NOTHING BUT NETS: THE HISTORY OF INSECTICIDE-TREATED NETS IN AFRICA, 1980s-PRESENT

by
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A dissertation submitted to Johns Hopkins University in conformity with the requirements for the degree of Doctor of Philosophy.

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Nothing but Nets: The History of Insecticide-Treated Nets in Africa, 1980s-Present

Abstract

Insecticide-treated bed nets (ITNs) have become a main pillar of global malaria control in the twenty-first century, distributed by the millions annually across Africa and the global South. Understood as ‘evidence-based,’ biomedical tools and one of the most cost-effective global health interventions, ITNs are a main target for health and development aid. This dissertation tracks the history of ITNs since 1980 to see how and why the technology became the centerpiece of malaria control efforts in Africa. Doing so, it reveals how conditions of resource scarcity and the politics of structural adjustment shaped the construction of ITNs as biomedical objects, the translation of experimental findings into evidence-based malaria control policy, and the implementation of evidence-based policy in practice. The identity of ITNs as biomedical tools was by no means obvious or pre-determined, nor did that identity alone lead to the tool’s widespread adoption as an evidence-based intervention for malaria control in Africa.

By following the biography of ITNs through the initial production of scientific knowledge, the consolidation of ITNs as universally applicable biomedical tools, the incorporation of ITNs into malaria control policy, and the implementation of ITN policy in public health practice, this study examines the relationship between local contingencies of knowledge and technology, and the formulation and mobilization of supposedly ‘universal’ scientific knowledge in global health. In tracking these biographical ‘moments’ both on a transnational scale and in Kenya, this study also elucidates the impact African, and specifically Kenyan, populations and landscapes have had on the production and application of ITNs as biomedical, evidence-based technologies. In this
case, Africans were not marginal or passive in the making of evidence-based global health; rather, they were centrally involved in the endeavor, actively reshaping and redefining ITNs to address biological and economic vulnerabilities during and following structural adjustment.

Primary Reader and Advisor: Randall Packard

Secondary Readers: Jeremy Greene, Graham Mooney, Pier Larson, Yulia Frumer
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interest in public health, capitalism, and poverty. I have benefited immensely from conversations with all of the faculty in the History of Medicine Department, as well as participants in the Johns Hopkins African Seminar, Critical Global Health Seminar, and History of Science, Medicine, and Technology colloquia. I would like to thank my fellow graduate students for all of their support and insights. In particular, I want to acknowledge Eli Anders, Katherine Arner, Julia Cummiskey, Penelope Hardy, Gregoire Hervouet-Zeiber, Seth LeJacq, Jessica Levy, Misha Mintz-Roth, Heidi Morefield, Rex, Justin Rivest, Marion Schmidt, Mac Skelton, and Alice Wiemers. And, of course, I would not have gotten very far without the help of my department’s amazing librarians, Christine Ruggere and Eliza Hill, and administrator, Coraleeze Thompson. I could not have asked for a better departmental home.

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### Abbreviations

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<tbody>
<tr>
<td>ABCP</td>
<td>Asembo Bay Cohort Project</td>
</tr>
<tr>
<td>AFR/SD</td>
<td>Africa Bureau/Office of Sustainable Development (USAID)</td>
</tr>
<tr>
<td>AFRO</td>
<td>(WHO) African Regional Office</td>
</tr>
<tr>
<td>AIM</td>
<td>African Initiative for Malaria Control in the 21st Century</td>
</tr>
<tr>
<td>AMF</td>
<td>Against Malaria Foundation</td>
</tr>
<tr>
<td>AMREF</td>
<td>African Medical and Research Foundation</td>
</tr>
<tr>
<td>BASICS</td>
<td>Basic Support for Institutionalizing Child Survival</td>
</tr>
<tr>
<td>CCM</td>
<td>Country Coordinating Mechanism</td>
</tr>
<tr>
<td>CDC</td>
<td>United States Centers for Disease Control (and Prevention)</td>
</tr>
<tr>
<td>CGHR</td>
<td>Centre for Global Health Research</td>
</tr>
<tr>
<td>CIDA</td>
<td>Canadian International Development Agency</td>
</tr>
<tr>
<td>CLCP</td>
<td>Centre National de Lutte contre le Paludisme</td>
</tr>
<tr>
<td>CORE</td>
<td>Child Survival Collaborations and Resources</td>
</tr>
<tr>
<td>DANIDA</td>
<td>Danish International Development Agency</td>
</tr>
<tr>
<td>DDT</td>
<td>Dichlorodiphenyltrichloroethane</td>
</tr>
<tr>
<td>DFID</td>
<td>(UK) Department for International Development</td>
</tr>
<tr>
<td>DHMB</td>
<td>District Health Management Board</td>
</tr>
<tr>
<td>DHMT</td>
<td>District Health Management Team</td>
</tr>
<tr>
<td>DOMC</td>
<td>Division of Malaria Control</td>
</tr>
<tr>
<td>DOTS</td>
<td>Directly Observed Treatment, Short-course</td>
</tr>
<tr>
<td>DVBD</td>
<td>Division of Vector Borne Diseases</td>
</tr>
<tr>
<td>EARN</td>
<td>Eastern Africa Roll Back Malaria Network</td>
</tr>
<tr>
<td>EBM</td>
<td>evidence-based medicine</td>
</tr>
<tr>
<td>FIELDMAL</td>
<td>Applied Field Research in Malaria</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GFATM</td>
<td>Global Fund to Fight AIDS, Tuberculosis and Malaria</td>
</tr>
<tr>
<td>GOK</td>
<td>Government of Kenya</td>
</tr>
<tr>
<td>HDSS</td>
<td>health and demographic surveillance system</td>
</tr>
<tr>
<td>HHRAA</td>
<td>Health and Human Resource Analysis for Africa Project</td>
</tr>
<tr>
<td>HIPC</td>
<td>Heavily Indebted Poor Country</td>
</tr>
<tr>
<td>ICIPE</td>
<td>International Centre for Insect Physiology and Ecology (Kenya)</td>
</tr>
<tr>
<td>IDRC</td>
<td>International Development Research Council (Canada)</td>
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<tr>
<td>IEC</td>
<td>Information, Education, Communication</td>
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<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
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<tr>
<td>IRS</td>
<td>indoor residual spraying</td>
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<tr>
<td>ITN</td>
<td>insecticide-treated net</td>
</tr>
<tr>
<td>KAP</td>
<td>Knowledge, Attitudes, and Practices</td>
</tr>
<tr>
<td>KEMRI</td>
<td>Kenya Medical Research Institute</td>
</tr>
<tr>
<td>Ksh</td>
<td>Kenyan shilling</td>
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<tr>
<td>LLIN</td>
<td>long-lasting insecticide-treated net</td>
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<tr>
<td>LSHTM</td>
<td>London School of Hygiene and Tropical Medicine</td>
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<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>M&amp;E</td>
<td>monitoring and evaluation</td>
</tr>
<tr>
<td>MACEPA</td>
<td>Malaria Control and Elimination Partnership</td>
</tr>
<tr>
<td>MCU</td>
<td>Malaria Control Unit</td>
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<tr>
<td>MDG</td>
<td>Millennium Development Goal</td>
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<tr>
<td>Merlin</td>
<td>Medical Emergency Relief International</td>
</tr>
<tr>
<td>MIM</td>
<td>Multilateral Initiative on Malaria</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>MRC</td>
<td>Medical Research Council</td>
</tr>
<tr>
<td>MSF</td>
<td>Médecins Sans Frontières</td>
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<tr>
<td>MVP</td>
<td>(UN) Millennium Development Villages Project</td>
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<tr>
<td>NATNETS</td>
<td>Tanzania National Net Programme</td>
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<tr>
<td>NGO</td>
<td>non-governmental organization</td>
</tr>
<tr>
<td>NMCC</td>
<td>National Malaria Control Centre (Zambia)</td>
</tr>
<tr>
<td>NMCP</td>
<td>National Malaria Control Program</td>
</tr>
<tr>
<td>OAU</td>
<td>Organization for African Unity</td>
</tr>
<tr>
<td>OFDA</td>
<td>Office of U.S. Foreign Disaster Assistance</td>
</tr>
<tr>
<td>PATH</td>
<td>Program for Appropriate Technology in Health</td>
</tr>
<tr>
<td>PCV</td>
<td>packed cell volume</td>
</tr>
<tr>
<td>PHC</td>
<td>primary health care</td>
</tr>
<tr>
<td>PMI</td>
<td>President’s Malaria Initiative</td>
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<td>PRSP</td>
<td>Poverty Reduction Strategy Paper</td>
</tr>
<tr>
<td>PSI</td>
<td>Population Services International</td>
</tr>
<tr>
<td>PVO</td>
<td>private voluntary organization</td>
</tr>
<tr>
<td>RBM</td>
<td>Roll Back Malaria</td>
</tr>
<tr>
<td>RCT</td>
<td>randomized controlled trial</td>
</tr>
<tr>
<td>REAPING</td>
<td>Roll Back Malaria Essential Action, Progress, and Investment Gaps</td>
</tr>
<tr>
<td>RUTF</td>
<td>Ready-to-Use Therapeutic Food</td>
</tr>
<tr>
<td>SER</td>
<td>Social and Economic Research</td>
</tr>
<tr>
<td>SMITN</td>
<td>Social Marketing of Insecticide-Treated Nets</td>
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<tr>
<td>SP</td>
<td>sulphadoxine-pyramethamine</td>
</tr>
<tr>
<td>SUFI</td>
<td>Scale Up For Impact</td>
</tr>
<tr>
<td>TAGS</td>
<td>(Impregnated) Target Specific Nets</td>
</tr>
<tr>
<td>TAMTAM</td>
<td>Together Against Malaria, <em>Tuafue Afya Na Maisha</em></td>
</tr>
<tr>
<td>TDR</td>
<td>Special Programme for Research and Training in Tropical Diseases</td>
</tr>
<tr>
<td>TRaC</td>
<td>Tracking Results Continuously</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNAIDS</td>
<td>United Nations Programme on HIV/AIDS</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>VAST</td>
<td>Vitamin A Supplementation Trial</td>
</tr>
<tr>
<td>VAT</td>
<td>value-added tax</td>
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"xi"
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<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>VBCRC</td>
<td>Vector Biology and Control Research Centre</td>
</tr>
<tr>
<td>VHW</td>
<td>village health worker</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WHO-AFRO</td>
<td>World Health Organization - Africa Regional Office</td>
</tr>
<tr>
<td>WHOPES</td>
<td>World Health Organization Pesticide Evaluation Scheme</td>
</tr>
<tr>
<td>WHO/RBM</td>
<td>World Health Organization/ Roll Back Malaria Department</td>
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Introduction
Making ‘Evidence-Based’ Global Health and Global Health Technologies in Africa

In 1988 a team of researchers working in rural Gambia set out to answer a seemingly straightforward question: would using mosquito (bed) nets treated with a pyrethroid insecticide lead to reductions in child mortality? An affirmative answer could mean hope for those seeking solutions to a growing malaria crisis in Africa. The researchers ordered permethrin solution months in advance to ensure they received this critical element in time for the malaria transmission season of 1989, when they planned to test the intervention. They ordered new batteries to power CDC light traps (portable contraptions used to catch mosquitoes for entomological investigation). Everything was in place…until the couple of weeks before the trial began. The researchers received notice that the permethrin had arrived in The Gambia but was nowhere near their research station and study site, located roughly 200 kilometers east of the ports on the coast. By the time they figured that out, they had to send their own drivers to make a late night run a third of the way across the country for the permethrin. The last drum of insecticide arrived in the target village at midnight before the intervention was supposed to be implemented there. Furthermore, in a test run, the new batteries—which were actually twelve volt rather than the required six volt—blew out the lights of all the CDC traps. Since it took over six months to get things shipped from Europe, some of the researchers made their own trip to the coast to buy emergency light bulbs and batteries from motorbike shops, secondhand stores, and the like. Despite these, and a number of other complications, the research team got the experiment up and running and, unbeknownst to them, kicked off what would become a series of similar (and similarly precarious) insecticide-treated bed net experiments across the continent. These subsequent
experiments, though highly contingent and difficult to fully control, ultimately succeeded in showing insecticide-treated nets could reduce child mortality in Africa.¹

Just over ten years later, in April 2000, hosts of international and state officials descended on Abuja, Nigeria for a momentous Summit meeting. Members of Nigeria’s Ministry of Health and other government officials welcomed streams of visitors arriving from all over Africa, Europe, and North America. Though somewhat heterogeneous in their professional backgrounds, these people were gathered to promote and publicize malaria control on the African continent, a relatively marginal cause on the world health agenda until the previous couple of years. To commemorate such an event, there were people singing, dancing, and snapping pictures. The festivities even included the world’s largest bed net, a circus tent-like fixture that groups of Nigerian children crowded into to give onlookers a sense of how many African children could be saved with insecticidal nets. High-ranking health and development officials, including Director-General of the World Health Organization (WHO), Gro Harlem Bruntland, spoke triumphantly to the crowd about a new global effort to Roll Back Malaria in Africa. Those pyrethroid-treated bed nets, it turns out, would come to play a major, disproportionate role in this global undertaking, enjoying over a decade in the spotlight of anti-malaria activities on the continent.

November 2015. A truck rumbles down the highway toward the highlands of Kisii, in western Kenya. Riding up and down the paved slopes of Kisii’s Gucha division, the truck arrives at a government clinic in the rural area of Nyoera. The driver opens the truck, packed to the brim with bales of blue, packaged insecticide-treated bed nets. The

¹ Details provided by Steve Lindsay, the entomologist who worked on this trial. Steve Lindsay, interview with author, Durham, UK, May 27, 2015.
following day, residents journey down the muddy hillside and join the line forming outside the clinic. Under the gaze of public health officers, residents submit vouchers to the man running the books, who checks them off and hands them some of the blue nets. The packages, decked out with logos of various companies and organizations, including that of Kenya’s Ministry of Health, read “Free Net”—a message meant to discourage resale. Some people complain and haggle, asking for additional nets to cover all, or at least more of the members in their household. Denied this request, they return home from the clinic along with the others in line, nets in hand. 2

These scenes in The Gambia, Nigeria, and Kenya, are separated by time and geographic distance but connected by a fairly mundane technology: the insecticide-treated bed net (ITN). Intended as physical and chemical barriers for malaria-carrying Anopheles mosquitoes, these portable meshworks of pyrethroid-treated, synthetic fabric have become a cornerstone of global malaria control in the twenty-first century. Since 2000, ITNs have been distributed by the millions across the global South. They are especially prevalent, nearly ubiquitous even, in sub-Saharan Africa, home to roughly 90% of the world’s malaria burden. ITNs, in fact, have emerged as a quintessential evidence-based intervention and posterchild for the ‘new’ global health. 3

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2 Based on fieldwork in November 2015.
3 Recognizing the continuities between transnational, world-scale public health efforts from the late nineteenth century to the present, historians and anthropologists have described ‘global health’ as a distinctive form that emerged in the post-Cold War period, roughly in the mid-1990s. In contrast to older models, this new iteration of global health is characterized by public-private partnerships, significant influence of non-governmental and humanitarian organizations on health care provision, randomized controlled trials and other practices of evidence-based medicine, biomedical commodities (especially pharmaceuticals), and neoliberal economic principles more generally. Although my study traverses the periods typically associated with ‘international’ and ‘global’ health, respectively, I will use the term ‘global health’ here since I am analyzing the development of relations, practices, and institutions associated with this paradigm of wide-scale public health. For historical treatments on the distinctions and continuities of international and global health, see Theodore Brown, Marcos Cueto, and Elizabeth Fee, “The World Health Organization and the transition from “international” to “global” public health,” American Journal of Public Health.
narratives within the global health community attribute the rise of ITNs in malaria control programming to the march of scientific progress marked in the opening scenes: first scientists demonstrated ITNs reduced child mortality in intervention trials, then policy makers incorporated ITNs into global health policy based on that scientific evidence, and then health programs deployed ITNs in Africa following evidence-based policies. Such a narrative reinforces the value of randomized controlled trials in rationalizing the choice and development of interventions in global health. Yet, as I show with this dissertation, such a narrative obscures the much more complicated, historically contingent reasons a low-tech, fairly old technology became so prominent and influential in the twenty-first century.4

This dissertation challenges existing narratives about ITNs as a simple case of scientific discovery and adoption by examining the circumstances and underlying assumptions that informed international interest in and the development of ITNs as a desirable public health intervention since 1980.5 European scientists began investigating ITNs in Africa during the early 1980s, amidst increasing rates of resistance to the antimalaria drug, chloroquine. By the late 1990s, researchers had demonstrated in multi-sited randomized control trials that ITNs could reduce child mortality and be incorporated

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4 Untreated mosquito nets and similar devices have been used in some form by people around the world over millennia. S.W. Lindsay and M. E. Gibson, “Bednets revisited—Old idea, new angle,” Parasitology Today 4, no. 10 (1988): 270-272. For a historical perspective on how and why low-tech, mundane, and old technologies persist, see David Edgerton, The Shock of the Old: Technology and Global History since 1900 (Oxford: Oxford University Press, 2007).

5 I focus on pyrethroid-treated nets only, first tested in field trials for public health use in 1980. Although U.S., U.S.S.R., and German military and residents of certain regions in China had treated mosquito nets with DDT prior to the advent of pyrethroids in the 1960s and 1970s, they did so on a small scale for a short period. Unlike pyrethroid-treated nets, DDT-treated nets did not become a major malaria control measure among populations living in malaria endemic areas.
into fragile, decentralized health systems, characteristic of many African countries following the debt crisis and subsequent implementation of World Bank and International Monetary Fund (IMF)-led structural adjustment policies. Through such experiments, scientists and health officials came to understand ITNs as a universally applicable, biomedical tool. Despite the publication of promising scientific results, during the 1990s many potential funders still deemed malaria control in Africa too difficult, expensive, and politically unpopular to support financially. Therefore, I argue, public health authorities did not adopt ITNs widely just because the intervention seemed to have inherent value as a biomedical technology. Rather, to a great extent, imperatives to sell malaria control in Africa to development agencies and corporate patrons as a feasible task, good investment, and endeavor aligned with neoliberal principles also led the WHO and its academic and African state partners to embrace ITNs as a primary tool for malaria control on the continent. The biomedical identity of ITNs and their ability to “save lives,” though, was critical to making and continuing this sale.

“Nothing but Nets” does more than simply explain the emergence and centrality of ITNs in malaria control programming; it also uses ITNs as a vehicle to explore major themes and questions in the history of global public health. How have social, political, and cultural contexts shaped the production of global health knowledge? How have the findings of research studies conducted in specific settings been generalized and incorporated into global health policy? How have efforts to implement global health policies been shaped by local contexts? What consequences have biomedical, global

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health interventions had in the places where they have been deployed? While historians and anthropologists of global health and postcolonial science have explored these questions, few have analyzed research, policy formulation, and implementation together as part of linked processes. By analyzing these questions in a single study, I want to elucidate the ways that paradigms of knowledge production in global health, and biomedical paradigms in particular, have shaped the construction and application of global health interventions. Interrogating a health intervention in this way, my study provides insight into how the local, or situated, contingencies of technology and knowledge have shaped, limited, or been transcended by ‘global’ epistemic frameworks—ways of knowing supposedly based on a non-specific, universal nowhere.

In using ITNs as a vehicle to explore the history and dynamics of global health, this study provides a new perspective on how ITNs became a main pillar of malaria control in Africa, one which involves multiple participants, places, and conditions. Scholarship on recent malaria control efforts portrays ITNs as always being understood as biomedical tools merely reflective of political, economic, and epistemic trends in twenty-first century global health and development. However, scientists and health

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8 I thank Andrew Lakoff for articulating some of this question in his commentary at the March 2017 Buffett Institute graduate student conference, “Science, Technology, and the Politics of Knowledge in Global Affairs.”

officials did not initially pursue ITNs *because* they were tools that addressed malaria as a problem of personal, medical management; rather, conceptions of the solution to and problem of malaria mutually informed and reinforced each other over the late twentieth and early twenty-first century. Additionally, scientists’ expertise, goals, obligations, and circumstances, informed how and why they set out to test ITNs in particular ways. The people they relied on to carry out these experiments, including African study participants, community health workers, local authorities, and fellow scientists, shaped what knowledge researchers could produce about ITNs and how they produced it. In order to understand the proliferation of ITNs in Africa, one must first account for the variety of influences involved in constructing this object as a biomedical technology, including those influences emanating from Africa.

Historicizing ITNs as biomedical, global health technologies in this way provides a perspective largely missing from academic literature on global health. Although many scholars have examined and critiqued technological and ‘evidence-based’ approaches in global health, including ITNs, few have actually analyzed global health technologies as complex, dynamic entities in and of themselves. Rather, critics have often treated technologies as “black boxes to be dismissed as not solving all problems, or to be feared.”¹⁰ Pharmaceuticals, vaccines, Ready-to-Use Therapeutic Food, and bed nets all target disease in a narrow technical and biomedical fashion without addressing the

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underlying social, political, and economic factors that exacerbate ill health. Such critiques are important at a time when practitioners and patrons are placing increasing faith and investment in narrowly technical, biomedical solutions to pathologies of the global South. Yet, these critiques overlook the ways “scientific and technical knowledges,” and indeed, technologies themselves, are blended “with choices made through politics, funding, and community organizing.” By opening the black box, and historicizing how and why ITNs became understood as biomedical technologies and main pillar of global malaria control, I shed light on the political valences and consequences of defining a technology as biomedical in global health. More than just another magic bullet for a complex public health problem, ITNs as cheap, simple, biomedical tools were central to consolidating international attention and action toward malaria control in Africa, albeit attention and action of a certain, “anti-political” kind.

In order to historicize and examine ITNs as complex, dynamic entities, I organize my study within a biographical framework. Specifically, I draw on the commodity biography approach elaborated by anthropologist Igor Kopytoff, who argued that

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commodities are cultural and cognitive as well as material productions.\textsuperscript{14} Artifacts do not have inherent, stable, or singly-defined identities; rather they are imbued with, sometimes various identities by different people in different contexts who exchange and assign value to them. “As with persons, the drama” of a thing’s biography “lies in the uncertainties of valuation and of identity.”\textsuperscript{15} Biomedical technologies, I suggest, are also cultural, cognitive, and material productions, to which people have assigned variable identities (including non-medical identities) and values in different contexts. This is exceedingly apparent in the history of ITNs, as scientists did not immediately understand the connection between the use of this tool and reductions in symptomatic malaria disease, and many African populations did not fully understand how a net could prevent an illness caused by the cold, rain, spoiled fruit, or witchcraft.\textsuperscript{16} Employing a biographical frame, then, this dissertation examines four key moments in the life history of ITNs: the initial production of scientific knowledge about ITNs as public health interventions in Africa; the consolidation of ITNs as biomedical technologies in a randomized control trial conducted in Kenya’s Siaya district; the translation of research findings into global (and national) health policy; and the implementation of policy in Africa as part of the WHO-led initiative to Roll Back Malaria. Interrogating the history of ITNs through these moments allows me to illuminate both the changing character and significance of ITNs,

\textsuperscript{15} \textit{Ibid.}, 90.
\textsuperscript{16} For more on perceptions of malaria among residents of rural western Kenya, for example, see Jane Alaii, et al., “Perceptions of bed nets and malaria preventions before and after a randomized controlled trial of permethrin-treated bed nets in western Kenya,” \textit{American Journal of Tropical Medicine and Hygiene} 68, Suppl. 4 (2003): 142-148.
and the shifting contexts in which this object became meaningful to different people and
groups in Africa and beyond.

Of course, the production of scientific knowledge about ITNs, the incorporation
of ITNs into health policy, and the implementation of ITNs in practice did not always
occur in chronological succession; sometimes these processes overlapped or even
preceded one another. This also complicates common narratives in the fields of public
health and medicine that portray the application of ‘evidence-based’ interventions as a
liner progression from scientific (typically biomedical) knowledge production, to
incorporation into health policy, to implementation in practice. Historians, sociologists,
and anthropologists of medicine have engaged with such internalist narratives by
challenging the idea that randomized controlled trials—the gold standard in evidence-
based medical research—and biomedical paradigms of knowledge production more
generally are politically and epistemically neutral. Few, however, have examined the
specific effects of biomedical paradigms and research practices on public health policy
formulation and subsequent, policy-guided implementation of interventions. By tracing
the life history of ITNs through research, policy, and practice, and exploring the role
scientific knowledge played in these processes, I problematize neat narratives and

17 Saurabh Shrivastava, et. al., “Formulating evidence-based public health policies: a guide to policy
makers,” International Journal of Preventive Medicine 6, no. 4 (2015); Stefan Lhachimi, Malgorzata Bala,
Lynn Meldrum also described these internalist narratives about evidence-based medicine in her dissertation
on the history of randomized clinical trials. Marcia Lynn Meldrum, “‘Departures from the Design’: The
at Stony Brook, 1994.
18 Andrew Lakoff, “The mousetrap: Managing the placebo effect in antidepressant trials,” Molecular
Interventions 2, no. 2 (2002): 72-76; Vincanne Adams, “Evidence-based global public health: Subjects,
profits, erasures,” in Bielh and Petryna, eds., When People Come First, 54-90; Vincanne Adams,
“Randomizing controlled crime: Postcolonial sciences in alternative medicine research,” Social Studies of
assumptions about how and why ‘evidence-based technologies’ are incorporated into
global public health programs. Like technologies, scientific evidence and its form,
meaning, function, and value are historically contingent and often work to reinforce
existing political approaches to and structures in public health.

The biography of ITNs in Africa also did not unfold in a single place or under the
influence of a single community or institution. Populations living in rural African villages
are as important to the history of ITNs as African and expatriate scientists, policy makers,
public health practitioners, and patrons. The fact that ITNs are individualized
commodities—which African ‘consumers’ must personally implement and, in earlier
periods, had to purchase and treat with insecticide—has meant that African communities
significantly shaped whether scientists completed scientific ITN experiments and whether
health officials successfully carried out ITN programs. Thus, I explore the life history of
ITNs as it unfolded both on a transnational scale and in Kenya, a main testing and
implementation ground for ITNs. Doing so, this project explores alternative narratives of
the development of biomedical, global health interventions that de-center donors,
development agencies, and academic institutions from the global North. African
communities were not merely passive recipients of an externally-defined, scientific
technology. Rather, they played crucial roles in producing and enacting biomedical
knowledge through their material, epistemic, and consumption practices. Taking
seriously the role of local contexts, health workers, researchers, and populations in
defining ITNs as biomedical, global health technologies, this dissertation aims to explain
and “assert [Africa’s] position in the gradual making of global affairs”—specifically,
‘evidence-based’ global public health—while still acknowledging the inequalities that persist in the global health enterprise.¹⁹

At the same time, by focusing on the history of ITNs in Kenya, I also want to highlight the impact that ITN research and programs, along with the object itself, have had on Kenyan communities, institutions, and landscapes. These impacts have been varied and ambivalent, in many ways mapping onto earlier political geographies of health services, disease, and poverty in the country.²⁰ ITNs emerged as a promising tool for malaria control in Africa around the time Kenya emerged as a popular test site for malaria control in the context of chloroquine resistance and impoverished, rural health systems. As a result, certain regions of the country became hot beds for ITN research, pilot programs, and distribution campaigns—a phenomena which helped reduce but by no means eliminated malaria in these places. The saturation of ITNs, ITN-related organizations, and ITN markets increased as the technology became part and parcel of antimalaria efforts in Kenya and Africa more generally. In addition, the emergence of ITNs coincided with state efforts to implement structural adjustment policies and health care reform in the 1980s and 1990s. Just as the politics of international health and development shaped the scientific testing of ITNs, so too did the politics of health reform shape how and why Kenya’s Ministry of Health adopted ITNs for malaria control in the country. Although seemingly mundane, I suggest, ITNs served as a site for re-imagining and remaking public health governance—or, the mechanisms, organization, and control


of public health activities—in Kenya and Africa during and following structural adjustment.

To capture the influences of various professional and non-professional, non-elite African communities on the history of ITNs, I draw from recent trends in the history of international health and development that examine activities and events as they unfolded on transnational, national, and sub-national scales. Scholars have used this tiered analysis to highlight the disunity and divisions between health policy makers and planners with those actually carrying out health programs in different social and cultural contexts. Doing so, they have helped to explain the ineffectiveness of certain policies in practice or complicate triumphalist narratives of top-down disease control campaigns.21 Other scholars have also drawn attention to the ways in which the so-called ‘recipients’ of international health and development projects actually shaped those projects when they were applied in local contexts.22 Such studies help revise understandings of who contributes to the making of international (or global) public health interventions, and how and why they do so. I similarly examine perspectives of those operating at transnational, national, and sub-national scales to elucidate the relationship between these actors, as well as their influence on the development and application of ITNs. However, rather than organize and examine these layers in a pyramid fashion, from the so-called ‘top’ to the

so-called ‘bottom,’ I look at the practices and responses of participants operating at sub-national, national, and transnational scales within single chapters. This allows me to highlight the continuous, multi-directional interactions between policy makers, scientists, donor organizations, civil servants, health providers, and African populations that have animated the field of global health and malaria control.

In conjunction with this structural-analytic, I draw on a variety of sources to present the perspectives of different participants in this history of ITNs. As is common in histories of global and international health and development, I use documents from institutional archives—including those of the WHO, World Bank, United Nations, London School of Hygiene and Tropical Medicine (LSHTM), U.S. Centers for Disease Control (CDC), and Kenya Medical Research Institute (KEMRI)—to understand the political interests, bureaucratic practices, practical needs, and constraints of relevant agencies. I complement my examination of archival materials with a review of published sources and oral history interviews with scientists, health officials, and others at these institutions who were involved in ITN research, policy, and implementation in Africa. These sources allow me to provide a more complete and detailed view of events than is captured in documents. I also use oral history and participant observation, to present the perspectives and experiences of Kenyan health officials, community health workers and residents of western Kenya (my primary region of study), typically absent from archival and published documents. Although I use oral histories to glean information about the past, I also read these sources as social texts co-produced by myself, my informants, and, in some cases, my research assistant in particular personal and historical contexts.23 As

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such, I also use oral histories to understand the meaning and significance different people imparted to ITNs in the present as well as in the past. Coupling this with a review of policy documents, scientific publications, health and demographic surveys, and other published and archival materials, I try to provide a thick, rich history of ITNs and malaria control in Kenya effectively interwoven into a discussion of ITNs in transnational perspective.

**Contributions to the Literature**

“Nothing but Nets” sits at the intersection of multiple fields of inquiry scholars have used to study global health and development, including the history of medicine, science, and technology; African history; and science and technology studies. The project draws on concerns, perspectives, and approaches from each of these fields, but also combines them to provide new insights on the history of global health in Africa in the late twentieth and early twenty-first centuries. The politics of technology in-the-making—as opposed to a completed technology—I want to emphasize, is a fruitful terrain for exploring the history of global health, biomedicine, and public health in Africa.24

First and foremost, my work adds to the growing body of literature in the history of global health and development (including its previous iterations) by bringing in approaches from the history of technology to understand the production of global health knowledge, formulation of global health policy, and application of global health interventions. Over the past decade, many historians and anthropologists have described

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the centrality of biomedical technologies, especially pharmaceuticals, to global health practice. In doing so, they have shown how institutions and private interests based in the global North have chosen and applied technology-centric disease control strategies to serve their own political and economic interests, acting as arbiters of life and death in colonial and postcolonial settings.\(^{25}\) Looking at humanitarian organizations specifically, anthropologist Peter Redfield has illustrated how analyzing the form, function, and discourse around technologies—in his case, humanitarian “micro-technologies” such as Ready-to-Use Therapeutic Food (RUTF) and portable water filtration straws—helps us understand these organizations’ approaches, values, and goals.\(^{26}\) Micro-technologies of the twenty-first century, Redfield argued, reflect humanitarian organizations’ commitments to securing survival with minimalist and mobile solutions that can be applied anywhere, without the need for permanent infrastructure. I build on these insights by analyzing ITNs to understand the interests and beliefs of the various institutions, individuals, and communities who contributed to the development of the technology as a major, similarly minimalist and mobile global health intervention. However, by historicizing the meaning, significance, and function of ITNs from a variety of


perspectives, including ITN users and health workers in Africa, I also show how and why people’s needs, interests, and contexts changed over time, and how such changes impacted the development of ITN interventions.

Furthermore, I engage with scholarship on the history of colonial and postcolonial science to expand conversations about the ways medical-scientific knowledge production has impacted public health efforts in Africa. Scholars have investigated the ways the social and political context of African research sites shaped the scientific knowledge produced there, and how this knowledge lost this sense of place when it travelled through scientific networks.²⁷ Africans’ contributions to the production of ‘universal’ scientific knowledge, many have argued, were often obscured or ignored due to political inequalities that favor experts from the global North.²⁸ Such analyses are useful for understanding biomedical ITN trials, the most important of which were conducted in Africa in partnership with or under the leadership of African scientists, health workers, and communities. Looking at biomedicine from a different angle, other scholars have illustrated how supposedly ‘universal’ biomedical knowledge and technologies took on different forms and significance as African populations incorporated these into their own circumstances and health care practices.²⁹ In a stark example of this, anthropologist


Caroline Bledsoe described how women in The Gambia used “modern” contraceptives in unintended ways based on their own priorities, beliefs, and histories with reproduction.\textsuperscript{30} As interpretatively and materially flexible artifacts, or “fluid technologies,” ITNs similarly elicited a variety of responses and applications from African users.\textsuperscript{31} So what happened to the biomedical knowledge produced in Africa about ITNs when ITNs were later applied as universally-applicable, biomedical interventions in malaria control programs on the continent? By combining the two lines of inquiry described here within my life history of an evidence-based technology, I illuminate the complexities of producing and implementing biomedical knowledge in global public health. In particular, I show how different participants’ specific political-economic interests and constraints informed the types of knowledge they considered relevant to applying ITNs in Africa and the ways in which they translated this knowledge into public health practice.

This study also speaks to scholarship in the history of technology, namely discussions of who contributes to the production and development of technologies and the ways in which they do so. Historians and science and technology scholars looking at technology in Africa have drawn attention to African populations as influential technological actors who actively shape their environments and circumstances.\textsuperscript{32} Joshua


Grace and Clapperton Chakanetsa Mavhunga, for example, both showed how non-elite groups, or “ordinary people,” innovated with foreign technologies in pursuit of their own interests and needs. By repairing cars to keep them on the road or driving new roads into existence, Grace illustrated, mechanics and automobile drivers in Tanzania participated in directing colonial and national development—a process often linked to former colonial powers. VaShona hunters in modern-day Zimbabwe incorporated guns into their own epistemic, spiritual frameworks to aid colonizers seeking to control animal hosts of trypanosomiasis (sleeping sickness) while obtaining good meat for their communities. This and similar work on technology in colonial and postcolonial contexts has made important revisions to earlier narratives of technologies as ‘tools of empire’ merely imposed on passive African populations. However, the implications of Africans’ use of technology outside the continent remains underexplored. Examining how non-elite African populations informed the development of a biomedical technology used in malaria endemic countries around the world, my dissertation aims to insert African technological practices into a broader global history.

Finally, in exploring the history of malaria control and ITNs in Kenya from the 1980s to the present, this dissertation contributes to understandings of public health in

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34 Grace, “Modernization Bubu.”
35 Mavhunga, Transient Workspaces.
Kenya since 1980. Scholars and policy analysts have described the negative impacts of austerity measures, decentralization, and privatization in Kenya’s health sector on Kenyan populations, particularly as these reforms dovetailed with the AIDS epidemic in the country. More recently, historians and anthropologists have also examined the shifting, or declining, role of the state in public health provision since the late twentieth century through the study of medical research. As P. Wenzel Geissler, Ruth Prince, and Kenneth Ombongi have shown, parastatal and expatriate research organizations and non-governmental organizations have largely taken over public health provision in the country’s new ‘research archipelagoes.’ Residents of places like Siaya and Kisumu in turn have adapted to the precarious conditions generated in this ‘projectification’ of public health by enrolling in medical research studies as participants and community health workers. My dissertation helps to bridge these two bodies of work by exploring how Ministry of Health officials, as well as Kenyan scientists, health workers, and at-risk populations engaged with ITNs in the context of scarce health resources. These groups worked with and through a medical technology in various ways to secure aid and resources from outside donors. In a sense, then, ITNs operated as political as well as public health technologies in Kenya.

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Chapter Outline

I track the life history of ITNs over six main chapters grouped into three sections: ITN research, ITNs in health policy, and ITN implementation. Within each section, I explore the activities in question as they unfolded on a transnational scale and in Kenya. Each chapter illuminates a different angle of the story, whether by looking at certain processes in more detail, by focusing on the contributions of different people and groups, or by examining differential impacts and consequences of ITNs on various groups and settings. Each chapter also adds new layers to the history of ITNs and malaria control in Africa, operating like transparencies overlaid on top of one another more than discrete pictures moving in chronological succession. Kenyan and African populations more broadly, these chapters show, shaped the construction of ITNs as biomedical, global health technologies; at the same time, ITNs and the organizations that have worked to proliferate the intervention have reshaped Kenyan and African landscapes, health infrastructure, and societies in important ways.

Chapter 1 examines how and why expatriate researchers investigated ITNs for large-scale malaria control in different sites across Africa beginning in the 1980s. In the midst of a global recession and declining effectiveness of existing malaria control tools, entomologists began studying the use of ITNs to repel Anopheles mosquitoes and reduce malaria transmission—in other words, as entomological, vector control tools. Soon, however, clinical researchers working in The Gambia began investigating the relationship between ITNs and human malaria disease indicators in the region as part of an effort to establish primary health care services in the county. Showing ITN use could lead to
drastic reductions in child mortality, this research sparked a series of randomized controlled trials across Africa that measured the efficacy of ITNs in reducing child mortality and malaria disease, as well as the cost-effectiveness of the malaria control intervention. Clinical researchers, epidemiologists, and social scientists working in Africa re-conceptualized ITNs as biomedical objects similar to drugs or vaccines, which supposedly operated the same way in any setting regardless of local ecologies, mosquito populations, the strength of health systems, or socio-cultural circumstances. In analyzing how scientists—who were dependent on local health workers and study populations—conceptually transformed ITNs in biomedical tools, I argue that the politics of late twentieth-century international health and development, along with local circumstances in African research sites, shaped the production of scientific knowledge about ITNs.

In chapter 2, I look in depth at the process of producing biomedical knowledge about ITNs in Africa through an historical ethnography of the last and largest ITN efficacy trial ever conducted: a community randomized controlled trial of ITNs in Kenya’s Siaya district. In the mid-1990s, researchers from the U.S. Centers for Disease Control and Kenya Medical Research Institute used existing, inchoate health research infrastructure in the lakeside district to test the efficacy of ITNs in an area of intense,

41 Jean-Paul Gaudilliére and other scholars have used the term ‘biomedical object’ to describe objects mobilized to “control the variability of the living.” These can be, as in Gaudilliére’s case, sex steroids, pharmaceuticals, and other material technologies intended to be universally medically efficacious. However, scholars have also used ‘biomedical object’ to refer to non-technologies as well, such as cancer tumors or particular diseases, understood as standardized, universal threats to the biological body. In both instances, the identity of objects as biomedical is rooted in epistemologies from the (human) biosciences; like treated bed nets, one can understand these objects in other ways. Jean-Paul Gaudilliére, “Genesis and development of a biomedical object: styles of thought, styles of work and the history of the sex steroids,” Studies in the History and Philosophy of Biological and Biomedical Sciences 35, no. 3 (2004): 525-543, 525; Livingston, Improvising Medicine, 52-84; Jeremy Greene, Generic: The Unbranding of Modern Medicine (Baltimore: Johns Hopkins University Press, 2014).
perennial malaria transmission. Doing so, they sought to prove ITNs could reduce child mortality anywhere, even the most extreme transmission conditions. Expatriate and Kenyan scientists had to continually tailor their experiment to circumstances and populations in Siaya to produce biomedical knowledge about ITNs, drawing on help from Siaya-based community health workers to do so. In the process, they transformed Siaya into a site of global health, biomedical knowledge production. However, the influence of conditions and populations in Siaya got lost as researchers generalized experimental findings as global health knowledge and consolidated ITNs as universally applicable biomedical objects.

Chapter 3 examines how policy makers mobilized ITN research findings to incorporate ITNs into ‘evidence-based’ global malaria control policy at the end of the twentieth century. Malaria control in Africa was a politically unpopular investment in the period following the WHO’s failed global malaria eradication campaign of the 1950s and 1960s. International health and development agencies, however, began to gravitate toward ITNs during the 1990s, finding them a simple, cost-effective solution that could be integrated as commodities into decentralized health systems in Africa. In addition, ITNs’ identity as biomedical tools that could save children’s lives resonated with development agencies’ intensified focus on maternal and child health. ITNs, in other words, were politically and economically appealing in an era of prevailing resource scarcity. In fact, calls to adopt ITNs sometimes preceded the circulation of scientific knowledge and scientific certainty. Political appeal, as much as scientific evidence of ITN efficacy, informed the inclusion of ITNs into ‘evidence-based’ global malaria
control policy and the subsequent elevation of malaria control in Africa as a worthwhile investment.

Next, I telescope in to examine how and why health officials in Kenya incorporated ITNs into national health policy during the late twentieth century in chapter 4. Kenyan state leaders set out to reform the country’s health sector in line with World Bank and IMF structural adjustment policies during the 1980s, including such austerity-focused reforms as decentralizing the health sector, introducing user fees for state health services, and prioritizing preventive and basic primary health services. They did so around the time malaria began to resurge in the country. Thus, the Kenyan government, along with non-governmental, bilateral, and multilateral partners, included ITNs in cost-recovery, primary health care projects before researchers published the first results showing ITNs reduced child mortality. The political salience of ITNs, rather than its basis as a biomedical, life-saving device, informed the tool’s initial adoption in Kenya. Kenyan health officials drew on the country’s early experiences with ITN distribution to craft malaria control policy in the mid-1990s. However, when Kenyan health officials adopted global policy recommendations to receive debt relief and financial assistance from development donors in 2000, they used evidence derived from statistical models rather than previous experiences to design national ITN activities. Therefore, I argue, ITNs also served as a technology of policy—a tool to enact health sector reform and attract development aid—for the Kenyan state.

Chapter 5 picks up the story in 2000 to explore how ITNs were scaled up for malaria control in Africa through the Roll Back Malaria program and its policies. Since the WHO and Roll Back Malaria Secretariat depended on extra budgetary funding from
major donor agencies, they had to translate the benefits of and their strategies for malaria control into the language of economic growth, free enterprise, accountability, efficiency, and maternal and child survival, which donors prioritized. As a result, ITN as biomedical commodities became a centerpiece of Roll Back Malaria in Africa. At the same time, Roll Back Malaria policies and guidelines did not simply dictate how African malaria control officials and their expatriate partners scaled up ITNs as a health intervention; rather these state officials had to translate their ITN activities into the language and goals of Roll Back Malaria to access donor funding. Thus, they relied heavily on market mechanisms to carry out ITN distribution in the early 2000s, despite the fact that groups most at-risk for malaria did not have the money and/or did not understand the biomedical value of ITNs. Patrons and other stakeholders tinkered with market mechanisms and ITN technology to overcome issues of slow ITN uptake on the continent, rather than address the problems of distributing ITNs as biomedical commodities. The individualistic orientation of biomedicine worked synergistically with the individualistic orientation of neoliberal, economic development models prevalent in the 2000s to crystallize malaria control in Africa (largely via ITNs) as a problem of personal and individual management rather than a systemic, structural problem.

In chapter 6 I take a closer look at how the roll out of ITNs through Roll Back Malaria-informed policy occurred in Kenya, and how Kenyan populations and the Kenyan state shaped global ITN distribution policy in the process. Early on, Kenya’s Ministry of Health and Division of Malaria Control relied on the private voluntary organization, Population Services International, to socially market ITNs as biomedical, malaria control tools in the country. Trying to meet Roll Back Malaria’s ITN coverage
goal quickly, the Ministry also welcomed and partnered with various research, non-governmental, and charity organizations carrying out time-limited, free ITN distribution activities among certain impoverished communities. The Ministry encountered numerous problems in this patchwork-style ITN distribution, including that many residents did not purchase or use ITNs as intended. This occurred in part because residents did not completely understand the biomedical function of the technology—a problem scientists encountered in ITN trials, but which health programmers did not sufficiently address. Believing the issue to be primarily one about financial access, the Ministry adopted free mass ITN distribution campaigns in 2006 to dramatically increase coverage. Kenyan scientists and their expatriate partners documented the health impact of free distribution to argue ITNs should be delivered to African populations for free, documentation the WHO mobilized to convince donor agencies of the same. While the adoption of free ITN distribution campaigns has not solved all problems with using ITNs for malaria control in Kenya, these campaigns have greatly increased the saturation of ITNs in the country and helped reshape the contours of the public health system. At the same time, the Kenyan case makes clear, African populations operating within local health systems have significantly shaped the trajectory of a biomedical, global health technology.

I conclude by discussing the current status and future prospects of ITNs for malaria control in Kenya and Africa more broadly as Roll Back Malaria and the WHO’s Global Malaria Control Programme seek to sustain funding levels and reductions in disease indicators. Climatic conditions, water levels, and food security, however, are in flux, increasing the likelihood that malaria transmission and disease rates will resurge in Kenya and elsewhere on the continent. Pyrethroids, and likely insecticide-treated nets,
have a limited shelf-life for malaria control in Africa. Nevertheless, many African states have tailored much of their malaria control programs around ITNs over the past twenty years; it may be difficult for health officials and at-risk populations to pivot from individualized, biomedical commodities to other control strategies. The history of ITNs cannot offer a single, actionable solution to the multidimensional problem of malaria in Africa; however, as the following pages will show, it can provide insight into alternative trajectories of malaria control and politics of public health that allow us to imagine a future beyond nets.
Chapter 1
The Emergence of Insecticide-Treated Nets as Scientific Commodities in Africa

International health officials and entomologists did not consider insecticide-treated nets new tools in the 1980s. In fact, they even included a brief history of treated nets going back to the days of Herodotus in their 1989 report on insecticide-impregnated bed nets for malaria control. Continued recourse to this basic technology, the authors of the report indicated, spoke to its value: “Most good ideas are “re-invented” several times, the earlier occasions usually being forgotten because, at that time, materials did not exist to make the concept work fully satisfactorily. This certainly applies to impregnated nets.”¹ At last, in the late twentieth century researchers had found the right insecticides—synthetic pyrethroids—to make this tool work for large-scale malaria control. However, as historians of technology will tell you, materials alone do not determine whether or not a tool will become useful, valuable, or popular.² The social, cultural, and political milieu is also important. Pyrethroid-treated nets actually underwent multiple transformations during the 1980s and 1990s, many of which had nothing to do with their material properties but were nonetheless critical to their becoming a cornerstone of global malaria control in the twenty-first century. These largely conceptual transformations, and the scientific knowledge and practices underpinning them, were interwoven with the shifting landscape of international health and development during the 1980s and 1990s.

In order to understand how the insecticide-treated net (ITN) became a central tool in the fight against malaria in Africa, it is essential to understand how and why this

technology emerged as an object of scientific inquiry—or ‘scientific object’—in the early 1980s. It was at this point when researchers began to systematically observe and experiment with ITNs to learn how this technology impacted insects, environments, and people. In the words of Lorraine Daston, they took a set of previously “unknown, ignored or dispersed set of phenomena” and transformed them into an object “that can be observed and manipulated, that is capable of theoretical ramifications and empirical surprises,” and that coheres as an ontological entity. Researchers mobilized specialized, technical bodies of knowledge to understand the utility of that object—in this case, ITNs—and render that utility natural and inherent.

These scientists, of course, did not conduct ITN research independent of broader social, political, and economic forces. The World Health Organization (WHO) first encouraged entomologists to investigate ITNs in Africa in the early 1980s, during a global recession. African nations faced serious debt crises and intense pressure to implement constraining structural adjustment policies. This occurred just as resistance to the first-line malaria drug, chloroquine, began to spread on the continent. Malaria rates resurged largely as a result of these developments. Moreover, conditions of economic scarcity seriously undermined efforts to build up primary health care (PHC) services in Africa, a new priority of the WHO. International health officials and researchers’ notions of what was possible for public health and malaria control in Africa at this time informed

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3 In this and subsequent chapters, when I use the terms ‘insecticide-treated (bed) net’ or ‘ITN’ I am specifically referring to nets treated or impregnated with pyrethroids.


5 Christine MacLeod and Gregory Radick have described and referred to this phenomenon—the “claim[s] of bodies of scientific knowledge as having inherently useful offshoots” such as technologies or technical practices—as “productivity claims.” Christine MacLeod and Gregory Radick, “Claiming ownership in the technosciences: Patents, priority and productivity,” Studies in History and Philosophy of Science 44, no. 2 (2013): 188-201.
their scientific inquiries into ITNs. In particular, ideas that African governments and populations would have to implement public health interventions in a decentralized fashion with few financial or technical resources led scientists to test the viability of ITNs for both malaria control and weak health systems. In the process, they created new knowledge about how to define and measure malaria disease, even in rural areas with limited health and laboratory infrastructure. An examination of scientific ITN research, its goals, and the practices involved helps illuminate this politics of international health and development during a period of crisis and uncertainty in international malaria control.

In tracing the development of ITNs, it is also important to understand that not everyone understood ITNs as scientific in the same way at the same time, if they did at all. As scientists with different types of expertise—including entomological, clinical, and epidemiology—investigated ITNs, they produced new understandings of the function of ITNs. In this sense, ITNs evolved as plural scientific objects in the domain of international health. Employing a close reading of scientific publications, grant proposals, progress reports, and other materials from the WHO’s archives along with insights gathered from oral histories with participating scientists, this chapter historicizes

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6 It is not clear, for example, that participants in Africa-based ITN trials thought of ITNs as having scientific or medical value. Some participants used these explicitly as physical barriers against nuisance insects and debris.

7 This concept of plural or multiple ontologies draws from Annemarie Mol’s study of how different groups “enact,” or make comprehensible, atherosclerosis in various ways in a single Dutch hospital. “Ontology is not given in the order of things,” Mol argued. Rather, “ontologies are brought into being, sustained, or allowed to wither away in common, day-to-day sociomaterial practices,” including those of medicine and science. Annemarie Mol, The Body Multiple: Ontology in Medical Practice (Durham: Duke University Press, 2002), 6. For more on the politics of plural ontologies and on studying the plurality of biomedical, objects, see Stacey Langwick, Bodies, Politics, and African Healing: The Matter of Maladies in Tanzania (Bloomington, IN: Indiana University Press, 2011); Jeremy Greene, Generic: The Unbranding of Modern Medicine (Baltimore: Johns Hopkins University Press, 2014).
the evolving construction of ITNs as multiple scientific objects from the 1980s to the mid-1990s. Doing so, it reveals how the convergence of particular people with certain sets of expertise working in specific circumstances informed the identity of ITNs as biomedical objects—an identity by no means obvious or inevitable. It is with this “moment” that I begin my biography of ITNs in Africa.

Entomologists, clinical researchers, and epidemiologists were not the only ones who defined ITNs as scientific objects in this period. Social scientists, including anthropologists and economists, conducted investigations of ITNs alongside these other scientists in an attempt to fix monetary and use values to ITNs. They used social science techniques, in other words, to make ITNs commodities of international health. Economists in particular played a key role in defining ITNs as ‘cost-effective,’ a quality health and development donors favored in this period of resource scarcity, using econometrics.8 People living in China, The Gambia, and elsewhere were already purchasing untreated bed nets before entomologists began ITN research; bed nets already circulated as private sector commodities, albeit on relatively small, localized scales. When researchers began field trials with ITNs, they essentially grounded the value, or significance, of the technology anew in the sciences of malaria control and public health. The medical-scientific basis of ITNs along with their designation as ‘cost-effective’ tools facilitated their wide, transnational circulation and consumption in a much larger economy of international health goods. Therefore, ITNs did not just emerge as scientific objects in the 1980s; they emerged as scientific commodities which served broader goals

of the international malaria control community of curbing malaria mortality in Africa with limited resources or state intervention.9

Igor Kopytoff’s framework of the commodity biography complements and enhances the study of ITNs as scientific objects because it acknowledges that objects acquire different identities over time but, in addition, draws attention to the question of value.10 Commoditization, according to Kopytoff, is best understood as “a process of becoming” in which people in a given society make things exchangeable by imparting them with a certain value, rather than an “all-or-none state of being.”11 By looking at the emergence of ITNs as scientific commodities, this chapter elucidates what members of the international malaria control community—WHO officials, collaborating scientists, and development agency representatives—valued over the 1980s and 1990s.12 In

9 Historians of pharmaceuticals have examined how scientific practices and regulations involved in pharmaceutical manufacturing were imbricated in the process of building markets and defining uses for the drug. Looking at this process in Germany, Jean-Paul Gaudillière described pharmaceuticals as “merchandise scientifique,” or “scientific commodities.” In the case of pharmaceuticals, however, the corporate actors who funded the science and adhered to scientific regulatory standards were those who directly profited from sale of the commodity. In the case of ITNs, those who carried out the most influential science and helped establish markets were often funded by bilateral, multilateral, or academic bodies that would not directly profit from the sale of ITNs, which for many years were not lucrative products. It is useful, then, to expand analyses of scientific commodities beyond profit motive to understand value creation. Jean-Paul Gaudillière, «Une merchandise scientifique? Savoirs, industrie et régulation du medicament dans l’Allemagne des années trente,» Annales, Histoires, Sciences Sociales 65, no. 1 (2010/1): 89-120. See also Jeremy Greene, Prescribing by Numbers: Drugs and the Definition of Disease (Baltimore: Johns Hopkins University Press, 2007); Greene, Generic; Jean-Paul Gaudillière, The Development of Scientific Marketing in the Twentieth Century: Research for Sales in the Pharmaceutical Industry (London: Routledge, 2015).


11 Ibid., 73. Historian and science studies scholar Michelle Murphy has also argued that one should not consider a commodity a “reified thing” but “an abstract ontology brought into being by social relations,” including the social relations of scientific knowledge production. Michelle Murphy, Economization of Life (Durham: Duke University Press, 2017), 25.

12 Others have also emphasized the fruitfulness of combining scientific and economic analyses in the history of science. In inviting scholars to consider productivity claims along with priority claims and patent claims in a broad conception of intellectual property (or ownership) in the technosciences, MacLeod and Radick argued that doing so allows us to highlight “how certain values,” such as the different apparent use values of ITNs, “came to be prized in the technosciences and certain technoscientific prizes,” such as the ITN as a biomedical, life-saving technology, “came to be valued.” MacLeod and Radick, “Claiming
addition, tracing the biography of ITNs as scientific commodities, provides an opportunity to interrogate the development of an emerging form of ‘global health science.’ Many scholars have explored how neoliberal principles valued by major funders of global health, such as the privatization and decentralization of health services, have informed medical research activities in the ‘global South,’ yet few have looked at this relationship historically. In doing so here, and exploring the ways conditions of resource scarcity and the normalization of resource scarcity during the 1980s and 1990s impacted ITN research, this chapter helps elucidate how producing and disseminating cost-effective, biomedical commodities became the central goal of twenty-first-century global public health.

**Malaria Control in Africa in the Post-eradication Era**

I want to begin by summarizing some of the main problems, concerns, and ideas about malaria that emerged in the post-malaria eradication era, since these provide the context in which scientists and health officials pursued ITNs as a possible malaria control intervention. The WHO officially abandoned its project of global malaria eradication in

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1969 as *Anopheles* mosquitoes grew increasingly resistant to the pesticide DDT, malaria parasites grew resistant to antimalarial drugs in Asia, and both the WHO and national governments ran low on resources to support the struggling campaign.\(^{14}\) Pilot tests of indoor residual spraying in Pare-Taveta in Tanzania and Garki, Nigeria suggested this expensive, intensive method would not work as a long-term solution to malaria control in many parts of Africa.\(^{15}\) In the 1950s, researchers working on the Pare-Taveta Scheme, a four-year study of indoor spraying with dieldrin in hyperendemic regions on the Kenya-Tanganyika border, failed to interrupt malaria transmission through this method.\(^{16}\) The Garki Project, carried out in the 1970s, showed that even a perfectly designed indoor spraying program with DDT, which eliminated over 90% of malaria vectors, did not curb malaria transmission.\(^{17}\) Following unsuccessful attempts at global malaria eradication and interrupting malaria transmission on the African continent through indoor residual spraying, members of the international health community embraced the more feasible goal of malaria control in the 1970s. Malaria experts also rejected top-down, one-size-fits-all approaches epitomized by insecticide spraying campaigns.

Backlash against centralized spraying campaigns and one-size-fits-all approaches coincided with WHO recommendations for African governments to integrate malaria control activities into decentralized, basic health services, especially in rural areas where

\(^{14}\) For more on the history of the WHO’s global malaria eradication campaign and the reasons for its failure, see Randall Packard, *The Making of a Tropical Disease: A Short History of Malaria* (Baltimore: Johns Hopkins University Press, 2007), 150-176.

\(^{15}\) Jo Lines and Peter Winch, who worked in malaria research during the 1980s and 1990s, recalled that many in the international malaria control community grew pessimistic about malaria control in Africa after the publication of results from the Garki Project. Jo Lines, interview with author, London, June 3, 2015; Peter Winch, interview with author, Baltimore, April 21, 2015.


malaria burdens were highest. This new integrated, horizontal approach to malaria
aligned with trends that emerged in international health and development during the
1970s, including the Primary Health Care (PHC) movement and increased interest in
rural development.\footnote{Community-based primary health care (PHC) was one of the central tenets of the Alma Ata Declaration, a declaration made in 1978 at an international conference on PHC and endorsed by the WHO’s Director-General at the time, Halfdan Mahler. For more on the history of PHC in international health and the shift from vertical disease control programs to integrated and basic health services, see Randall Packard, A History of Global Health: Interventions into the Lives of Other Peoples (Baltimore: Johns Hopkins University Press, 2016), 227-266. For more on the push for integrated malaria control more specifically, see Charles CJ Carpenter, et al., eds., Malaria: Obstacles and Opportunities (Washington, D.C.: National Academies Press, 1991), 44.} Advocates for PHC emphasized the compatibility of antimalaria
drug treatment and chemoprophylaxis with the integrated PHC model, a model which
privileged the dispensation of essential drugs to combat multiple disease threats in low
income settings. Such advocates encouraged recourse to pharmaceutical and other
individualized solutions for malaria in Africa—home to roughly 90% of the world’s
malaria burden.\footnote{James L.A. Webb, Jr., The Long Struggle against Malaria in Tropical Africa (Cambridge: Cambridge University Press, 2014), 107}

Following the failure of global malaria eradication, moreover, malaria experts
adopted the view that malaria was a focal disease whose characteristics depended on
local social, economic, and ecological factors—factors that shaped the ways in which
people came into contact with mosquitoes.\footnote{Harrison Spencer, “The Global Strategy for Malaria Control within Primary Health Care as Recommended by the 18th Committee on Malaria,” July 1986, WHO Archives, Geneva, File M2-370-21, Jacket 5.} Experts incorporated the view of malaria as
a focal disease into a new “epidemiological approach” to malaria, an approach that
“recogniz[ed] the variability of epidemiological risks at local level” and stratified areas
by epidemiological characteristics such as the seasonality and stability of malaria
transmission.\textsuperscript{21} Entomologists in particular advocated for the epidemiological approach and antimalaria interventions based on specific knowledge of mosquito vectors, much as their predecessors did earlier in the twentieth century.\textsuperscript{22} In 1978 and 1979 WHO officials also developed tactical variants that outlined four sets of recommended malaria control strategies for different epidemiological strata. Tactical variant four, the top category meant for regions with low malaria transmission rates and capable public health systems, called for “country-wide malaria control, with the ultimate objective of eradication.”\textsuperscript{23} Officials placed most countries in sub-Saharan Africa into tactical variant one, which called for the reduction of mortality through drug treatment—in other words, “palliative measures.”\textsuperscript{24} Like calls for integrated malaria control in PHC programs, the tactical variant framework encouraged WHO member states in Africa to adopt pharmaceutical-based malaria control strategies.

Unfortunately, around the same time WHO officials recommended African countries embrace drug treatment as the basis of their malaria control programs, the first-line antimalaria drug chloroquine began to fail on the continent. Chloroquine-resistant strains of \textit{Plasmodium falciparum}—the deadliest malaria parasite species and most common species in Africa—first appeared in Southeast Asia in 1957; these strains began

\textsuperscript{22} Throughout the early twentieth century entomologists often clashed with clinicians and parasitologists, who promoted drug-based strategies aimed at eliminating malaria parasites in human hosts and which did not require specialized local knowledge. For more on the history of entomologists’ promotion of malaria vector control strategies based on a detailed understanding of local vectors and vector habitats, see Packard, \textit{The Making of a Tropical Disease}, 111-149.
\textsuperscript{23} Carpenter, et al., eds., \textit{Malaria: Obstacles and Opportunities}, 215. For more on the epidemiological approach to malaria, see pages 211-236.
appearing in East Africa in the late 1970s. With few other effective tools, African health programs continued to rely on diagnosis and treatment with chloroquine, though members of the international malaria control community knew chloroquine would soon prove untenable. Additionally, health programs that previously relied on mass chemoprophylaxis with chloroquine began limiting the practice to certain vulnerable groups, such as pregnant women, and searching for alternative antimalarial drugs for fear of accelerating drug resistance.

African health officials and international malaria control officials, however, were limited in their attempts to reduce reliance on the cheap antimalarial drug, since donors who previously contributed great sums of money to the eradication campaign grew skeptical about the viability of antimalaria endeavors and pulled their funding from the cause as a result. Growing interest in immunology and molecular biology supported some new interest and collaboration from countries such as the United States around developing a malaria vaccine during the 1970s. However, this effort did not come to fruition as quickly as scientists thought it would. By 1991, those involved in international malaria control “recognized that the vaccines on which hopes are pinned are for the future and that there is an urgent need to ensure meanwhile that all other means of control

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27 Packard, *The Making of a Tropical Disease*, 174. Foreign aid for antimalaria activities dwindled from $1.4 billion for the period from 1957 to 1967, to just $250 million over the eight years following the end of the eradication campaign.
are used to best effect.”

Technical as well as financial resources for malaria control diminished drastically in the post-eradication era.

In this context of technological failure and dwindling financial support, malaria rates resurged in Africa. Populations who benefited from eradication activities and reduced malaria transmission rates lost their acquired immunity to malaria. Consequently, in places where insecticide-spraying teams did not complete eradication activities due to the loss of aid and resources, such as Madagascar, people suffered from severe, fatal forms of malaria. This “rebound effect” of malaria threatened populations in many countries across Africa and the global South. The acceleration of development activities, increasing labor- and warfare-related migration, deterioration of health systems, and spread of chloroquine and insecticide resistance sparked waves of malaria epidemics in these places during the 1980s. Epidemics even devastated populations living in areas with traditionally low rates of malaria, including urban, highland, and desert fringe regions, who had little acquired immunity to the disease. International and African health officials, in other words, encountered a growing disease crisis on the continent during a “time of retraction and rethinking” concerning malaria control strategies in Africa.

**Insecticide-Treated Nets as a Public Health Technology**

New approaches to malaria in the post-eradication era influenced how international health officials understood ITNs as a public health intervention in the late

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twentieth century. Although Chinese populations had implemented bed nets as part of malaria control activities for decades, international malaria experts did believe the technology would work as well in Africa, where the epidemiology of malaria and public health infrastructure differed significantly. Their conceptions of malaria as a highly specific disease, and their beliefs about the viability of ITNs in different locales and in political structures of health care, informed their calls for ITN research in Africa in the 1980s. To understand the goals of ITN research in Africa, then, this section looks at the initial emergence of pyrethroid-treated nets as public health technologies in China. While China’s experience inspired efforts to employ ITNs in Africa, WHO officials and entomologists especially saw China as too incommensurate with Africa to be a valid testing ground for the new malaria control tool.

Before scientists investigated ITNs in formal field experiments, Chinese public health programs had adopted this technology for malaria vector control. People used DDT-impregnated nets in Yunnan Province as early as the 1950s, while those living in other provinces used untreated bed nets in the mid-twentieth century.31 These net-users employed bed nets primarily as personal protection measures. This meant that people slept under treated nets to reduce the number of mosquito bites they personally received, so as not to get infected with the parasite; they did not do so necessarily to reduce the overall number of malaria-carrying mosquitoes feeding in the region (i.e. reduce malaria transmission).32 Moreover, bed nets were private goods manufactured and sold in

31 Wang Wenren and Yang Henglin, Zhongguo nüeji de fangzhi yu yanjiu [Prevention and Treatment of Malaria in China] (Kunming, China: Yunnan Science and Technology Press, 2013). I thank Yubin Shen for pointing me to this source and information, and James Flowers for helping me with translation.
32 Although it is not entirely clear, it seems bed nets were used to prevent infection given that they were included in an array of methods the Chinese used to pursue malaria eradication. Zhou Zu-Jie, “The malaria situation in the People’s Republic of China,” Bulletin of the WHO 59, no. 6 (1981): 931-936.
communities of malaria-endemic provinces. They existed as part of an array of vector control methods, which also included indoor residual spraying, mass chemoprophylaxis, environmental management, and use of window screens. “Barefoot doctors” often carried out these antimalarial activities at the commune level as part of China’s PHC system. China’s public health system was therefore already prepared to adopt pyrethroid-treated nets as public health measures after pyrethroids (synthetic pyrethrins) became commercially available, and after scientists began laboratory tests with pyrethroid-treated materials in the late 1970s.

Chinese health officials adopted pyrethroid-treated nets as a public health measure in 1982. This also preceded field trials with treated nets, although Yinlong Liu and colleagues did initiate a field trial with untreated bed nets in Hanghuai Plain in 1980.

In the Chinese system, residents would wash and bring their nets to a particular meeting place where local health workers measured out water and deltamethrin emulsifiable concentrate. Using their own wash bins, people would soak their nets in the insecticide solution and hang the nets to dry. This system depended heavily on the efforts of both local health workers and members of the community. Not only did people have to bring

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33 Ibid.
34 People used pyrethrins—organic compounds derived from pyrethrum flowers (Chrysanthemum)—as an insecticide for centuries. The United States even declared pyrethrum a strategic war material on June 13, 1942. Around 1968-1969, once it became clear DDT would no longer be a sustainable insecticide due to increasing insect resistance, chemists in the U.S. and U.K. developed new synthetic, pyrethrin-like compounds called pyrethroids. The U.S. Department of Agriculture, Entomology Research Division was a major developer and tester of pyrethroids and pyrethroid-treated materials—mostly for military purposes—from the late 1940s to the 1970s. Michael Elliot and his team at the Rothamsted Experimental Station in the U.K. developed some of the more stable and photostable pyrethroids in the mid-1970s, including permethrin and deltamethrin. George McLaughlin, “History of pyrethrum,” in John Casida, ed. Pyrethrum: The Natural Insecticide (New York: Academic Press, Inc., 1973), 3-16; L. Crombie, “Foreword,” in N.F. James, ed., Recent Advances in the Chemistry of Insect Control (London: The Royal Society of Chemistry, 1985), vii-ix.
36 Ibid. In some places, such as Sichuan Province, they sprayed nets with insecticide.
their nets and wash bins to meeting spots; they also had to purchase bed nets, which were typically made by local tailors. Insecticide-treated nets were not entirely private commodities; the government did provide the insecticide for free. However, the first model for ITNs as a public health intervention was based on the premise that users would pay for and help maintain the tool.

Despite the apparent success of bed nets, and later ITNs, in China, researchers and WHO officials did not assume this technology would necessarily work for large-scale vector control in Africa. First, the idea that a single uniform technology could be used universally conflicted with a central dictum of malariologists in the post-eradication era. Vector control measures should be “appropriate” and tailored to specific vector biologies and ecologies. East Asia and Africa had different malaria vectors and vector complexes, and malaria transmission was, in general, more intense in sub-Saharan Africa than in China. Furthermore, China had already developed a well-functioning PHC system through which to implement treated nets as a public health measure. Such systems did not exist in most malaria endemic countries in Africa. Researchers and policy makers later drew on China’s experience to inform their thinking about scaling up ITNs in Africa. However, for a number of reasons, ITNs did not travel easily as a public health measure between China and Africa.

**Becoming a Scientific Object: Entomological Studies with Insecticide-Treated Nets**


Scientists from various backgrounds and institutions conducted field trials to see whether ITNs could work in Africa beginning in the early 1980s. They undertook these endeavors not only within prevailing disciplinary and intellectual “thought styles” in malaria research, but also in a particular political-economic milieu characterized by global resource scarcity and rising popularity of decentralized approaches in international public health. These factors shaped scientists’ research questions as they constructed and identified ITNs as *entomological objects*, or objects entomologists showed had systematic, predictable effects on mosquito vectors. The emergence of ITNs as scientific objects in Africa is a narrative deeply entwined with the politics of international public health during the late twentieth century.

Indeed, one cannot separate ITN research from the broader political climate of international health and development in the 1980s. The oil shocks and high levels of inflation of the 1970s helped generate a major global recession the following decade. This hurt the economies of major manufacturing countries in the global North, as well as commodity-exporting, developing countries that had accumulated high levels of debt. The World Bank and International Monetary Fund (IMF) provided structural adjustment loans to developing countries in danger of defaulting on their debt. In return, these countries had to restructure their economies by implementing a variety of austerity measures and policies promoting market-fundamentalism. The global recession combined with structural adjustment meant many African governments cut health sector spending. Meanwhile, the WHO, which relied on member-state donations, also reduced

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financial support for international health activities. Even though the WHO had promoted broad-based PHC in the 1970s with the aim of shifting resources in low income countries from expensive tertiary care to basic health services for the poor, they had few resources to support this goal. Seeking to intervene in an era of diminishing resources, others called for selective approaches to PHC justified through metrics measuring the cost per death averted, or ‘cost-effectiveness.’ Ultimately, health and development donors gravitated toward Selective Primary Health Care—an approach based around the implementation of simple, inexpensive technology-commodities in decentralized health systems—taking the donation-dependent WHO along with them. As cheap, individualized commodities, ITNs fit the mold for selective, cost-effective public health interventions.

The WHO pursued ITNs as a possible method for malaria control at the beginning of this period, as chloroquine resistance began to spread across the African continent. Partly inspired by the use of insecticidal nets in China, WHO officials wanted to learn more about pyrethroid-treated nets as personal protection from malaria. “I am aware of the recent request from Dr. L.S. Self […] for permethrin impregnated bed nets in connexion with his forthcoming visit to China,” the Chief of Programming and Training for the WHO’s Malaria Action Programme wrote in a 1982 letter to the U.S. Department of Agriculture. “We are naturally interested in the possibilities of using this method of personal protection in other parts of the world,” including in Africa. Due to the WHO’s

41 Ibid., 231-248. Selective Primary Health Care was the term used to describe an ‘interim strategy’ for implementing primary health care, which entailed developing cost-effective tools and vertical disease programs with measurable results. J. Walsh and K. Warren, “Selective primary health care: An interim strategy for disease control in developing countries,” *New England Journal of Medicine* 301, no. 18 (1979): 967-974.

42 Letter from Dr. A. Noguer (Chief of Programme and Training for the WHO Malaria Action Plan) to Dr. Donald Weidhaas (Laboratory Director of the U.S. Department of Agriculture), April 29, 1982, WHO Archives, Folder M2-372-16. Scientists in the U.S. Department of Agriculture Entomology Division began
and donor agencies’ push for decentralized health programming in low-income settings, along with the lack of infrastructure in many Africa countries for centralized malaria control activities, international health officials embraced methods individuals could use to protection themselves against malaria during the 1980s, including ITNs.43

WHO officials and collaborating experts ramped up research on ITNs for malaria control, feeling that bed nets could be included in community-based PHC programs as cheap, simple tools. WHO officials wanted to find methods that non-health professionals could carry out with little financial and technical support or permanent public health infrastructure. Such preferences stemmed from the failure of vertical DDT house-spraying campaigns, communities’ resistance to indoor house spraying, and governments’ lack of resources for centralized vector control campaigns. “The administrative and sociological aspects of vector control have undergone a shift of emphasis,” one 1983 WHO vector control report stated,

moving away from a vertical administration to a rather more flexible administration involving well motivated community participation. [...] The time has come for a gradual transfer of responsibility for vector control activities to the communities themselves in order to improve the long-term effectiveness of the control of vectorborne diseases and to achieve economies.44

Within this context of declining economic resources, declining efficacy of existing antimalaria technologies, and calls from international agencies to decentralize of public health

studying pyrethrum in World War II, and later took up pyrethroid development. They then started testing pyrethroid-treated materials for military use during the 1970s. Crombie, “Foreword,” vii-viii.

43 For more on the decentralization of public health and essential dissipation of coordinated malaria control activities in Africa during the early 1980s, see Webb, Jr., The Long Struggle against Malaria in Tropical Africa, 105-114.

health activities in Africa, the directors of WHO Collaborating Centres recommended starting field trials on pyrethroid-treated nets in 1982.

Because health officials understood both bed nets and pyrethroids as interventions on the malaria vector at this time, entomologists conducted most of the early research on ITNs in Africa. This meant that early research focused on the effects of ITNs on mosquitoes. The first experimental investigation of (untreated) bed nets in Africa was published in 1982. As a follow-on to their studies of mosquito vectors in a Gambian village, entomologists Gordon Port and Peter Boreham tested whether bed nets—which people in the village used regularly—could reduce the feeding success of *Anopheles gambiae* s.s., and how the amount and size of holes in the net affected feeding success. Although they found that bed nets greatly reduced feeding success, they noted that bed nets alone may have little effect on malaria transmission in areas with highly efficient vectors, such as *Anopheles gambiae*, since these vectors could sustain transmission even with low biting rates. Thus, they concluded, “in itself,” the observed effects of bed nets on mosquito feeding success, “ha[d] little importance for malaria control as there is usually significant man-mosquito contact in the part of the night prior to retiring.” At this early stage, entomologists and health officials viewed bed nets as a supplementary method and not one that could shoulder the burden of malaria vector control on their own.

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45 For more on the dominance of entomologists in international malaria control, especially after World War II, see Packard, *The Making of a Tropical Disease*.
47 Ibid., 487.
48 Even in the seventh report of the WHO Expert Committee on Vector Biology and Control, mention of bed nets for malaria vector control was significantly less compared to measures such as environmental management and larval control.
Entomologists from the French Institute of Health for Development contributed some of the first formal scientific investigations of pyrethroid-treated nets in Africa. With funding from the WHO, Frédéric Derriet, Pierre Carnevale, and others carried out an experimental hut trial with permethrin-treated nets in Burkina Faso in 1983.\textsuperscript{49} They wanted to see whether insecticide could enhance the protection provided by a bed net against biting mosquitoes since, as Port and Boreham pointed out, ordinary bed nets often developed holes through normal wear and tear. Like Port and Boreham, they tested this by observing the feeding success of female \textit{Anopheles} mosquitoes, along with mosquito entry and exit rates. They concluded that nets impregnated with permethrin reduced man/vector contact to such a degree that, even when damaged, this technology “could become an effective method of malaria prevention for populations normally at risk of this disease.”\textsuperscript{50}

British entomologists working in Tanzania, led by Chris Curtis from the London School of Hygiene and Tropical Medicine (LSHTM), also set up experimental hut trials to gauge the effect of ITNs on entomological indices, such as biting rates and vector mortality. This work built on previous observations, experiments, and laboratory work on the effects of insecticide-treated materials. Around 1983-84, Curtis, Jo Lines, and colleagues from the Tropical Pesticides Research Institute in Arusha tested impregnated curtains, bed nets, and anklets (which could be in worn in the evenings before one went to bed).\textsuperscript{51} They cut holes in the material to simulate torn bed nets. This simulation

\textsuperscript{50} \textit{Ibid.}, 10.
reflected a main goal of early ITN studies: to determine whether pyrethroid insecticides could improve the protection people received from ordinary, untreated bed nets. Entomologists did not simply assume this was the case.

Additionally, the British team framed their results in terms of the suitability of insecticide-treated materials for community-based PHC which, when “organized locally […] could avoid several of the problems encountered with centrally organized programmes of house spraying.”52 They set out to find an easier-to-implement, more cost-effective alternative to DDT spraying which could work in decentralized, impoverished health systems. Despite increased attention to ITNs as politically salient malaria control tools, the intervention by no means monopolized discussions on malaria vector control. Members of the WHO Expert Committee on Vector Biology and Control suggested a wide variety of methods, such as environmental management, larvivorous fish, window screens, and other fairly cheap methods for vector control. They also did not abandon recommendations for pesticide-spraying altogether, though they recommended it with much caution and felt most African countries did not have the resources to employ the method sustainably anyway.53

Scientists also carried out field studies in East and Southeast Asia, and the Western Pacific during this period. Some communities in these regions had even begun to implement ITNs as personal protection measures to address the malaria burden.54 The implementation of nets sparked further pilot studies of ITNs in the region, which looked

52 Ibid., 9.
not only at epidemiological and entomological factors, but cost-effectiveness as well.\footnote{Ibid.} Entomologists working in Africa certainly cited experiences and studies from Asia and the Western Pacific when amassing evidence for the effectiveness of ITNs. Again, however, because the vector biologies and ecologies were not the same in Africa as in Asia or the Western Pacific, such evidence had limited impact on scientific thinking about the effectiveness of widespread ITN use to reduce malaria transmission in Africa—a main concern of entomological investigations of ITNs.

In sum, studies of bed nets for vector control were situated in specific places and political-economic circumstances. Entomologists felt evidence from Asia was relevant to understanding the effects of ITNs, but thought it was difficult to apply this knowledge in assessments of ITNs for vector control in Africa. Different vectors, different vector habits, different environments, different health systems. Even entomologists conducting investigations with ITNs in Africa carefully qualified their findings as pertinent to specific vector ecologies. In other words, while scientists conducted experiments with ITNs, defining them as scientific objects, they did not understand them as working equally well in all settings. They had not yet become universally applicable, biomedical objects. This lack of generalizability deterred bodies such as the WHO from recommending ITNs widely for vector control.

**Becoming a Biomedical Object**

The initiation of clinical bed net trials in the 1980s was not an inevitable or obvious next step in the history of this technology. Although entomologists had been
testing the effects of pyrethroid-treated materials on mosquito mortality and entry and exit rates early in the decade, they were not examining the effects of ITNs on human disease indicators. The idea that ITNs could reduce one’s risk for malaria disease by blocking, repelling, or killing mosquito vectors may seem obvious in retrospect. However, entomological evidence and gaps in knowledge about the relationship between infective bites and manifestation of symptomatic disease did not lead researchers to assume this in the early 1980s. Instead, scientists with particular interests in clinical and other human sciences working in particular circumstances generated questions about the relationship between bed net use and human disease, namely malaria morbidity.

Measuring the protective, medical effects of ITNs on humans, instead of their effects on mosquitoes, they began to transform ITNs into *biomedical objects*. Multiple factors, including established bed net use among populations in parts of West Africa, the WHO’s promotion of PHC, and health officials’ increasing focus on curbing symptomatic malaria disease, all played a major role in the emergence of ITNs as biomedical objects. In the process of conducting biomedical ITN research, moreover, scientists created new knowledge about how to define and measure malaria disease.

The British Medical Research Council (MRC) Laboratories in The Gambia served as an important origin point for the emergence of bed nets and ITNs as biomedical objects. The MRC had been doing research on malaria in The Gambia since 1948 and continued to do so into the late 1970s and 1980s, focusing primarily on immunology and drug treatment.56 These interests reflected larger concerns of developing a malaria

vaccine, measuring chloroquine resistance in Africa, and developing alternative therapeutics for malaria. Few other institutes conducted malaria research in Africa at this time due to, among other things, lack of funding and interest following the failure of malaria eradication on the continent and discouraging results from the Garki project and Pare-Taveta scheme. The MRC provided steady funding for its Gambian field stations during the 1980s to cover basic operation costs, which allowed researchers to establish and engage in long-term projects. The MRC Laboratories was one of the few institutions positioned to do substantial field trials on malaria control measures in Africa.

Prior to 1980, most of the malaria research the MRC did in The Gambia was entomological or parasitological, focusing mainly on mosquito vectors. However, the research profile of the MRC Laboratory began to shift during the 1980s toward malaria disease, especially disease among young children. This occurred for a couple of reasons. First, the MRC hired Dr. Brian Greenwood, whose primary background was as a clinician, to be Director of the Laboratories at the beginning of the decade. His clinical interests greatly shaped the types of research questions the MRC investigated in The Gambia, including deceptively simple questions such as, ‘how many children died from discipline of tropical medicine, as well as malaria research in Africa, were entwined with European colonial projects. Following independence, European countries maintained, or developed new scientific and advisory relationships with African countries in the name of postcolonial development. Deborah Neill, Networks in Tropical Medicine: Internationalism, Colonialism, and the Rise of a Medical Specialty (Stanford: Stanford University Press, 2012); Lukas Meier, Swiss Science, African Decolonization and the Rise of Global Health, 1940-2010 (Basel: Schwabe, 2014); Melissa Graboyes, The Experiment Must Continue: Medical Research and Ethics in East Africa, 1940-2014 (Athens, OH: Ohio University Press, 2015).

57 Brian Greenwood, interview with author. The MRC provided its Laboratories in The Gambia with roughly $150,000 per year for bed net studies during the 1980s, as well as a grant to hire Steve Lindsay as an entomologist on the project. It only had to apply to supplement this funding to cover things such as supplies, equipment, and non-MRC staff. Brian Greenwood, “Trial of permethrin treated bed nets in The Gambia,” proposal for Special Programme for Research and Training in Tropical Diseases (TDR) Director’s Initiative Fund, submitted Feb 19, 1985, WHO Archives, File T-16-181-M2-A-60.
or had a clinical episode of malaria in a year?" Secondly, the Gambian government was trying to set up PHC services in villages beginning in 1982. The WHO had been encouraging governments to set up PHC services delivered by local health workers to make basic health care accessible to more people while reducing the burden on national health budgets. The MRC helped the government integrate malaria control activities—at that time “fever management” and mass chemoprophylaxis with chloroquine—into PHC services as much as possible. Finally, given the emergence of chloroquine resistance on the continent, Greenwood and others thought malaria-endemic countries would need new, effective treatments very soon. Under these circumstances, the MRC was one of the first institutions to investigate the effectiveness of village health workers in reducing morbidity and mortality.

The MRC’s approach marked an important shift in the history of malaria control. Since the beginning of the twentieth century, there had typically been two schools of thought regarding malaria control. One, championed by Sir Ronald Ross, emphasized killing the mosquito vector in order to eliminate or eradicate malaria with such measures as spreading Paris Green on mosquito breeding sites and spraying buildings with insecticides. The other, championed by Robert Koch, emphasized killing parasites within

59 Bob Snow, interview with author, Nairobi, August 6, 2015. The WHO began discouraging mass chemoprophylaxis among anyone except pregnant women around 1984 due to fear about the spread of chloroquine resistance. However, because of the MRC, The Gambia was one of the few places where mass chemoprophylaxis among the larger population continued. Although such mass chemoprophylaxis did correspond to reductions in malaria mortality in the 1980s, The Gambia had also not developed widespread chloroquine resistance at this time (as opposed to countries like Kenya and Tanzania).
human hosts using antimalarial drugs. Both camps were concerned with preventing human disease and mortality; however, they focused on intervening at different points in the malaria transmission cycle and thus focused on mosquito and human hosts, respectively. With their investigation of bed nets, the MRC Laboratories combined a mosquito control method—typically the purview of entomologists examining the effects of tools on insect vectors—with an investigation of the tool’s effects on human disease outcomes—typically the purview of clinical researchers. In doing so, the scientists changed the indices used to measure the success of vector control tools from mosquito-based to human-based indicators. As later sections will discuss, this move had lasting effects on the position of entomologists in future malaria control activities and decision-making. More importantly, it allowed researchers to use biomedical experimental paradigms, namely randomized controlled trials (RCTs), to test the efficacy of ITNs in subsequent years.

The MRC opened a new field station in The Gambia in 1982 following the interruption of MRC’s activities in Uganda during the reign of Idi Amin. They set up the station in Farafenni on the north bank of the river Gambia. Brian Greenwood and demographer Andrew Bradley, who had worked with Greenwood in Nigeria, turned Farafenni into a demographic surveillance site, one of the first in Africa. The Gambian government was also trying to set up a PHC system in some of the larger villages there in

62 The main MRC Laboratories Unit is based in Fajara, near the Gambian capital Banjul. It was officially established under that name there in 1953. Shortly thereafter, the MRC also established a field station in Keneba. Reynolds and Tansey, eds., Transcript of “British Contributions to Medical Research and Education in Africa after the Second World War,” http://www.histmodbiomed.org/sites/default/files/44832.pdf.
63 Brian Greenwood, interview with author. Compared to the south bank of the river, the north bank had fewer available clinical services.
64 Brian Greenwood, interview with author.
early 1982, which would rely on village health workers to deliver health commodities and educational messages to people at their homesteads or village centers. In preparation for the establishment of a PHC system in Farafenni, Greenwood and his colleagues did a malaria morbidity survey early that year. While doing so, they noticed that many residents regularly used bed nets. Up to that point, nobody had done a formal evaluation of the protective clinical effects of bed nets, though some had reported anecdotally that people who slept under mosquito nets had lower levels of malaria parasitemia.

Members of the MRC attempted to measure the clinical effects of nets by conducting a bed net survey in December 1982, retrospectively correlating bed net use with lower splenomegaly (36% in net users compared to 58% in non-users) and parasitemia (31% among net-users compared to 53% in non-users) in young children. Because confounding factors such as ethnic group and geographic location challenged the statistical significance of this finding, researchers felt their “findings need[ed] to be confirmed by intervention trials.” This inspired further studies on the connection between bed nets and malaria disease in The Gambia, a marked contrast to the more prevalent, entomological work being done at the time.

66 For example, H. Carlsson in Guinea-Bissau, reported in Bradley, et al. “Bed-nets (mosquito-nets) and morbidity from malaria.”
67 Splenomegaly refers to the enlargement of the spleen—an organ involved in the production and removal of red blood cells—which can occur following malaria infection. Parasitemia refers to the presence of parasites in the blood. Phillipe Ranque did a small trial to test the clinical effects of deltamethrin treated bed nets shortly after this survey in 1983, and also found lower splenomegaly in children sleeping under nets. However, the small scale of the trial made it difficult to determine if pyrethroid-treated nets had any significant effect on malaria morbidity. Phillipe Ranque, et al. “Use of mosquito nets impregnated with deltamethrin in malaria control,” Abstract of a paper presented in the Xth Conference of Tropical Medicine and Malaria, Calgary, 1984.
68 Bradley, et al., 207.
The MRC did not carry out additional bed net trials simply to gauge the medical efficacy of the tool; the institution’s commitments to developing low-cost PHC services in Gambian villages also encouraged them to pursue investigations of ITNs. Following the Farafenni study, Greenwood and his colleagues initiated a three-year, three-study project on the effect of bed nets on malaria morbidity in children.69 One of the main objectives of this project was to see whether permethrin-treated bed nets “offer[ed] a practical approach to the control of malaria in African villages.”70 Concern for finding an inexpensive, simple way to malaria control in malaria endemic areas also appeared in the publication of the 1982 study results: “Because bed-nets are relatively cheap (about $10 in The Gambia) and because they might be as effective in areas where drug resistance is widespread as in areas where drug resistance is not a difficulty we believe that their use as a method of malaria control in endemic areas warrants further study.”71 Sponsored by the WHO’s Special Programme for Research and Training on Tropical Diseases (TDR), a multilateral program supporting scientific research on the control of ‘tropical diseases’ and research capacity in tropical disease-endemic countries, this project was financially linked to the interests of major international health and development agencies as well.72

70 Brian Greenwood, “Trial of permethrin treated bed nets in The Gambia,” proposal for TDR Director’s Initiative Fund, submitted Feb 19, 1985, WHO Archives, File T-16-181-M2-A-60. MRC received funds from TDR, not because TDR had established any organized effort to study bed nets, but because some of the program’s administrators were interested in the project.
71 Bradley, et al., 207.
72 TDR was established in 1975. Based out of Geneva, the program was initially co-sponsored by the WHO, United Nations Development Programme (UNDP), and World Bank with the aim of developing new, effective tools to combat six diseases: malaria, schistosomiasis, filariasis, trypanosomiasis, leishmaniasis, and leprosy. For more on the history of TDR, see C.M. Morel, “Reaching maturity – 25 years of the TDR,” Parasitology Today 16, no. 12 (2000): 522-528. Scholars have pointed out that ‘tropical’ disease is not a natural category simply reflective of climate but a category significantly informed by global political and economic inequalities. Packard, The Making of a Tropical Disease.
This project was also partly inspired by increasing entomological evidence documenting the effects of pyrethroids on *Anopheles* mosquitoes published between 1982 and 1985. However, the MRC investigation approached the pyrethroid-treated bed net as a slightly different kind of technology: rather than frame it as a tool whose success stemmed from its effects on mosquito populations, MRC researchers framed it as a tool whose success stemmed from its effect on rates of human symptomatic disease. Although the mechanism of action was understood as the same in both cases—the bed net would act as a man/mosquito barrier and the pyrethroid treatment would enhance this effect by repelling or killing mosquitoes—the difference in framing was important. Interest in measuring the effects of ITNs on human disease rather than on mosquito vectors generated different primary research questions and objectives.

*Study 1: Treated v. untreated nets on malaria morbidity*

The MRC conducted its first study in the village of Katchang, near Farafenni, in 1985. The study was a randomized controlled trial conducted among a population of regular bed net users, which aimed to see whether permethrin-treated nets would reduce malaria morbidity in children under 10. The MRC team tested this hypothesis by measuring splenomegaly, packed cell volume (PCV), and parasitemia among nearly 400 participants. The study design mimicked pharmaceutical intervention trials, not only in its use of randomization and a placebo arm (a group that received nets treated in a dilute solution of crystal violet), but also in its use of the individual child as its unit of analysis (stratified by frequency of enlarged spleens, or spleen rate).73 Would a bed net treated

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with permethrin, researchers asked, reduce episodes of malaria illness in a child living in Katchang to greater degree than would an untreated bed net?

However, conducting an intervention trial with permethrin-treated nets turned out to be a bit more complicated than a typical pharmaceutical trial. First of all, the MRC conducted this trial among a population of regular bed net users using their own bed nets for the experiment. This allowed them to save money on bed nets as well as resources needed to educate people on bed net use. However, researchers still needed to treat the nets with insecticide at the study site. Bob Snow, the lead investigator on the Katchang trial, therefore had to determine how much water each type of net material absorbed without wastage to ensure each net had the same dosage of insecticide, 0.5 g/m². Residents also had different sizes of bed nets, which affected the amount of permethrin necessary to achieve this dosage.\(^7\text{4}\) Simply standardizing (as much as possible) the intervention took a considerable amount of time and effort.

It is also important to note that most Katchang residents who regularly used bed nets, which looked more like bed canopies, used this tool for reasons other than malaria prevention. Carol MacCormack, an anthropologist the MRC hired for the trial, found that people from the Mandika ethnic group hung nets up for privacy, as well as for protection against mosquitoes and nuisance insects. Men often provided bed linen, including these bed nets or canopies, as part of marriage exchanges.\(^7\text{5}\) Participants in the MRC’s bed net

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\(^{74}\) Snow, Rowan, and Greenwood, “A trial of permethrin-treated bed nets in the prevention of malaria in Gambian children.”

trial used the modified, insecticide-impregnated version of this technology, but they did not necessarily do with the understanding that bed nets functioned as medical tools. MRC researchers, as well as researchers conducting later ITN efficacy trials, carried out experiments even though many trial participants did not share their understanding of ITNs. This did not always matter for the experiments since many participants used ITNs regardless. However, as the next chapter discusses, such incongruous understandings could definitely challenge ITN trial protocols.

Additionally, measuring outcomes for malaria disease was complicated since neither the definition of a clinical attack of malaria, nor the methods of case detection, were standardized.\(^{76}\) Measuring outcomes was especially difficult to do among such a large population and with somewhat limited laboratory resources. The symptoms of mild malaria illness, such as fever, sweating, chills, and headaches, are not wholly distinctive to malaria. Reported fever together with an enlarged spleen could not even confirm a diagnosis of malaria. In order to track malaria morbidity in the study population, Snow and a team of Gambian field workers completed weekly morbidity surveillance through verbal autopsy and temperature-taking, later confirming parasitemia through blood work done at the labs in Farafenni. Getting consent to take blood samples from children presented its own obstacles, and 20% of participants refused to give samples in the final clinical survey.\(^{77}\) Few researchers or clinicians had attempted to measure malaria

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\(^{76}\) This was the case even in 1992, when the WHO commissioned a review of bed net field trials. A. Bermejo and H. Veeken, “Insecticide-impregnated bed nets for malaria control: a review of the field trials,” *Bulletin of the WHO* 70, no. 3 (1992): 293-296.

\(^{77}\) A number of anthropological and historical studies on medical research in Africa have reported people’s resistance to and fear of researchers taking blood. For more on perceptions of blood stealing in The Gambia by MRC researchers (although for a different study conducted at a different time), see James Fairhead, Melissa Leach, and Mary Small, “Where techno-science meets poverty: Medical research and the economy of blood in The Gambia, West Africa,” *Social Science & Medicine* 63, no. 4 (2006): 1109-1120.
morbidity and mortality at a population level or in non-hospital settings prior to this trial. Thus, Snow and the field team did not simply elicit data by taking temperatures and administering questionnaires; they also helped establish methods for evaluating malaria disease indicators and malaria control interventions in non-clinical, rural village settings. Such methods set the stage for subsequent ITN trials in Africa measuring the object’s effects on human disease.

Study 2: Untreated nets on malaria morbidity

Drawing on these research methods, the MRC carried out the second morbidity study in a set of 16 villages near Farafenni, where residents, primarily of the Fula ethnic group, did not use bed nets regularly. This study’s main objective was to determine whether untreated bed nets conferred protection from malaria morbidity to children. While Snow had a bit more control over the standardization of the intervention since residents did not already own nets, control over experimental conditions more generally depended heavily on local authorities within the villages. Scientific work, in other words did not stop at taking temperatures, examining blood films, and conducting statistical analysis but entailed cultivating social relationships as well. “You build a rapport,” Snow recounted,

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79 Although in retrospect it seems this trial comparing untreated nets with no net should have come before the Katchang trial comparing treated and untreated nets, this was not the case since the MRC began its research in an area where most of the study population was already using untreated bed nets. Thus, it would be difficult to establish comparable intervention and control groups within this population for a trial testing the efficacy of untreated nets.

80 For more on the role of African ‘intermediaries’ in the production of scientific knowledge, see Lyn Schumaker, Africanizing Anthropology: Fieldwork, Networks, and the Making of Cultural Knowledge in
so you have people being compliant, they understand the studies. There’s lots of village meetings that you have to have with the elders. You sit around a big baobab tree on what was called a banta bar, which was sort of like a woven mesh on sticks. We would all sit round and say the opening of the Qur’an so we’d feel settled. And then we’d begin our discussions on issues to do with the trial, or problems that the village was having.  

For him, learning to “speak Wolof, eat out of a bowl, and work twenty-three hours a day, seven days a week” was as much a part of scientific life as learning to catch mosquitoes. It was particularly essential for MRC researchers and Gambian field workers to engage with communities and community authority structures in this trial because, in order to test bed nets as an intervention, you need people to use the nets correctly, every day for the entire rainy season—when malaria transmission is highest. And in order to discern the impact of bed nets on malaria morbidity, you need to take people’s blood. Generating data was a negotiative process in which people in the study area, including trial participants and village authorities, had the final say on what, if any, scientific knowledge MRC researchers produced on bed nets.

In the end, this trial did not demonstrate that untreated nets alone reduced malaria morbidity in children. Children who slept under bed nets during the rainy season had similar splenomegaly rates and clinical episodes of malaria, though slightly lower parasitemia rates, than children who did not. This somewhat matched results from the Katchang trial, which showed that children sleeping under permethrin-treated nets had similar splenomegaly rates to those under untreated nets but lower parasitemia rates and

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81 Bob Snow, interview with author.
82 Ibid.
clinical episodes of malaria. Field workers who observed study participants’ bed net use noticed that children would get up at least once during the night, which could have affected results. However, Snow and colleagues thought the discrepancy with their earlier 1982 survey results, which did show untreated nets reduced malaria disease indicators, could have been due to the geographic dispersal of the intervention. Bed net users and non-users in Farafenni lived together in the same village. Therefore, thinking went, it was possible that bed nets simply diverted mosquitoes to bite non-users, leading to higher rates of malaria morbidity in this latter group. In the trial of untreated nets, however, researchers dispersed interventions by village. Assuming everyone in a village was using their bed nets correctly, hungry mosquitoes would not be able to feed on unprotected neighbors, and therefore malaria indicators would not be as disproportionately high among control groups.

Results from both this and the Katchang trial had significant implications for the use of bed nets and treated bed nets as a large-scale public health measure. First, similar splenomegaly rates combined with lower parasitemia rates indicated that neither treated nor untreated nets completely prevented infection with malaria parasites. Thus, it would be difficult to use bed nets alone to reduce malaria transmission in Africa, especially in places where transmission pressure was high. Trial results cast doubt on the ability of bed nets to work in areas where transmission was more intense than in The Gambia. Even if ITNs limited the number of infective bites a child received, the child would still receive a large number of infective bites per year. Results also suggested that bed nets might...

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simply divert mosquitoes to non-bed net users, making it necessary that everyone in an area sleep under nets if the intervention was going to reduce malaria morbidity on a population level. Since researchers and health officials assumed people would have to buy their own bed nets, at least at a subsidized price, mosquito diversion threatened the viability of ITNs as a large-scale, malaria control intervention in Africa.\footnote{For discussion of disseminating ITNs as commodities see, MacCormack, Snow, and Greenwood, “Use of insecticide-impregnated bed nets in Gambian primary health care.”}

\textit{Study 3: Treated nets on malaria transmission}

The MRC’s third bed net trial built on the previous studies to see whether community-wide use of ITNs could reduce malaria morbidity in villages by reducing malaria transmission. Because the MRC could not find an entomologist for their first study in Katchang, this was the first study they did with treated nets which thoroughly tracked mosquito survival, sporozoite rates, and exit rates alongside malaria disease indicators.\footnote{Letter, Brian Greenwood to Dr. A.O. Lucas, May 20, 1985, WHO Archives, File T16-181-M2-A-60. Authorities at WHO and in TDR believed entomological data was critical to the MRC’s morbidity trials. However, the initial search for an entomologist was hampered by the fact that Greenwood was looking for an African entomologist in particular (in line with TDR’s commitment to training scientists from ‘tropical,’ low-income countries), of which there were few at the time. Chris Curtis taught Bob Snow do some basic mosquito collection work for the Katchang trial, though this work did not generate very much entomological data. Bob Snow, interview with author.} In essence, this trial brought together approaches of measuring the success of ITNs by their effects on mosquito populations and by their effects on malaria disease episodes.

People in the control group of the previous study received nets made by local tailors before the rainy season of 1987. Now everyone in the study site had nets. People living in seven of the original 16 villages had their nets treated with permethrin while those living in the other nine villages had nets treated with a placebo (milk in water). As
part of the MRC’s ongoing effort to evaluate the possibility of incorporating ITNs into PHC services, village health workers dipped the intervention nets under the supervision of one of the investigators. Bob Snow and field workers conducted weekly morbidity surveys and verbal autopsies. At the same time, entomologist Steve Lindsay and his assistant, Musa Jawara, monitored mosquito vectors in two intervention and two control villages.\(^8\)

In the end, entomological results confirmed that while permethrin-treated nets appeared to repel mosquitoes really well, they did not keep mosquitoes from biting people completely.\(^8\) As long mosquitoes continued to harbor sporozoites, malaria transmission would not be interrupted.

Even with careful planning, it was difficult for scientists to control experimental conditions completely. Right before this trial was supposed to begin, a plague of grasshoppers broke out in the country. In response, the Gambian government proposed to spray insecticide to get rid of the pests. If they sprayed in the study area, Greenwood feared, there would be many fewer mosquitoes present; as such, it would be much more difficult to evaluate the true effects of ITNs on malaria transmission.\(^9\)

Moreover, even though researchers asked people not to wash their nets during the trial, and marked the nets with a water soluble pen to monitor this, they could not completely control people’s washing practices.\(^9\) After all, researchers brought ITNs into a world where people had

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established ideas about cleanliness and care, particular for luxury items such as bed nets. Findings that ITNs appeared to be less efficacious at the end of the rainy season, which I describe below, led researchers to question whether people washing their nets led to the reduction in efficacy. Ultimately, researchers did not attribute reduced ITN efficacy to washing, but it is clear they struggled to manage all of the conditions that affected whether or not ITNs ‘worked.’

This third trial showed reductions in mosquito feeding success rates and malaria morbidity, defined as “incidence of episodes of fever accompanied by heavy parasitemia,” in intervention villages. However, it also heightened concerns that ITNs might not work in areas of high malaria transmission. Researchers found that levels of parasitemia among intervention and control villages were not significantly different by the end of the rainy seasons—the peak season for malaria transmission. This, combined with the fact that ITNs seemed to be less effective in reducing malaria morbidity in high transmission areas of Burkina Faso and Papua New Guinea, led Snow and colleagues to conclude, “insecticide-treated nets may prove to be more useful as a malaria control measure in areas with low or moderate transmission.” Even in The Gambia, where transmission pressure was seasonal and fairly low, ITNs seemed to be most effective in reducing heavy malaria infection and infections resulting in clinical disease episodes, but

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93 Snow, et al., “Permethrin-treated bed nets (mosquito nets) prevent malaria in Gambian children,” 838-842. This definition of “episodes of fever accompanied by heavy parasitemia” is worth noting as not everyone who conducted bed net trials in the 1980s used this definition when measuring malaria morbidity.
94 Snow, et al., “Permethrin-treated bed nets (mosquito nets) prevent malaria in Gambian children.”
not in reducing infection altogether.\textsuperscript{96} Therefore, in reporting trial results back TDR sponsors, Greenwood stated that, “permethrin-impregnated bed nets have thus proved to be an effective way of controlling malaria in The Gambia where the malaria transmission is seasonal and short lasting.”\textsuperscript{97} “Before permethrin-impregnated nets can be recommended for widespread use in Africa,” scientists needed to “determine whether protection against malaria observed in The Gambia can be reproduced in other areas of Africa” where malaria transmission was higher and less seasonal.\textsuperscript{98} ITNs seemed promising, but not as a universal solution to the problem of increasing malaria rates in Africa.

\textit{Political value of ITN research}

The WHO’s interest in building up PHC in Africa informed the MRC’s bed net trials throughout the 1980s. MRC researchers investigated the suitability of ITNs for decentralized PHC alongside the technology’s effects on malaria disease. Developing tools to fit existing health infrastructure in rural areas was not simply a concern in The Gambia, but was a stated priority of the WHO.\textsuperscript{99} Health officials felt it was increasingly important to find vector control measures that could be implemented by communities, as studies revealed treatment of clinical malaria cases by village health workers (VHWs) did little to curb malaria morbidity or mortality in rural areas.\textsuperscript{100} These pursuits, of course,

\textsuperscript{96} The link between parasite rates and presentation of malaria disease may seem obvious in retrospect. However, this link had not been studied or elaborated until the 1990s.


\textsuperscript{98} \textit{Ibid.}


reflected the shift to ‘selective’ PHC approaches in international health, which privileged cheap, technology-commodity-based solutions over broad structural changes.\textsuperscript{101}

Within the MRC’s three bed net trials, then, researchers tried to simulate, or at least prepare for, using ITNs within (selective) PHC-based malaria control.\textsuperscript{102} Snow and colleagues, for example, published a paper on a new technique they used during the third trial to treat large amounts of bed nets at once. This so-called “dustbin technique,” in which many nets were dipped in a single, large drum of insecticide solution, they claimed, “provide[d] a practical method for impregnated bed nets suitable for use by VHWs.”\textsuperscript{103} The treatment method originally proposed by Carl Schreck and Lee Self and employed by the MRC in the Katchang study was “too complicated to be carried out by illiterate VHWs who would not be able to calculate the surface area of nets or to make appropriate concentrations of permethrin solution.”\textsuperscript{104} Given the success and speed of the dustbin technique during the trial, as well as the population’s acceptance of sleeping under nets, investigators concluded that “insecticide-treated bed nets offer a potential method for malaria control that is well-suited to community participation and integration

\textsuperscript{101} See footnote 41.
\textsuperscript{102} This is a similar phenomenon to what Ann Kelly described in her study of a window screens-for-malaria intervention trial in The Gambia, though in her case, MRC researchers were not as successful in disseminating knowledge beyond the specific trial context. Ann Kelly, “Pragmatic fact-making: Contracts and contexts in the UK and The Gambia,” in Catherine Will and Tiago Moreira, eds., Medical Proofs, Social Experiments: Clinical Trials in Shifting Contexts (Surrey, England: Ashgate Publishing, Ltd., 2010): 121-136.
into a primary health care programme."\textsuperscript{105} Partly for this reason, research teams and TDR continued to pursue ITNs for malaria control in Africa.

While the MRC used its bed net studies to comment on how ITNs fit into PHC programs more generally, the organization paid special attention to how to integrate this technology into The Gambia’s PHC services specifically. The MRC’s anthropologist, Carol MacCormack, investigated social and cultural factors that affected bed net purchase and use in the area as part of the bed net trials. Based on the way MacCormack framed her findings, it appears this work had less to do with ensuring compliance during trials than with efforts to incorporate ITNs into PHC services in the country. MacCormack began ethnographic work in 1985, using surveys and questionnaires to find out what net fabrics and colors people liked, how much people would be willing to pay for ITNs, and how cultural factors might influence people’s willingness to purchase nets. Since, researchers believed, bed nets would have to be sold as commodities through the private sector given The Gambia’s budget constraints, they wanted data on consumer preferences. MacCormack reported, for instance, that the Fula kept most of their wealth in cattle and preferred to have fewer goods around so they could more readily move with their herds. Thus, they would be less likely to purchase nets.\textsuperscript{106} Choice of net fabric was also important, she emphasized, as some trial participants thought certain fabrics “tore too easily to justify investment of D55” (around US $7 at the time).\textsuperscript{107} Like Snow and Greenwood, MacCormack framed her conclusions as relevant for a Gambian national bed net program, not for bed net programs in Africa more broadly. “If impregnated bed nets

\textsuperscript{105} Snow, et al., “Permethrin-treated bed nets (mosquito nets) prevent malaria in Gambian children,” 841.


\textsuperscript{107} Ibid.
become a Gambian primary health care strategy,” she wrote, “promotion of nets should be done in post-harvest dry season when 100% of respondents said it would be easier to make purchases.”

She went on to say that any expanded program in the country should include custom net manufacturing by village tailors, who could make nets according to individual preferences and contribute to economic development in rural areas. Within the context of international health and development in the 1980s, MRC researchers viewed ITNs simultaneously as scientific, biomedical objects and tools for building up decentralized, under-resourced health systems.

Following the Gambian bed net trials, WHO representatives convened a meeting in Geneva to discuss the studies done on ITNs up to that point. Most of these studies were small in scale, often comparing two villages with nets and two villages without nets. Incorporating 16 villages (around 400-450 people per study), the MRC’s trials in The Gambia were the largest studies conducted so far. And even though these trials did not generate overwhelming evidence of the efficacy of bed nets and ITNs, at the very least the trials had been randomized. Furthermore, different research institutions did not coordinate their ITN studies. Teams of investigators not only measured different outcomes—both biomedical and entomological—but did not even measure some of these outcomes in the same way or test the same intervention. Researchers often distributed interventions to households or communities, but many of them measured the impact of

109 At this time, epidemiologists and others who evaluated bed nets trials considered randomization desirable in order to control for all the possible confounding factors, which abounded in community field trials of ITNs. Bermejo and Veeken, “Insecticide-impregnated bed nets for malaria control,” 295.
ITNs on malaria in individuals, as if individuals were unaffected by the larger introduction of insecticidal nets in the area.\textsuperscript{111} As entomologist Steve Lindsay recalled, Louie Molyneux, the lead epidemiologist on the Garki project, “ripped everyone’s studies to pieces” at that meeting.\textsuperscript{112} Together these studies could not answer conclusively whether ITNs were effective for malaria control in Africa. Despite growing interest in ITNs for malaria control, at the end of the 1980s, the fate of ITNs remained unclear.

**Becoming a Tool for Child Survival**

The results of the first mortality trial with ITNs stimulated efforts to demonstrate that the technology reduced childhood malaria mortality in any setting—that ITNs were universally applicable, biomedical technologies. However, investigators did not foresee this outcome when they first proposed the study in 1988.\textsuperscript{113} Nor did their results suggest ITNs would be equally efficacious in reducing child malaria mortality in different settings. In the end, MRC investigators qualified their findings as providing evidence on which to base a Gambian national bed net program, and not necessarily the continent-wide scale up of ITNs. Yet, their findings provided hope for a new way forward for controlling malaria in Africa, and specifically saving lives, as chloroquine resistance continued to spread. This section examines how researchers produced scientific knowledge about the efficacy of ITNs in reducing of childhood mortality, and how this trial shaped efforts to consolidate ITNs as biomedical objects—objects that could reduce malaria mortality anywhere, regardless of local circumstances. Contextualizing a major

\textsuperscript{111} Ibid.
\textsuperscript{112} Steve Lindsay, interview with author.
\textsuperscript{113} Brian Greenwood, interview with author.
turning point in the life history of ITNs, when the future of this technology was uncertain, I show how and why this uncertainty was resolved in particular ways.

Members of the MRC Laboratories undertook the first trial that measured child mortality as a part of its larger focus on finding practical malaria control strategies for PHC in rural Gambia. This experiment fit with the broader interests of the international health and development community, not just in promoting PHC (however “selective”), but in promoting child survival as well. The United Nations Children’s Fund (UNICEF) and its Director Jim Grant spearheaded a so-called “Child Survival Revolution” beginning in 1982. This movement entailed bringing simple, cheap technologies to low-income settings with the goal of saving children’s lives. Furthermore, although members of the WHO, UNICEF, and World Bank did not agree on the best way to support health and development in the global South in the 1980s, all supported transferring responsibility for health care activities to communities and individuals in this period of declining resources. Bed net commodities, which village health workers could treat using little more than a bucket, gloves, and insecticide solution, and which targeted a frequently fatal disease among African children, were well-suited to such international projects.

The mortality trial also fit the MRC Laboratories’ research profile at the time. Not only had researchers collected extensive data on bed nets and malaria in The Gambia, including community acceptance of the intervention, but they had also developed techniques for measuring child mortality through post-mortem questionnaires. Within

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the MRC’s cluster of projects, Greenwood and his team identified and measured major causes of death among children in the region.116 Therefore, they also had a substantial base of health data from which to measure the impact of ITNs on overall child mortality.

In addition, MRC researchers had tested the impact of other malaria control strategies, including treatment of clinical episodes with chloroquine verses treatment combined with chemoprophyllaxis, on all-cause and malaria mortality in children.117 Findings from this particular study suggested that treatment of presumptive episodes of malaria in PHC services did not reduce child malaria mortality, even in areas with no chloroquine resistance. Cases of malaria turned fatal as quickly as two to three days after the onset of symptoms, Greenwood hypothesized, and it was very difficult for families to access treatment once they recognized a case of malaria in a PHC system staffed by volunteer health workers.118 In this situation, preventive measures such as bed nets were much more valuable in helping children survive a bout of malaria.

Yet MRC researchers did not privilege questions about the effects of ITNs on child mortality from the outset. Instead, they prioritized programmatic questions related to implementing ITNs through PHC services. In 1988 Greenwood sent a research proposal for the trial to the Applied Field Research on Malaria (FIELDMAL) division of TDR, a working group comprised mostly of experts in malaria entomology and epidemiology that oversaw bed net-related research during the 1980s and 1990s. The

118 Ibid., 1125.
abbreviated list of objectives on the first page of this early proposal did not even mention mortality:

Objectives of Project
1. To determine whether village health workers (VHWs) can be taught to impregnate bed nets safely and effectively with insecticide.
2. To determine whether targetted chemoprophylaxis combined with treated bed nets is more effective at reducing morbidity from malaria than treated bed nets alone.
3. To investigate community attitudes to chemoprophylaxis and treated bed nets as malaria control measures.\textsuperscript{119}

In other words, the MRC team initially foregrounded different research questions for funders.

This list of objectives, and indeed the full proposal, suggests MRC researchers were already thinking about implementing ITNs when they designed the trial. Members of FIELDMAL also encouraged Greenwood to include “community participation” and cost analyses as components of the trial, and gear it “towards continuity on a self-sustained basis” following withdrawal of TDR support.\textsuperscript{120} In line with suggestions from TDR patrons, MRC investigators used this trial to assess whether The Gambia’s government could implement ITNs in a decentralized, community-based PHC system to reduce all-cause and malaria-specific mortality.\textsuperscript{121} Ideas about public health governance in The Gambia, particularly about having communities take over public health provision to promote child survival, shaped the goals and design of the scientific experiment.

\textsuperscript{119} Brian M. Greenwood, Proposal to TDR for “A trial of insecticide impregnated bed nets and targetted chemoprophylaxis as a control strategy for the prevention of malaria in children within a primary health care programme,” Proposal Form, 1988, WHO Archives, File M24-181-16.
\textsuperscript{121} Brian M. Greenwood, Proposal to TDR for “A trial of insecticide impregnated bed nets and targetted chemoprophylaxis as a control strategy for the prevention of malaria in children within a primary health care programme,” 1988, WHO Archives, File M24-181-16.
Taking an applied approach in the experiment, however, would limit the replicability of this efficacy trial. MRC researchers chose not to design the experiment as an RCT—the gold standard for medical intervention trials. Instead they monitored child morbidity and mortality among 16 PHC villages, where children received ITNs along with either the antimalarial drug Maloprim or a placebo. 122 Researchers simultaneously monitored 35 smaller villages without PHC services or VHWs, which received no interventions and served as controls. 123 Although researchers recognized that research questions “could have been answered more satisfactorily by a randomised control trial” within PHC villages, this would mean one group of children would receive both placebo tablets and placebo dipped nets. 124 Since previous studies showed both interventions could reduce malaria morbidity, researchers argued it would not be ethically justifiable to deny one group these interventions. At the same time, investigators claimed that people from non-PHC villages served as adequate controls for the study because they had, according to MRC’s surveillance data, lower baseline rates of child malaria mortality. This suggested that the lack of PHC services did not lead to higher mortality rates among the control group, a situation which would otherwise bias results. 125 MRC researchers, in other words, tried to balance scientific standards and protocols with realities of health and health care in The Gambia.

122 Unlike the ITN intervention, the drug component of the study was randomized.
123 Rather than directly compare mortality rates between PHC and non-PHC villages, investigators compared the change in mortality rates from pre- to post-intervention between PHC villages on the one hand and non-PHC villages on the other (i.e. the rate ratio).
125 Ibid. Because, investigators determined, PHC and non-PHC villages were not comparable (due to different resident ethnic groups, access to health services, environmental factors), they measured changes in child mortality rates within each group rather than between groups before and after intervention. Investigators thought this would control for possible confounding factors.
Researchers also wanted to see whether VHWs, supported by community women’s groups and ‘traditional birth attendants,’ could adequately dose nets with insecticide. VHWs measured out the insecticide in wash bins at village centers, while mothers dipped their nets in the solution and then laid nets to dry on mattresses at home. Using bioassays—tests that use insects (or other organisms) to determine the relative strength of a chemical solution—MRC researchers found that there was a lot of variability in concentrations between net samples taken at the same time. They also found uneven distribution of insecticide on single nets.\textsuperscript{126} The intervention was not completely standardized. Such complications did not nullify trial results, but they did lead some experts to cast doubt on the generalizability of results later on.\textsuperscript{127}

Some complications extended beyond scientific protocols and procedures. The ‘natural’ variability of experimental conditions from year to year and from place to place led MRC researchers themselves to qualify their scientific findings and circumscribe the wider applicability of results. After the rainy season of 1989, the first year of the trial, Principal Investigator (PI) Pedro Alonso found child mortality rates in intervention villages had reduced dramatically, even among children taking the placebo. The histogram Alonso produced from surveillance data showed an initial peak in mortality among ITN users in October 1988 (the pre-intervention period), followed by a rapid, sustained drop extending into June 1990. This contrasted with two, consistent mortality peaks—one in October 1988, one in October 1989—among non-ITN users.\textsuperscript{128}

\textsuperscript{126} Brian Greenwood, progress report, WHO Archives, File M24-181-16. Investigators attributed this variability to possible spillage of the solution during preparation, insecticide dripping off nets when mothers carried them home, or absorption of insecticide by mattresses during the drying phase—not to misappropriation of insecticide.
\textsuperscript{127} Bermejo and Veeken, “Insecticide-impregnated bed nets for malaria control.”
Lindsay described to me, mortality in the intervention group had been “decapitated.”  

In 1990, however, after the year-long trial period, the region experienced much less rainfall, and thus lower malaria transmission and rates of overall mortality as well. Results showed that the group that received an ITN and Maloprim experienced notable reductions in mortality, but mortality rates for the ITN-placebo group came out roughly the same as those for the control group—both fairly low. ITNs alone, in other words, appeared to have little impact on child mortality when malaria transmission and mortality were already very low.

Alonso and the rest of the MRC research team were unsure as to whether the similarity between mortality rates in controls and the ITN-placebo arm was some “statistical quirk” due to overall fewer deaths in 1990, whether this meant Maloprim had some prophylactic effect on another microorganism that was more visible during periods of low overall mortality, or whether chemoprophylaxis did actually have some additional action in protecting children from malaria mortality.  

Therefore, Brian Greenwood reported to TDR, “the results of the 1990 study illustrate the way in which the effects of impregnated bed nets on mortality and morbidity from malaria are influenced by the level of malaria transmission in the community in which they are used.” This “emphasise[d] the need for further studies of impregnated bed nets in areas of varying malaria transmission before their true potential as a malaria control measure can be ascertained.”  

Analyzed together, moreover, the morbidity trials conducted in different sites during the 1980s also suggested that ITNs were variably effective in areas of

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129 Steve Lindsay, interview with author.
131 Ibid.
differing transmission pressure. The MRC’s single-sited mortality trial led investigators to this same conclusion. ITNs were not yet universally applicable, biomedical tools.

Nevertheless, mortality measurements from the intervention and control groups during 1989 rainy season, when researchers introduced the interventions, were markedly different. Rates in the control group climbed steadily from June to October, while those from the intervention group remained low.\footnote{Alonso, et al., “The effect of insecticide-treated bed nets on mortality of Gambian children,” 1501.} In sum, all-cause mortality appeared to decline with use of one malaria control intervention: the ITN.\footnote{Because child mortality decreased at roughly the same rate in PHC villages during the first year of the trial, whether or not children were taking Maloprim or a placebo, Alonso and colleagues concluded that chemoprophylaxis had comparatively little—almost no—effect on malaria mortality. Surveillance data, however, did indicate that it reduced malaria morbidity. Alonso, et al., “The effect of insecticide-treated bed nets on mortality of Gambian children.”} Researchers could not make claims about malaria-specific mortality due to the extreme difficulty of measuring this indicator through population-level surveillance outside health facilities. Nonetheless, trial results suggested that preventing malaria could help prevent other leading causes of child death. Arguably, the MRC team refashioned this mundane, vector control technology into a tool for ensuring child survival, which many in the policy sphere considered a “benchmark of public health impact.”\footnote{“Towards a Strategic Implementation Agenda on Insecticide-Impregnated Bednet Interventions,” August 1994, TDR Bednet Initiative, WHO Archives, File M24-370-2.} They no longer needed to demonstrate that ITNs reduced malaria specifically, which was more difficult to measure than overall mortality, or describe the exact mechanism by which ITNs reduce child mortality—an indicator for which it can be difficult to attribute a single or direct cause. The fact that rural communities could employ ITNs in decentralized, underfunded health systems increased the value of ITNs all the more, at least for those working in international health and development.
The publication of trial results in the *Lancet* signified their clinical importance, as all other bed net studies had been published in entomology, parasitology, and tropical medicine journals in years prior. The *New York Times* even picked up on the results shortly after the MRC published their findings, reporting, “Nets cut malaria deaths.” Furthermore, TDR’s Director, Tore Godal, announced it would sponsor larger mortality trials in other parts of Africa to see if, or how closely, researchers could replicate the MRC’s results in areas of varying transmission pressure. “As a consequence of the encouraging preliminary findings by the MRC,” Godal wrote, TDR decided “to investigate the effectiveness of impregnated bed nets in large scale trials, and to assess their potential role in malaria control programmes. Further trials using treated nets under different geographical as well as transmission conditions are necessary.” Godal put about half of the TDR’s budget behind testing ITNs, Swiss researcher Christian Lengeler recalled, “basically stopp[ing] a lot of other projects just to finance the bed net trials.”

Despite internal criticism over Godal’s allocation of TDR’s resources, Godal soon set up a Taskforce on Bed Nets in TDR, which oversaw the organization’s new ‘Bed Net Initiative.’ African scientists and their collaborators soon began applying for funding for bed net studies in droves.

While many people identified this trial as a turning point in the history of ITNs, scientists, health officials, and donors had variable responses to the results. Jo Lines, who

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136 Letter, Tore Godal to Dr. Nyi Nyi (Director of Programme Division at UNICEF), February 6, 1992, World Bank Archives, Washington, D.C., File 1873045.
137 Christian Lengeler, interview with author, online (skype), November 5, 2015.
138 *Ibid.* The development of a Taskforce on Bednets seemed to be part of a larger effort to restructure TDR around 1992. The FIELDMAL and Social and Economic Research (SER) divisions were dissolved and replaced by taskforces on various interventions (bed nets, vaccines, drugs, etc.).
began investigating insecticide-treated materials in Tanzania during the early 1980s, said he thought scientists had shown ITNs were effective for malaria control by the early 1990s; it was time to “let the world invest.”  

Steve Lindsay recalled having similar feelings following the publication of the MRC’s results: “I thought, ‘publish this paper in the *Lancet*, you’ve got these papers out, gone to WHO, bish, bash, bosh—job done. Take it away boys. Scale up.” And in fact, some organizations, such as UNICEF and the African Medical and Research Foundation (AMREF), started to procure and distribute ITNs on a small scale at the beginning of the decade.  

The WHO’s Malaria Control Department, however, had very little money to invest in bed nets. TDR had more capacity to do so since it relied on monies from the World Bank and United Nations Development Programme (UNDP) as well as the WHO. However, TDR funded scientific research and training, not health programs. Furthermore, the WHO Expert Committee on Malaria still emphasized rapid diagnosis and treatment of malaria as the main control strategy in Africa at this time.  

Because the long-term effects of ITNs on malaria transmission remained uncertain, WHO officials hesitated to endorse the technology for large-scale use. In particular, they feared ITNs just diverted mosquitoes to non-ITN users and reduced malaria immunity among ITN users. Some

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141 UNICEF, for example, procured ITNs for Kenya’s Bamako Initiative projects in the early 1990s, some of which were located in areas of intense, perennial malaria transmission. AMREF worked with the Kenya Ministry of Health to help start business enterprises and income generating schemes in Kenya, which incorporated ITNs. For more see Lengeler, Cattani, and de Savigny, eds., *Net Gain*, 91-97; Letter, Christopher Nevill to Tore Godal, Nov. 5, 1991, WHO Archives, File M2-87-59.  
consultants for the WHO also did not see this trial as substantiating the large-scale implementation of ITN programs in Africa.\textsuperscript{144} The MRC’s mortality trial and previous bed net experiments were simply too individual, too singular in their results, that the consultants cautioned against extrapolating scientific findings. Results from The Gambia trial were exciting, Christian Lengeler remembered, but “people were a bit cautious about the result” because the trial had not been “sufficiently randomized.”\textsuperscript{145} Thinking African communities might value and purchase bed nets for “privacy and protection from nuisance insects,” the WHO Expert Committee on Malaria saw an opportunity for inexpensive, decentralized malaria control; yet, in 1992 they continued to promote chemoprophylaxis alongside a range of “adjunct[s]” selective vector control methods for prevention, leaving bed net programs for the future.\textsuperscript{146} Health officials and agencies operating on small scales in specific African countries may have disseminated ITNs in the early 1990s, but the object remained marginal in the international malaria control toolkit.

**Demonstrating the Value of ITNs in Africa**

Seeking to overcome critiques, TDR coordinated and sponsored a series of RCTs in different field sites in West and East Africa in the early 1990s to produce definitive scientific proof of ITN’s efficacy in reducing child mortality. This series of experiments

\begin{footnotesize}
\textsuperscript{144} Bermejo and Veeken, “Insecticide-impregnated bed nets for malaria control,” 295.
\textsuperscript{145} Christian Lengeler, interview with author.
\textsuperscript{146} WHO Expert Committee on Malaria, “WHO’s Malaria Control Strategy: Global Initiative, Local Action,” June 24, 1992, 11, WHO Archives, File MALARIA1-SG-VECTORS-5. “Selective vector control” methods basically comprised methods that prevented man-mosquito contact, often on an individual or ‘community’ scale due to the fact African governments had no infrastructure in place to carry out large-scale vector control programs (and fears that any attempt at large-scale vector control would not be sustained and cause a resurgence of malaria). Some of these methods included repellents, mosquito coils, improving house construction, and limited indoor house spraying.
\end{footnotesize}
included an effectiveness trial—a trial testing ITNs in ‘real world’ as opposed to ideal, controlled conditions—in The Gambia. The experiments also contributed to a growing trend of using RCTs in global public health, serving as an early example of large-scale RCTs (tracking tens of thousands of subjects as opposed to tens or hundreds) for non-pharmaceutical interventions. The FIELDMAL Steering Committee, which later morphed into the Taskforce on Bednets, helped set up these trials as demonstrations of value in multiple senses. Based on the RCT paradigm, these trials were supposed to demonstrate the statistically-articulated value of ITNs in saving children’s lives.

Measuring cost-effectiveness of ITNs and differences in clinic attendance, economists aimed to demonstrate the value of ITNs in relieving financial burdens on ailing health systems. Incorporating community education about ITNs into experiments, investigators sought to demonstrate to study participants, who represented the future consumers of ITNs, the value of ITNs as personal protection measures. And, in the end, statistical results demonstrated the value of malaria control for overall child survival in Africa, much as the MRC’s results suggested in their original mortality trial. As these RCTs

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\(^{147}\) Clinical epidemiologists used RCTs to test global public health interventions, such as tuberculosis drugs, in previous decades, but these trials did not track a study population in a single research site of such great proportion. Large-scale Vitamin A RCTs done in places like Indonesia and Ghana during the 1980s provided an important precedent and model for RCTs with ITNs during the 1990s. Part of the reason Vitamin A and ITN RCTs were so large is because they tested interventions for which it was difficult to demonstrate that the intervention alone caused reductions in death or disease; one needed to show reductions in a large enough intervention group to say these reductions were not simply a result of chance. As more epidemiologists received training to carry out these large RCTs of public health interventions in the global South, in some cases looking to the ITN trials as a model, this method became a norm for measuring the efficacy for many different public health interventions in global health practice. Christian Lengeler, interview with author; Penelope Phillips-Howard, interview with author, Kisumu, October 16, 2015. For more on the rise of RCTs in global health, see Packard, *A History of Global Health*, 305-327; Adams, “Metrics of the global sovereign.”

\(^{148}\) Chris Henke has also described the relations and dynamics of field trials, in which investigators strive to control experimental conditions but also maintain the ‘authentic character of the field’ to ensure applicability of results. In his example of an agricultural research project, he also described the necessary negotiation between researchers and research subjects/intended beneficiaries in the context of scientific demonstration. Chris Henke, “Making a place for science: The field trial,” *Social Studies of Science* 30, no. 4 (2000): 483-511.
unfolded, however, the experiments also illustrated how strongly contingency shaped evidence of ITN efficacy. Nevertheless, even amidst considerable variation and contingency, investigators helped stabilize and demonstrate the value of ITNs as biomedical tools fit for national, community-based malaria control programs in Africa.

The Steering Committee for TDR’s FIELDMAL division, managed by epidemiologist Jacqueline Cattani, selected four sites for the mortality trials at its April 1992 meeting: The Gambia, Navrongo (northeastern Ghana), Kilifi (coastal Kenya), and Oubritenga (central Burkina Faso). Committee members considered these ideal test sites because they already contained some existing research infrastructure, including networkers of village health workers and informants. At the same time, these sites represented rural, malaria-endemic areas of Africa with weak health systems. In addition, investigators had already collected or inherited some health and demographic, and sometimes entomologic, data from previous projects in these places. The participating research centers, moreover, had ties with their respective countries’ Ministries of Health. This latter factor was important to TDR, since the organization’s officials wanted scientific results to inform national programs and policies at the end of the trials.

149 Michelle Murphy has described a similar phenomenon of where areas with just enough infrastructure to carry out field research, but which still have inadequate health infrastructure—in her case, Matlab, Bangladesh—are selected as medical research sites because they function as (idealized) proxies for other impoverished areas. Murphy, *Economization of Life*.


151 Letter, Jackie Cattani to Dr. Lamizana and Dr. V. Pietra, November 18, 1991, WHO Archives, File M24-181-76; Letter, Jackie Cattani to Pedro Alonso, September 26, 1991, WHO Archives, File M24-181-78, Jacket 1. As Secretary for FIELDMAL and one of the leaders of TDR’s new Bed Net Task Force, Jackie Cattani, advised one PI on updating his proposal, saying he should give further attention to
To ensure comparability of experiment results, Dr. Christian Lengeler, an epidemiologist with a background in parasitology at the LSHTM, came on as the “Bednet Coordinator.” Coordinating the experiments from London, he essentially helped standardize experimental methods, materials, and outcomes measured across the four field trials. However, each experiment also incorporated some unique element intended to generate new knowledge about ITNs. The Gambia study measured changes in child mortality rates, but within an effectiveness trial evaluating the country’s new National Bednet Programme.152 The Burkina Faso trial tested curtains rather than bed nets since, investigators claimed, people in the study area did not live in houses big enough to accommodate bed nets easily and could not afford bed nets in the first place.153 Because they had established a district hospital surveillance system that tracked severe, life-threatening malaria among children, the team in Kilifi set out to measure the effect of ITNs on rates of severe malaria.154 TDR members sought to generate new scientific knowledge about ITNs, but they did so with the intention to support policy and prepare African countries to implement bed net programs.

152 The Ministry of Health initiated a national bed net program following the MRC’s mortality trial. Many people in The Gambia already had nets, so the MRC’s effectiveness trial focused mainly on cost-recovery schemes and getting people to buy and use insecticide to re-treat their nets.


154 Almost exclusively caused by *P. falciparum*, severe malaria can be extremely fatal and involves complications in the nervous, respiratory, renal, and/or hematopoietic systems.
All four RCTs sought to evaluate two things: the efficacy of ITNs in reducing child mortality (among children 12 to 59 months-old) and the cost-effectiveness of ITNs in the particular research site. The first objective basically functioned as an extension of the Gambian mortality trial; policy makers and scientists wanted to confirm that ITNs could reduce child mortality in areas with higher malaria transmission pressure.\textsuperscript{155} Moreover, scientists still did not know exactly how ITNs achieved their protective effect to reduce mortality.\textsuperscript{156} Therefore, the FIELDMAL committee felt, it was crucial and necessary for researchers to demonstrate statistically that ITNs showed a protective effect consistently. Only then would members of the international health and development community accept ITNs as universal biomedical objects.

All of these trials included measuring cost-effectiveness of ITNs as a primary objective. This fit with broader trends in international health during the 1980s and 1990s of using cost-effectiveness data to justify investments in health interventions.\textsuperscript{157} Health economists considered cost-effectiveness information on bed nets important since resources, especially for malaria control, remained tight. Dr. Anne Mills, a health economist from the LSHTM, acted as Lengeler’s counterpart for this aspect of the study, establishing formulas for economists from each trial to use in their evaluations.\textsuperscript{158} She had done the cost-effectiveness for the Gambian mortality trial as well, finding that “for the first time a malaria control strategy in Africa has shown to be competitive with other

\textsuperscript{155} Although none of the four was conducted in an area of intense, perennial malaria transmission.

\textsuperscript{156} This remained the case all through the trials as well. Entomological studies done in service to the goals of epidemiological investigations did not show that ITNs led to reduced sporozoite rates or elimination of malaria infection. Brian Greenwood, Progress Report submitted to TDR, 1993, WHO Archives, File M24-181-83, Jacket 1.

\textsuperscript{157} This trend did not just impact the field of international health. Those evaluating health systems in the U.K., the U.S., and other industrialized countries also used cost-effectiveness studies to inform and justify health expenditures. Anne Mills, interview with author, London, June 3, 2015.

\textsuperscript{158} \textit{Ibid}. 

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interventions that prevent child deaths.”

If researchers could show scientifically that ITNs were cost-effective and could reduce child mortality (i.e. in a way that could be reproduced and achieve the same general result), this simple technology could be a viable candidate for scarce health and development resources.

To establish the feasibility of introducing ITNs into these regions as ‘community-based,’ ‘self-help’ malaria control measures, the PIs of the four TDR trials included evaluations of community attitudes, perceptions, and acceptability of bed nets as a research objective. Some scientists working with the WHO criticized previous bed net trials for not collecting this information in the 1980s, the Gambian studies excepted. What African populations thought about ITNs was critical because, scientists and program planners believed, residents of malaria-endemic areas would not only have to use ITNs but pay for them as well. Every investigative team had a social scientist, often an (applied) anthropologist, who issued questionnaires to and conducted focus group discussions with study participants. In reporting their results, PIs emphasized that most participants wanted bed nets and insecticide treatment but often could not afford these products. In The Gambia, where the MRC was evaluating the effectiveness rather than efficacy of ITNs, the social scientist there tried to figure out how much people would likely pay for a net and insecticide treatment by posing this question to chiefs and imams in study villages. Social scientists also found that most people did not believe

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160 Bermejo and Veeken, “Insecticide-impregnated bed nets for malaria control.”
163 Brian Greenwood, interview with author.
mosquitoes caused malaria. Instead, participants desired nets because these killed and provided a barrier against nuisance insects.\textsuperscript{164} Study participants and scientists, in other words, did not all understand ITNs as having the same use value. Framed as seeing whether ITNs could be introduced into a community successfully, including communities where most residents had not used bed nets before, these social scientific investigations were also attempts to reveal and establish the value of ITNs for future consumers.

Investigators did various things to shape communities and health to make both of these suitable for the introduction of an ITN project. Researchers in a couple of the trials set up different ‘culturally-specific’ channels for disseminating educational messages about bed nets. The team from the Kenya Medical Research Institute (KEMRI) and Wellcome Trust in Kilifi organized poster competitions, youth-group theatre performances, and \textit{barazas} to disseminate messages about the benefits and proper use of ITNs.\textsuperscript{165} In Burkina Faso, the Centre National de Lutte contre le Paludisme (CLCP) team organized Burkinabe traditional theater performances, poster competitions, and village-wide “causerie-débats” for the same purpose.\textsuperscript{166} Even in The Gambia, in the context of a national bed net program, the MRC and Gambian Ministry of Health used radio shows and t-shirts illustrating correct dipping procedures to inform people about re-treating their


nets.\textsuperscript{167} Such activities were important to ensuring compliance and generating sound scientific results.\textsuperscript{168}

Investigators found that education was critical to ensuring regular, correct use of ITNs during the trials. However, they also evaluated how well the study population absorbed and applied knowledge about using bed nets, publishing these findings for the benefit of future program managers working in areas where people were unfamiliar with bed nets. In other words, they helped establish methods designed to demonstrate the value of ITNs to future consumers who may or may not connect mosquitoes with malaria, and who may or may not have the money to afford this product.

Personnel who carried out mortality surveys, helped dose the bed nets with insecticide, and disseminated messages to study participants about bed nets were crucial to the demonstrative goals of these trials as well. Some research teams benefited from having personnel in the region who could act as community liaisons or health workers. The Navrongo team, for example, inherited quite a lot of community field research infrastructure from the Ghana Vitamin A Supplementation Trial (VAST) project. This included ‘village key informants,’ who were trained to collect demographic information from households.\textsuperscript{169} The Kilifi team seconded Public Health Officers and Public Health


\textsuperscript{168} Patricia Rosenfield described multidisciplinary research conducted under the guidance of TDR’s Social and Economic Research division, and in the USAID-funded Applied Diarrheal Disease Research Project. She found that often times in such multidisciplinary research projects, different aspects of the problem were analyzed separately by social and medical scientists, each using methods which often do not allow for a comprehensive analysis of the problem. This type of research, she claimed, in turn generated 'problem-specific’ results which work well for short term projects, but work less well for long term programmatic change. This phenomenon, I would argue, also appears in TDR-funded bed net studies. Patricia Rosenfield, “The potential of transdisciplinary research for sustaining and extending linkages between the health and social sciences,” Social Science and Medicine 25, no. 11 (1992): 1343-1357.

Technicians from Kenya’s Ministry of Health to act as community educators during the trial, in part to “ensure sustainability of the intervention at the end of the trial.”¹⁷⁰ The Kilifi team also set up ‘local bednet committees’ through the existing PHC system to resolve and report various issues or difficulties people in their villages had with bed nets. These intermediaries were critical in collecting data from thousands of study participants, and ensuring the validity of scientific data for statistical analysis of results. They were just as important to researchers’ goals of demonstrating that ITNs could be incorporated into decentralized, community-based malaria control programs, which the MRC tested explicitly in The Gambia.¹⁷¹ In demonstrating that ITNs could work within existing health infrastructure, researchers also tailored this infrastructure to accommodate ITNs and ITN experiments.

Despite these well-planned, well-organized efforts, certain circumstances presented obstacles to demonstration efforts. Sometimes the requirements of scientifically valid RCTs provided the obstacle. In Kilifi, researchers found that child mortality rates were much lower than expected. Therefore, they would have to increase the sample size or prolong the trial to achieve sufficient power for the study. Researchers deemed both options unfeasible since the control group was already complaining about not receiving nets and TDR funds were running low.¹⁷² Furthermore, HIV prevalence among children in the study area was high (roughly 23%), which made it difficult to predict the “true effects of a malaria-specific intervention [on child mortality].” Together, these two

¹⁷² Bob Snow, Progress Report submitted to TDR, 1994, WHO Archives, M24-181-87, Jacket 1. In epidemiology, the power of a study is the probability that the test would reject a false null hypothesis.
phenomena led PI Bob Snow to defer to the study’s second objective in 1994: defining ITNs’ impact on severe malaria.\textsuperscript{173}

In another instance, MRC researchers found that ITNs did not demonstrate protective effects in one of the five zones evaluated in its effectiveness trial. Reporting results back to TDR, Brian Greenwood attributed this to noncompliance among villagers in that area, emphasizing that ITNs showed a strong protective effect in the other four zones.\textsuperscript{174} Investigators in Burkina Faso encountered a similar problem, finding that insecticide-treated curtain (ITCs) appeared to reduce child mortality in the first year of the trial, but had no effect in the second year—a year when child mortality in the control group was inexplicably low.\textsuperscript{175} Nonetheless, in all of these cases, investigators had the statistical data to argue that on the whole, taking into account all groups and all years of the trials, ITNs were efficacious in reducing child mortality. The fact they could demonstrate this despite noncompliance of participants and ‘anomalous’ mortality patterns, they claimed, just meant that findings underestimated the “true effects” of ITNs on child mortality.\textsuperscript{176}

Many of the trials also suffered from financial woes. In both Kilifi and Burkina Faso, governments had devalued the currency as part of IMF and World Bank structural adjustment policies. This occurred after research institutions had received grant money for the year and converted it into local currency. In Kenya, inflation was so high that the

KEMRI-Wellcome Trust team’s estimated expenses for fuel costs alone rose by US $15,000 for the year.\textsuperscript{177} TDR was unable to provide money to the Navrongo study in its second year to purchase bed nets and insecticide. PI Fred Binka had to look to UNICEF and other organizations to procure these fundamental items for the trial. In the end, the Navrongo team could not even secure enough insecticide to re-impregnate all the nets in the intervention arm of the study. Mistakenly assuming WHO/TDR would provide funding for insecticide, MRC researchers also had to cobble together donations from UNICEF, Action Aid, and other NGOs to carry out, not simply a trial, but a national program.\textsuperscript{178} Both the Navrongo and Kilifi teams had problems with timely or complete delivery of nets to study sites, which interfered with experimental protocols.\textsuperscript{179} Such difficulties in coordinating large ITN trials foreshadowed logistical difficulties in running large-scale ITN programs in Africa, difficulties which seemed especially relevant since most African governments would have to import both nets and insecticide. Such complications speak to a broader issue in global public health, where policy makers and health programmers assume heavily funded, carefully monitored efficacy trials provide proof-of-concept that, for example, ITNs reduce child mortality, but overlook the fact that trial conditions cannot be replicated in practice. Issues with funding, however, were downplayed in published scientific findings, which, as was standard, mainly focused on illustrating numerically the protective efficacy and cost-effectiveness of ITNs.\textsuperscript{180}

\textsuperscript{177} Bob Snow, Progress Report submitted to TDR, 1994, WHO Archives, M24-181-87, Jacket 1.
\textsuperscript{180} Adams, “Evidence-based global public health.”
Despite the, sometimes unexpected, challenges of conducting RCTs with ITNs, trial results appeared to show that the technology could reduce all-cause child and malaria-specific mortality in a variety of epidemiological settings. This included severe malaria mortality in Kilifi. Statistics demonstrating the cost-effectiveness of ITNs and survey findings that people desired nets sat uneasily alongside the recognition that those most at-risk for malaria would not be able to afford the product. The four TDR-sponsored RCTs demonstrated ITNs could work for large-scale malaria control in Africa, where states continued to cut health budgets and where chloroquine became less and less effective. Policy makers and program planners, it seemed, simply had to resolve the cost issue. These trials also appeared to demonstrate how critical malaria control was to reducing child mortality in Africa by the simple fact that a malaria-specific intervention could reduce child mortality to such a significant degree.\footnote{Bob Snow, et al. “Insecticide-treated bednets reduce mortality and severe morbidity from malaria among children on the Kenyan coast,” \textit{Tropical Medicine and International Health} 1, no. 2 (1996): 139-146.} For donors aiming to reduce child mortality more generally, ITNs seemed like a good investment. ITN research, later chapters explore, helped put malaria control back on the international agenda, not as an integrated component of PHC, but as its own separate, activity worthy of financial support.

**Lingering Uncertainties about Scaling Up**

Once researchers published results from these four RCTs, a larger portion of the international health and development community believed that ITNs could, and should, be implemented in malaria control programs across Africa. However, some still harbored doubts. Most importantly, protective efficacy appeared to decline with increasing
transmission pressure.\textsuperscript{182} ITNs, entomologist Chris Curtis pointed out, may not have much impact in areas of East Africa where malaria was holoendemic.\textsuperscript{183} Because national, or even district level, ITN programs were logistically-complex, expensive operations, a number of people representing implementing agencies hesitated to invest in something that might not generate sufficient returns. Reductions in ITN coverage in The Gambia following the introduction of cost-recovery schemes provided little solace.\textsuperscript{184} Finally, some people still harbored concerns that putting young children under ITNs might simply delay their acquisition of immunity and shift the age pattern of disease; once children stopped sleeping under nets, they might be at even higher risk for cerebral malaria than they would be at that age had they not slept under nets at all.\textsuperscript{185} Certainly in retrospect, some scientists felt perpetuation of this latter concern unnecessarily slowed efforts to scale up a life-saving intervention during a worsening malaria crisis in Africa.\textsuperscript{186} At least for a portion of the international health and development community, though, these all remained unresolved questions throughout the 1990s.

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\textsuperscript{186} Jo Lines, interview with author; Bob Snow, interview with author.
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Conclusion

This chapter has provided a close examination of the first moment in the life history of ITNs in Africa: the production of scientific knowledge about this malaria control technology. Within and through such productions, ITNs acquired various identities and values, at times operating as plural scientific objects. Scientists from various disciplinary backgrounds and national origins did substantial work to show ITNs had predictable, reproducible effects on malaria mosquitoes, and later human disease, in different contexts. The outcomes researchers focused on in turn affected the generalizability of scientific results: mosquito species and ecologies could differ widely from one place to the next, and different mosquito species responded variably to pyrethroid insecticides; while ‘epidemiological situations’ or levels of malaria transmission pressure (i.e. factors determining malaria disease) also varied between places, they did so to a much lesser degree. Generalizability and knowledge of ITNs’ clinical effects were crucial to the acceptance of this technology for large-scale malaria control in Africa at a time when child survival and measuring the cost of lives saved were top priorities in international health and development. Although by no means out of the picture, entomologists lost influence in directing and defining international malaria control activities as malaria control entered a new age of ‘evidence-based public health.’

Indeed, in completing four RCTs with ITNs in different ‘epidemiological settings’ on the continent, researchers demonstrated the value of the technology to save children’s lives in impoverished, rural communities with limited access to health resources. During

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187 Adams, “Evidence-based global public health.”
the course of these trials, a number of contingencies challenged demonstrations of ITN efficacy, some of which only became visible within the statistics-based paradigm of the RCT. However, presenting scientific findings in a way that fit with this paradigm—in effect, “thinning” out the richly thick knowledge about how ITNs worked in different African settings—allowed investigators to render these contingencies as anomalies or potential confounders, or simply omit them altogether. These trials crystallized ITNs as scientifically valid, politically valent, biomedical tools worthy of financial investment. As the rest of this dissertation explores, the ways in which this crystallization took place had significant implications for the ways ITNs were implemented as global health interventions.

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Chapter 2
Universalizing Insecticide-Treated Nets in Siaya: Scaling Up Local Claims

By the time the trials in The Gambia, the Kenya coast, and Ghana ended, around 1994-1995, many researchers already began building a consensus that ITNs should be available to people in malaria endemic areas of Africa. They advocated disseminating ITNs with a great sense of urgency as rates of chloroquine resistance continued apace and as scientists continued to search for suitable therapeutic alternatives. The AIDS crisis compounded this sense of urgency as HIV began to spread through blood transfusions—a first-line therapy for malaria-related anemia. This converged with major malaria epidemics in countries such as Kenya, precipitated by climatic and ecological changes and lack of an adequate, effective drug supply. During a period of great pessimism about controlling malaria in Africa, researchers felt they had a series of statistical trial results showing ITNs could reduce child mortality by the mid-1990s. Why, then, did the United States Centers for Disease Control (CDC) and Kenya Medical Research Institute (KEMRI) initiate a large randomized controlled field trial with ITNs in Kenya’s Siaya district in 1996?

The answer to this question lies in Vincanne Adams’ argument that randomized controlled trials “stabiliz[e] some of the background noise that makes one region incomparable with another”; rather than make global claims, this experimental paradigm makes “local and specific claims that can be scaled up.”¹ Researchers could scale up, or apply widely, results from previous randomized controlled trials to claim ITNs reduced child mortality in many parts of Africa. However, they could not claim these tools would

be effective in areas of intense, year-round malaria transmission such as Siaya. In other words, KEMRI and CDC researchers set out to conduct an experiment under the most extreme conditions of malaria transmission pressure to be able to claim ITNs could reduce child mortality, that they could ‘work,’ anywhere in Africa. This chapter examines the history of that experiment—the second key moment of my biography of ITNs—to understand how different people and groups working in Kenya helped consolidate ITNs as universally applicable, biomedical objects. In particular, I interrogate how these groups made specific claims about the efficacy of ITNs in Siaya, and made their knowledge scalable.

A growing body of scholarship on the history and anthropology of science in Africa has explored how the social and political context of African research sites, and the populations within these sites, shaped the scientific knowledge produced there.\(^2\) This work has illustrated the importance of understanding how specific relationships and practices are imbricated in the production of scientific knowledge in a given site.\(^3\) It has also shed light on how the history of a research site and residents’ prior experiences with ‘research’ shapes knowledge production processes.\(^4\) Historicizing the production of biomedical knowledge about ITNs in Siaya, and attending to the relationships and practices that made this production possible, this chapter provides an historical

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ethnography of KEMRI-CDC’s large bed net trial in Siaya. As Lyn Schumaker did in her historical ethnography of anthropological fieldwork in Northern Rhodesia, I aim to “evoke the nature of life in the field and the process of fieldwork” and “gain an understanding of the relations and rituals of a diverse group of people drawn together”—in this case for the production of biomedical knowledge. This approach not only elucidates the role that Kenyans, including scientists, nyamrerwas (community health workers), their supervisors, and research participants played in producing biomedical knowledge; it also shows how these people’s intellectual and material practices, and their scientific, technical, and social skills, were critical to generating local and specific claims about the efficacy of ITNs. This analysis—which itself is only possible with the help of my research assistant, Molly Omany, the community health workers who led us around Siaya, and my KEMRI contact person, Dr. Simon Kariuki—therefore helps qualify narratives about the dominance of expatriate researchers in dictating global health knowledge production. In the case of ITNs, this latter group of experts heavily depended on their Kenyan colleagues and those who lived and worked in Siaya to universalize ITNs as a biomedical malaria control technology.

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5 I use KEMRI-CDC in this chapter to talk about the institutional collaboration based out of facilities in Kisumu (Kisian). I also refer to the Vector Biology and Control Research Centre (VBCRC)—the name of KEMRI’s Centre at Kisumu from 1984 to the early 2000s, after which it became the Centre for Global Health Research (CGHR). CDC and KEMRI staff worked together at the Centre when it was the VBCRC and when it became the CGHR.


7 The Luo term nyamrerwa was translated as “traditional birth attendant” in publications on the ITNs trial. This reflected researchers’ efforts to find midwives who could act as research assistants and community health workers. However, a number of nyamrerwas in the trial did not have much or any experience as midwives since the trial required more workers from across the villages than existed the number of midwives who met the work requirements, such as literacy. Today people in Asembo and Gem use nyamrerwa to refer to community health workers, who remain predominantly female.
Scholars interested in the history of science in Africa have also shown how the African origins of scientific knowledge were stripped away when this knowledge circulated through transnational scientific networks. I use historical ethnography to look at this process as well. More specifically, I examine how CDC researchers designed an ITN trial to generate scalable results. They continually tailored the experiment to the Siaya landscape to secure scalable results and translated knowledge from the field into generalizable global health knowledge. These practices, for which expatriate researchers relied partly on Kenyan colleagues, required a different set of skills, relationships, and expertise—some of which researchers forged in the process of conducting a large scale, community randomized field trial for the first time. Just as one might see nyamrerwas or their supervisors as “middle figures” in the experiment, one can examine expatriate and Kenyan researchers as different kinds of “middle figures” who had to translate their personal experiences conducting research in Siaya into data that had purchase in the world of global malaria control. As this chapter suggests, when researchers circulated

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9 My use of ‘landscape’ in this chapter specifically draws on David Cohen and E. S. Atiento Odhiambo’s broad definition of landscape in their historical anthropological study of Siaya: as existence, encompassing the physical land, the people on it, and the culture through which people work out the possibilities of the land. *Siaya: The Historical Anthropology of an African Landscape* (Nairobi: Heinemann Kenya Ltd., 1989), 9.

10 Timothy Mitchell has also made the argument that development ‘experts’ working in Egypt forged their technical expertise in the process of doing development projects and did not come into the region with that expertise fully formed. Timothy Mitchell, “Can the mosquito speak?,” in *Rule of Experts: Egypt, Technopolitics, Modernity* (Berkeley: University of California Press, 2002), 19-53.

11 I invoke Nancy Rose Hunt’s term, ‘middle figures’ to draw attention to the translation work that trial workers, including scientists, had to do in order to orchestrate a biomedical experiment that depended on participants with little to no understanding of ITNs and malaria as biomedical objects using ITNs for biomedical purposes. Those who acted as translators, or middle figures, had certain skills—such as ability to read and speak English, and other evidence of formal education—that made them desirable employees and gave them access to positions of privilege. Nancy Rose Hunt, *A Colonial Lexicon: Of Birth Ritual,*
their experimental findings in scientific publications, they black-boxed knowledge about how much and what kind of labor it required to get ITNs to ‘work’ in Siaya—knowledge which was not readily scalable. In doing so, they not only obscured the ways the specific context of Siaya shaped the production of biomedical knowledge about ITNs, they also further dissociated ITN technology from the factors necessary to its function as a malaria control tool, such as bed net-users’ sleeping habits. This later authorized malaria control programmers and NGOs to disseminate ITNs in Africa without addressing local contingencies that hindered people’s uptake and deployment of nets for public health purposes.

In examining the consolidation of ITNs as biomedical objects in Siaya, this chapter seeks to complicate elisions often made between producers of biomedical and global health knowledge, and representatives from the global North. Kenyan scientists and health workers did not simply engage in biomedical research believing they were doing this for the ‘world’ rather than for Kenya, or Nyanza Province. Nevertheless, they were instrumental not only in collecting, but also in analyzing data which substantiated the widespread roll out of ITNs across Africa. Trial participants were not passive participants of research protocols designed elsewhere, but rather used or did not use bed

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*Medicalization, and Mobility in the Congo* (Durham: Duke University Press, 1999). For more about the role of scientific data, specifically data from RCTs, in directing capital flows in global health, see Adams, “Metrics of the global sovereign,” 37-46.


13 Siaya is a former district (now a county) of Nyanza Province, which encompasses the locations of Asembo and Gem.
nets for a diverse set of reasons. They circumscribed scientists’ ability to make legitimate and generalizable claims about the efficacy of ITNs. By tracking the development of KEMRI-CDC’s ITN trial and the research projects that laid the foundations for the experiment, this chapter seeks to elucidate the role Kenyan scientists, health workers, and research participants have played in global health knowledge production. Not simply resistors of biomedical interventions, nor adopters of the tenets of global health, such persons sought to reimagine and remake public health governance in Kenya, and Nyanza in particular, through the material technology of bed nets.

Figure 2.1. Map of Luo Land, including the present-day counties of Siaya and Kisumu (separated by the dashed lines)¹⁴

Roots of Transformation: Malaria Research in Siaya from 1980 to the mid-1990s

The transformation of Siaya into a site of global health knowledge production did not occur through one ITN experiment alone. Prior research on malaria control in the district laid important groundwork for KEMRI-CDC’s major ITN trial. Borne out of the area’s dearth of medical resources and heightened ecological and economic vulnerabilities to malaria, these earlier scientific projects helped make Siaya into a proxy for ‘impoverished, rural Africa.’\textsuperscript{15} Kenyan researchers sought to address residents’ vulnerabilities to malaria by pursuing transnational research partnerships, engaging in international fora on malaria control, and conducting scientific investigations in Siaya and Nyanza Province more broadly, bolstering their own scientific credentials in the process. During the 1980s and early 1990s Kenyan researchers reimagined and tried to remake public health governance in Nyanza around various malaria control technologies, technologies intended to substitute for permanent, primary health care services. A detailed look at this pre-history of KEMRI-CDC’s ITN trial, then, elucidates the underlying politics motivating and shaping malaria research and research infrastructure in Siaya during the late-twentieth century. These politics shifted as researchers made Siaya into an ideal site for testing biomedical malaria control tools.

Siaya emerged as a major hub for malaria research in Kenya beginning in the 1980s.\textsuperscript{16} This occurred for a couple of reasons. First, malaria was extremely prevalent in Siaya. Ecological conditions, such as the district’s close proximity to Lake Victoria and equatorial climate, contributed to high malaria transmission. However, sparse and fragile

\textsuperscript{15} For more on the underpinning of postcolonial, medical experimentation in precarious living conditions, see Michelle Murphy, \textit{The Economization of Life} (Durham: Duke University Press, 2017).

health resources in the district also exacerbated malaria disease rates there. Politically marginalized in Kenya following independence, Nyanza Province suffered from an historical neglect of state health services—a hole often filled by missionary organizations.\(^\text{17}\) Due to the combination of high malaria prevalence and precariousness of health resources, moreover, Nyanza Province recorded some of the highest rates of chloroquine resistance on the continent in the early 1980s. As a hotbed for the transmission not just of malaria, but of chloroquine-resistant malaria, Nyanza and Siaya specifically attracted numerous malaria investigators.

New institutional infrastructure in Kenya also fostered the emergence of Siaya as a popular site for malaria research. In November 1979 the Kenyan government established the Kenya Medical Research Institute under the Science and Technology Amendment Act.\(^\text{18}\) A number of Kenyan scientists who had been working at Ministry of Health research stations joined the new, parastatal agency upon its founding.\(^\text{19}\) KEMRI’s early leaders envisioned biomedical science as a national endeavor whose results would “be of practical application to the country at large and more specifically to the Ministry

\(^{17}\) By the 1980s, a majority of health care services in Nyanza were provided by mission organizations. NGOs took on a greater role in providing health care, usually in the form of time-limited projects, moving into the 1990s. Later on, research institutions also began to provide time-limited health care services during research studies. For more on the history of health services in Kenya and Nyanza, see George Ndege, *Health, State, and Society in Kenya* (Rochester: University of Rochester Press, 2001), 128-158.


\(^{19}\) For more on parastatal medical-scientific organizations in Africa, or organizations that take on some of the roles and political authority of civil governments without being a formal part of the state apparatus, see P. Wenzel Geissler, “Introduction,” in P. Wenzel Geissler, ed., *Para-states and Medical Science: Making African Global Health* (Durham: Duke University Press, 2015), 1-44.
of Health.”

Foundational rhetoric and even initial blueprints for a KEMRI Research Center in Nyanza’s Provincial capital of Kisumu, P. Wenzel Geissler has argued, reflected scientists’ postcolonial “vision of national science-as-government”—a vision that moved beyond funding from former British colonizers. “In determining its research priorities,” KEMRI’s annual report for 1988-1989 emphasized, “the Institute [was] guided primarily by the national priorities on the promotion of health as identified by the Government of Kenya.” In Nyanza, this meant focusing heavily on malaria.

KEMRI’s focus on malaria research in Siaya, however, originally emanated from Nairobi. In 1979 Harrison Spencer, a member of the CDC’s Division of Parasitic Diseases, started the first CDC field station in Kenya, located in the nation’s capital. He worked with KEMRI and seconded Kenyan scientists from the Ministry of Health’s Division of Vector Bourne Diseases (DVBD) to carry out malaria research around the country. This partnership aligned with KEMRI administrators’ goals of establishing international collaborations to access necessary technical and financial resources.

Spencer also taught in the Department of Community Medicine at the University of Nairobi, where he met Professor Dan Kaseje. Spencer’s work with Kaseje and Esther

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Sempebwa, based at KEMRI’s Clinical Research Centre in Nairobi, was instrumental in instigating malaria research in Siaya.

The first major malaria research project to result from the collaboration grew out of an effort to improve health services in Kaseje’s home village of Saradidi, in Siaya. Kaseje worked with Spencer to set up a community-based malaria control project there in 1980. Within the project, Kaseje, Spencer, and collaborating Kenyan scientists measured whether a chloroquine distribution program carried out by village health helpers, as opposed to stationary, facility-based distribution, could reduce mortality and the costs of malaria control in Kenya. Since it was “unlikely the government will have sufficient funds in the near future to supply chloroquine to communities like Saradidi,” these scientists wanted to see whether the cheaper, decentralized method of chloroquine distribution could be both effective and sustainable. The project ultimately failed to diminish malaria. Nonetheless, in conducting the study, researchers developed a network of local health workers who could provide basic health services and collect health data from households in Saradidi. In some ways, this trial was an applied project in an area of personal importance to Kaseje. However, the international malaria control community also cited the project as key evidence that community-based drug distribution alone could not reduce malaria in poor, rural areas of Africa. In an era of resource scarcity, within both international malaria control and African health systems generally, rural areas with

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poor health infrastructure like Siaya became representative test sites for malaria control in Africa.

The Saradidi project paved the way for further malaria investigations during the 1980s, which in turn strengthened the collaboration between KEMRI and CDC in Nyanza Province. KEMRI opened its Vector Biology and Control Research Centre (VBCRC) in Kisumu Town in 1984, soon relocating the center to the “more modern and spacious laboratories at Kisian,” on the outskirts of the city. Members of the CDC’s Division of Parasitic Diseases based at KEMRI’s Nairobi research centers, worked with scientists at the VBCRC to study chloroquine resistance, alternative antimalarial compounds, and mosquito vectors in Nyanza. KEMRI and CDC scientists also used the Kisian laboratories to study human and mosquito immunology in the region, foundational topics for malaria vaccine development.

By the mid-1980s, the directors of KEMRI and the CDC’s Kenya station, Mutuma Mugambi and A. David Brandling-Bennett, respectively, were advertising Siaya’s potential as a site of scientific knowledge production at international malaria conferences. This potential included a system researchers had set up for the routine collection and testing of blood in Saradidi, which would allow scientists to determine such indicators as hemoglobin and malaria antibody levels relevant to both malaria drug testing and malaria vaccine development. “The Saradidi Project has accomplished a great deal,” Brandling-Bennett proclaimed.

Within the project, considerable information is now available about demographic characteristics, mortality, morbidity, and health-related knowledge

and behavior in the community. With the continued understanding and participation of the people, Saradidi is an ideal location in which to undertake further studies of malaria epidemiology and control. For that reason, KEMRI, in collaboration with CDC and the Walter Reed Army Institute of Research, has initiated new studies of malaria transmission in and near Saradidi, which we hope will lead to the vaccine trials.  

KEMRI-CDC scientist-administrators began strengthening research infrastructure in Siaya geared toward testing malaria control technologies, building the scientific reputation of the transnational partnership in the process. Despite the CDC’s increasing input into the VBCRC’s research—signified by the creation of two permanent positions for CDC scientists at the VBCRC in the early 1990s—at the end of the 1980s, KEMRI administrators still thought of the U.S. agency as providing support for applied, “community-oriented” medical research in Kenya.  

The creation of the VBCRC, as the center’s name suggests, reflected the large population of malaria vectors in Nyanza. And, as part of their research on malaria vectors, scientists based at the VBCRC investigated the effects of insecticide-treated bed nets and curtains. CDC entomologist Jack Sexton, along with colleagues from the Division of Parasitic Diseases and the KEMRI Clinical Research Centre, conducted a

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34 This was not the first insecticidal net study conducted in Kenya. In 1987 Chris Nevill and colleagues at the African Medical and Research Foundation (AMREF) and the Wellcome Trust conducted a study comparing treated nets and proguanil for malaria prevention in the southern Rift Valley. Nevill’s study illustrates how researchers looked into multiple solutions—not just bed nets—for the failure of chloroquine and declining ability of countries such as Kenya to finance public health services during this period. Chris Nevill, et al. “Comparison of mosquito nets, proguanil hydrochloride, and placebo to prevent malaria,” British Medical Journal 297, no. 6645 (1988): 401-403.
trial of permethrin-treated nets and curtains in Uriri in 1988. This 15-week trial, they claimed, was the first to demonstrate that impregnated curtains were effective in malaria prevention and “have a place in malaria control.” Because impregnated curtains required less netting material and insecticide per household than did bed nets, researchers considered it important to keep this cheaper alternative on the table. Sexton’s replacement, Ray Beach, and a new cohort of Kenyan entomologists conducted a second, slightly larger trial in Uriri beginning in 1990. The team essentially tested the same interventions over a one-year period, responding to concerns about the efficacy of treated nets and curtains during seasons of high malaria transmission. According to Kenyan entomologist John Vulule, this research informed the KEMRI-CDC’s later ITN trial in Siaya. At the same time, it served KEMRI’s goals of developing practical (or feasible) malaria control methods for use in Kenya.

This and related bed net projects from the late 1980s and early 1990s provide a glimpse of a different possible trajectory for insecticide-treated materials in Kenya. Specifically, these projects reveal how Kenyan scientists sought to address malaria in the country by modifying bed net technology. Shortly after Vulule arrived at the VBCRC in

36 Ibid., 16.
37 Ray Beach and colleagues articulated this in, Raymond Beach, et al., “Effectiveness of permethrin-impregnated bed nets and curtains for malaria control in a holoendemic area of western Kenya,” AJHTM 49, no. 3 (1993): 290-300, 299. They reported curtains would cost about 30% less per family than would bed nets.
38 Beach, et al., “Effectiveness of permethrin-impregnated bed nets and curtains for malaria control.”
39 John Vulule, interview with author, Kisumu, January 11, 2016. During KEMRI-CDC’s much larger mortality trial, researchers went back this region to assess people’s use and attitudes towards bed nets in the years since the previous study ended. Researchers found that while many people in Uriri continued to use and maintain their nets, they still did not consider nets a top priority. S. Patrick Kachur, interview with author, Atlanta, April 1, 2015. S. Patrick Kachur, et al., “Maintenance and sustained use of insecticide-treated bednets and curtains three years after a controlled trial in western Kenya,” Tropical Medicine and International Health (TMIH) 4, no. 11 (1999): 728-735.
1990, VBCRC staff initiated the Sisal Strands Project in Kisumu. Researchers designed the project to determine whether insecticide-treated curtains woven locally from locally-grown sisal could provide a suitable alternative to treated bed nets. This was one of many examples in the early 1990s where African scientists tried to alter bed nets to make the intervention cheaper and more sustainable. According to KEMRI research, curtains did not appear to reduce malaria transmission enough to significantly affect clinical or parasitological outcomes. Even so, Kenyan scientists believed that since curtains reduced the number of children infected with malaria, the intervention and vector control more generally “had relevance to the National Malaria Control Strategy which focuses on chemotherapy” (i.e. chloroquine treatment).

In early 1992 the Director of the VBCRC, Aggrey Oloo, proposed expanding the Sisal Strands Project to examine the effect of bed nets woven locally from sisal. Having tailors manufacture sisal bed nets and VBCRC members treat the nets with insecticide, scientists thought, could greatly reduce the cost of the intervention. Oloo proposed to make Kenya’s Ministry of Health and DVBD key partners in this endeavor, with CDC

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41 For example, Dr. Jack H. P. Nyeko and colleagues in Uganda proposed to introduce “impregnated target specific nets (TAGS),” which one wore to cover certain, exposed body while sleeping. Like curtains, TAGS required much less netting and insecticide than did bed nets, which Nyeko claimed many of those most at-risk could not afford. Researchers elsewhere in Kenya also tested technologies such as permethrin-impregnated ‘mbu cloth.’ Dr. Jack H. P. Nyeko, Grant Proposal, “Impregnated Target Specific Nets (TAGS) in Malaria Control,” WHO Archives, File M24-181-1, Jacket 25. M. Mutinga, et al., “Malaria prevalence and morbidity in relation to the use of permethrin-treated wall cloths in Kenya,” *East African Medical Journal (EAMJ)* 70, no. 12 (1993): 756-62.
playing a much lesser role. Oloo’s proposal, which foregrounded Nyanza’s scientific and manufacturing capacities, highlights the national orientation of the VBCRC’s research. Ultimately, the Special Programme for Research and Training in Tropical Diseases (TDR)—the project’s potential funders—rejected the proposal, and the research was never carried out. Nevertheless, the Sisal Strands Project provides insight into how scientists attempted to reimagine and shape public health governance in Nyanza during the early 1990s. At the same time, it illuminates the extent to which African scientists depended on external funding and the difficulties they faced gaining traction for new ideas without external validation or funding.

Going into the 1990s, then, the research profile of the VBCRC was rather narrow in terms of disease focus (mainly malaria), but methodologically broad, including epidemiological, immunological, and entomological work. It included applied research oriented towards solving national public health problems with limited resources, and immunological research oriented toward international goals of developing a malaria vaccine. As the CDC’s Malaria Branch and its Director, Kent (Carlos) Campbell, began to establish closer ties to World Health Organization’s (WHO) Centre for Tropical Diseases/Malaria in April 1993, Siaya and KEMRI became increasingly entangled in internationally-oriented research on malaria. As part of the WHO’s Sick Child Initiative, for example, CDC staff collected malaria data from Siaya District Hospital to improve the malaria section of ‘Sick Child Charts.’ Such charts aided clinic staff across rural areas of Africa in diagnosing common childhood illnesses by observation alone, many of

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44 P. Wenzel Geissler has also written about this ‘pre-millennial’ medical science in Kenya, where “trained laboratory technicians with a microscope and cheap reagents could make a decent contribution to parasitology and epidemiology, and—through integration into government—to public health.” Geissler, “Parasite Lost,” in Geissler and Molyneux, eds., Evidence, Ethos, and Experiment, 299.
which shared similar symptoms. Experiences and knowledge from Siaya informed broader developments in malaria control for regions with limited laboratory and other medical resources.

As part of this trend, KEMRI-CDC initiated a project in Siaya in 1992 to study the relationship between malaria infection and malaria disease: the Asembo Bay Cohort Project (ABCP). Based in and around the lakeside village of Asembo Bay, the ABCP aimed to study how children acquired immunity to malaria. It is worth pausing to examine this project, as it laid much of the infrastructural groundwork for KEMRI-CDC’s large ITN trial later in the decade.

The ABCP was a large-scale, longitudinal cohort study that used household demographic surveillance to follow 1,848 pairs of mothers and their children in 15 villages. The project’s primary goals included characterizing factors associated with acquisition of malaria infection, investigating the determinants of the progression from malaria infection to illness, and investigating the acquisition of malaria immunity under “natural conditions.” In other words, how and why do children become infected with malaria, and why does that infection manifest as certain symptoms in certain people over time? The answers to these questions would provide important insights for the development of a malaria vaccine. The last main goal of the project, however, was slightly different. CDC researchers wanted to describe the epidemiology of malaria in this lakeside region so as to turn it into a ‘natural laboratory’ for malaria control

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technologies.\textsuperscript{47} “Barring the massive improvements in standards of living or access to high-quality health care,” they wrote,

large-scale community-based interventions that either prevent infection, reduce the rate or intensity of exposure, or attenuate the clinical progression to severe disease are most likely the only interventions that will have a significant impact in the foreseeable future. […] A reliable assessment of the intervention’s efficacy […] requires an extensive and thorough understanding of the dynamics and natural history of malaria infection and disease in the area in which they are tested.\textsuperscript{48}

The ABCP, which, like the Saradidi studies, grew out of the population’s economic, ecological, and biological vulnerabilities to malaria, was supposed to provide foundational knowledge necessary to test malaria control interventions in Siaya. In setting up the ABCP, however, researchers also helped transform Siaya into a representative test site for malaria control in rural, resource-poor Africa more broadly.\textsuperscript{49}

Making Global Public Goods in Siaya

In the mid-1990s the VBCRC teetered between projects explicitly aimed at improving malaria control in Kenya and projects oriented toward more general needs of resource-poor, malaria-endemic Africa, for which Siaya began to function as a proxy. At the same time, scientists working elsewhere in the country and the continent were conducting trials with ITNs to show this promising intervention reduced child mortality in any African setting (see chapter 1). The CDC researchers who designed the RCT in

\textsuperscript{47} Tilley discussed notions of colonial scientists that Africa was a ‘natural laboratory,’ or a site where they believed they could observe and experiment with nature, supposedly unobtrusively. Tilley, \textit{Africa as a Living Laboratory}.


\textsuperscript{49} Michelle Murphy also describes this phenomenon of setting up research infrastructure in places with little to no health infrastructure, thereby transforming the site into a testing ground for interventions aimed at the poor, in her work on Matlab, Bangladesh. Murphy, \textit{The Economization of Life}, 95-104.
Siaya, therefore, did so in such a way as to generate scientific knowledge, which would contribute to malaria control in Kenya, but would also be considered a “global public good,” which could scale up to be “useful everywhere in the world, in every local context.” The process by which CDC researchers designed an experiment to produce universally applicable, biomedical knowledge about ITNs in Siaya reflected political and epistemic values of the international health and development community at the close of the twentieth century. In addition, the experiment’s design circumscribed what information scientists paid attention to and the ways in which they did so.

One of the primary ways CDC researchers sought to produce scalable biomedical knowledge about ITNs was to test the intervention in a community randomized controlled trial. Bill Hawley, an entomologist at the CDC who designed the original protocol for the ITN trial in 1992, wanted to ensure the protocol closely resembled designs for the other, randomized controlled ITN trials in Africa so all the results could be compared and aggregated. RCTs are extremely transportable tools, meant to demonstrate the efficacy of an intervention whether it is tested in Navrongo, Kilifi, Siaya, or Atlanta. In fact, Hawley initially designed this large-scale ITN trial for southern Malawi, near the CDC’s field station in Mangochi. TDR even considered funding the Malawi trial along with those in Ghana, The Gambia, Burkina Faso, and the Kenyan coast to demonstrate that ITNs could reduce child mortality in every “epidemiological situation.” After the plans for testing ITNs in Malawi fell through due to issues with personnel, the incoming

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51 Bill Hawley, interview with author, Atlanta, April 2, 2015.
Director of the CDC’s Malaria Branch, Rick Steketee, convinced members of the United States Agency for International Development’s (USAID) Africa Bureau to fund the trial in Siaya.  

Hawley revised the protocol, he recalled, so it matched as closely as possible those from the TDR-sponsored trials. For Hawley and others at the CDC, the ability to compare results with other trials in a reproducible way was key.

A trial measuring the efficacy of ITNs in reducing child mortality in Malawi, or Siaya, was supposed to fill an important gap in knowledge about ITNs in Africa. Both areas were regions of intense, perennial transmission. In Siaya, individuals typically received 100 to 300 infective bites each year. Scientists worried that ITNs might reduce malaria infection among children under these conditions, but not nearly enough to reduce malaria-related mortality. Findings from the other ITN trials, in fact, showed that ITN efficacy decreased as malaria transmission pressure (the amount of infectious bites per year) increased. Director of the CDC field station in Kisian at the time, Bernard Nahlen, remembered that CDC staff did not jump at the chance to conduct the experiment for this reason. Given that the trial would be large, long, and costly, they wanted to ensure they would not “spend a large part of [their] lives doing a negative study.”

Moreover, researchers working in Kilifi argued in 1995 that aggressively reducing malaria transmission in intense transmission areas through the use of ITNs might simply shift the age profile of the disease. Young children spared bouts of severe malaria and anemia by using ITNs might start to die from cerebral malaria at a slightly older age.

54 Feiko ter Kuile, interview with author, Kisumu, October 12, 2015.
55 Bill Hawley, interview with author.
56 Lawrence (Larry) Slutsker, interview with author, Atlanta, March 31, 2015.
An age-shift of this sort was a serious concern for researchers, especially since several places experienced severe spikes in malaria mortality during the 1970s and 1980s, after DDT spraying ceased. Some researchers feared that introducing large numbers of ITNs into Siaya might actually be harmful as the intervention might delay children’s acquisition of immunity. Such anxieties did not outweigh accumulating evidence that ITNs reduced child mortality in Africa, a critical need in places of intense malaria transmission. Therefore, KEMRI-CDC scientists continued with the trial.

The politics of international health and development shaped the CDC’s plans to test ITNs. At the United Nations World Summit for Children in 1990, U.S. President George Bush called for the country to become involved in improving child survival in Africa. Following his intervention, USAID established the Health and Human Resource Analysis for Africa Project (HHRAA). It provided a mechanism to increase the use of research, analysis, and information in support of improved health policies and programs in Africa. The agency’s Africa Bureau/Office of Sustainable Development (AFR/SD) then established a Participating Agency Service Agreement with the Department of Health and Human Services in 1992 to facilitate the transfer of financial and technical assistance to African communities. Through this agreement, USAID initially gave the CDC $1 million with which to conduct a bed net trial in Siaya—the largest sum any research team had received to conduct an ITN trial in Africa. The agency wanted the experiment to be “the ‘definitive’ scientific study, one that would address conflicting

60 Feiko ter Kuile, interview with author.
findings [...] and clarify issues that may have been poorly monitored in earlier studies."62 Producing universally applicable, generalizable knowledge, in other words, would be the top priority.

Since USAID provided its funding through an open funding mechanism—that is, the grant awarded was not fixed at a certain amount—CDC researchers had more leeway than colleagues in previous trials did to expand the scale of their research. USAID even provided another $1 million to double the size of the experiment mid-way through the study.63 Furthermore, while the initial research protocol only proposed to investigate a few questions, researchers were able to add smaller studies onto the main experiment. For example, the team had the money to study the impact of ITNs on the health of adolescent girls and physical growth of primary school children, which no other trial had examined. While USAID did not dictate the design of the bed net trial, the agency and its funding did shape what knowledge researchers could produce about ITNs in western Kenya by giving them the opportunity to collect and analyze data beyond the standard child mortality and cost-effectiveness measurements.64

CDC-KEMRI had already set up research infrastructure and conducted small bed net trials in Siaya by the time USAID agreed to fund the study. Setting up and conducting a large-scale community trial of ITNs, however, required substantially more work and planning. As initially conceived, the study enrolled a population of roughly 55,000—

62 Ibid., 16.
63 Penelope Phillips-Howard, interview with author, Kisumu, October 16, 2015; Feiko ter Kuile, interview with author.
64 It is important to note that different patrons of ITN trials also informed divergent ‘afterlives’ of the research. TDR, which funded the four other large bed net trials, emphasized that researchers needed to prepare to integrate ITNs into regional or national public health programs following the trial. While KEMRI and CDC researchers certainly considered how to integrate ITNs into malaria control activities in Siaya during the trial, this was not as much a priority for USAID as it was for TDR.
most of the residents of Asembo. Researchers, as I will discuss later in the chapter, also added some 70,000 additional people—most of the residents of Gem—mid-way through the two-year experiment. For this trial, scientists investigated a number of different epidemiological, clinical, entomological, and social scientific outcomes. Assessing any one outcome required a coordinated effort from people with different sets of skills and expertise together with cooperation from trial participants. Due to their expertise in conducting epidemiological studies, CDC staff designed the ITN experiment in Siaya, defined its outcomes, and chose methods for measuring these outcomes. Actually applying this kind of ‘transportable’ scientific expertise in Siaya, however, required CDC researchers to learn from and rely on Kenyan research staff.

Making Local Claims in Siaya

For KEMRI and CDC scientists, making claims about the universality of ITNs as biomedical tools entailed first making local and specific claims about the efficacy of ITNs in Siaya. Scientists had to transform Siaya, specifically the locations of Asembo and Gem, into a setting legible in the RCT paradigm to bolster the applicability of their findings outside the district. However, scientists also had to continually tailor their research practices to circumstances in Siaya, which they did with the help of local health workers. Thus, the landscape of Siaya—its environment, its residents, and residents’ social relations—significantly shaped what knowledge scientists could produce about ITNs and how they produced it.65 Taking what historian Lyn Schumaker called a “field science perspective,” which views the relations and practices that constitute a place as a

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65 Cohen and Odhiambo, Siaya, 9.
site of scientific investigation as the central context for understanding scientific knowledge production, this section illuminates the work scientists had to do to conduct an RCT with ITNs in Siaya.\textsuperscript{66} “Not simply a product of Western thought brought to bear upon African societies,” biomedical knowledge about ITNs was “itself a product of Africa.”\textsuperscript{67}

Making the field

Since this was a field trial, researchers had to start by defining ‘the field.’ Field trials are intended to test interventions \textit{in situ}, as if researchers are unobtrusive observers. However, not only do researchers often reorganize social relations in the process of conducting field trials, creating new hierarchies separating observers from the observed, they also stabilize ‘the field’ as a kind of controlled laboratory, as a place where they can produce knowledge that is scientifically valid.\textsuperscript{68} This was certainly the case in KEMRI-CDC’s ITN trial. In 1996, during the pre-intervention stage, Bill Hawley and statistician Allen Hightower walked around and mapped every household and geographic feature in the original Asembo study area using GPS technology.\textsuperscript{69} They took a census of everyone in the study area, expanding what they had done for the Asembo Bay Cohort Project. Doing so, they defined spatial and physical relations in ‘the field’ for researchers tracking people and objects, such as bed nets and employee’s cash salaries. CDC and KEMRI used this mapping work to turn Asembo, and later Gem, into a Health and Demographic

\textsuperscript{66} Schumaker, \textit{Africanizing Anthropology}, 6.
\textsuperscript{67} Ibid.
\textsuperscript{69} Bill Hawley, interview with author.
Surveillance Site. Hawley and Hightower effectively transformed much of Siaya into a geographically circumscribed space overseen and governed by the research partnership.\footnote{For more on the ways data collection is imbricated in the state-like functioning of research projects in Africa, see Biruk, “Seeing like a research project.”}

Part of their mapping work entailed defining and bounding villages, since the experiment used villages, rather than individuals, as the unit of analysis. In one way, this made sense. The insecticide on bed nets, scientists presumed, affected the distribution of mosquitoes across areas larger than an individual household. Simply tracking individuals would not account for this community-wide or ‘mass’ effect. At the same time, defining \textit{villages} as units of analysis and in terms of geographic space is problematic for testing an intervention such as an ITN. For one, villages in Siaya could be difficult to define as their boundaries tended to be fluid. Defining clear boundaries created artificial social units that did not account for people’s day-to-day patterns of movement and the ways they came into contact with mosquitoes and mosquito breeding sites. Many Asembo residents are fairly mobile, even during evening and early morning hours when \textit{Anopheles} mosquitoes feed. As one public health officer in the region explained, a number of children must leave very early in the morning to go to school in other villages.\footnote{Alisha O., personal communication, Rarieda-Omiyomano (Asembo), July 29, 2015.} For decades, men from Siaya have travelled to Kisumu and Bondo town for short-term employment. Sometimes they brought the bed net with them while travelling.\footnote{Cohen and Odhiambo, \textit{Siaya}, 43-60. Michael Onyango, interview with author, Asembo Bay, December 4, 2015.} The dynamic social world of Siaya and Nyanza Province, in other words, burst open the containers the RCT and clinical epidemiology provided for it, though not enough to invalidate the scientific project altogether.
CDC researchers and their Kenyan colleagues also tried to define ‘the field’ by conceptualizing the study population through demographic parameters. What were participants’ ethnic backgrounds? How many women, men, and children were there? They interviewed residents about sleeping behaviors and designed a Knowledge, Attitudes, Practices, and Beliefs survey to measure changes in mothers’ perceptions of malaria and bed nets during the trial. Researchers working on previous bed net trials had collected this kind of data, partly to understand factors that affected people’s uptake or rejection of ITNs. Such applied social scientific research became a necessary part of ITN trials, like a norm or best practice, as researchers sought to ensure participants’ cooperation and prepared for the development of ITN programs. This is how the CDC initially treated it. Co-Principal Investigator (PI) Penny Phillips-Howard recalled that at first, she thought the team would simply have to “tick the boxes” of the social science components—in other words, collect gather just enough, fairly shallow data on the study population to fulfill protocol requirements—and then go on with the epidemiological and clinical work. The scientific disciplines informing KEMRI-CDC’s interdisciplinary trial, and indeed most randomized controlled field trials with ITNs, did not neatly congeal.

**Coordinating experts and expertise**

CDC and KEMRI had to bring a number of researchers, staff, and partners together to collect and analyze data from the field for the experiment. Nahlen recruited

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73 Fax, Penelope Phillips-Howard to Karen Shelley, March 1, 1996, Randall Packard, personal archive, Baltimore.
74 Penelope Phillips-Howard, interview with author.
Dr. Feiko ter Kuile and his wife, Phillips-Howard, from the Netherlands and UK, respectively, to work on the trial. Phillips-Howard previously collaborated with the CDC in western Kenya on its Sick Child Initiative projects as part of WHO Centre for Tropical Diseases/Malaria. Although ter Kuile was initially supposed to serve as the co-PI along with Bill Hawley, he decided to spend the beginning of the trial building up infrastructure at the VBCRC: creating storage space for tens of thousands of bed nets, fixing the broken water tower, putting in desks and computers, and so forth. As ter Kuile recalled, he drew on his experience working in a Médecins Sans Frontiers refugee camp in Thailand with a director who built basic medical infrastructure. “It was useful to be Dutch,” he remembered, because there was a Dutch drilling company working in the area that agreed to drill a borehole for the VBCRC at a third of the cost.\(^{75}\) Invited to do the social science work despite her training in nursing and epidemiology, Phillips-Howard assumed her husband’s position as co-PI in 1996 while he went on to run the clinic-based aspects of the study.\(^{76}\)

Many Kenyan scientists who worked on the trial had been working at the VBCRC since the early 1990s. Simon Kariuki, an immunologist, originally came in 1992 to work on the ABCP. He used his work on the bed net trial, which determined whether sustained ITN use would inhibit young children’s acquisition of malaria immunity, for his doctoral thesis.\(^{77}\) Other scientists, such as medical entomologist Evan Mathenge, were hired

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\(^{75}\) Feiko ter Kuile, interview with author.

\(^{76}\) Penelope Phillips-Howard, interview with author. In fact, Penny originally entered the field of malaria research when she applied to work as a secretary at the London School of Hygiene and Tropical Medicine. Professor David Bradley, Penny recalled, “said I’d make a lousy secretary but a very good researcher” based on her experiences as a tropical diseases nurse who had travelled internationally and at one point lived in the Amazon jungle.

specifically for the ITN trial. Mathenge was studying for an MSc in Medical and Veterinary Entomology at the University of Nairobi when he joined the project and described his hiring as somewhat random: Hawley wanted a good medical entomologist and told the university to “send whoever” among the three possible candidates.\textsuperscript{78} After the team began pre-intervention activities in 1996, they also hired Jane Alaii. Originally from Siaya, Alaii worked as the lead social scientist on the ITN trial. Prior to joining the team, she had interned on several studies with social science components and worked on WHO-sponsored research concerning health-related quality of life measurements for African communities. Like Kariuki, she earned her MSc and PhD in social and behavioral sciences through her work on the Siaya ITN trial.\textsuperscript{79} These and other Kenyan scientists were critical to producing scientific knowledge about ITNs. At the same time, they used KEMRI-CDC’s ITN trial to build up their scientific credentials.

CDC and KEMRI also established links to Kenya’s Ministry of Health at the beginning of the trial in an attempt to include and acknowledge the Ministry as a stakeholder in the project. In the early 1990s the CDC had hired Amos Odhacha, a Public Health Officer for the Ministry of Health, as an officer for a primary health care (PHC) project in Kenya’s Western Province.\textsuperscript{80} Odhacha and the district health teams he managed worked with the CDC for three years on the PHC project, a connection that helped him gain employment on the ITN trial. Odhacha worked in the field during the trial, helping convince people to participate in the study. However, he also acted as a

\textsuperscript{78} Evan Mathenge, interview with author, Nairobi, August 6, 2015.
\textsuperscript{79} Jane Alaii, personal communication, November 2015.
\textsuperscript{80} Amos Odhacha, interview with author, Kisumu, December 1, 2015.
liaison between KEMRI-CDC and other partners in Kenya, including the Ministry of Health, district health teams in the study area, and interested research organizations. Odhacha’s duties included updating partners on the project’s status and making introductions to public health groups in the region. His networking helped ensure that KEMRI-CDC could carry out the bed net trial in the study area proposed. His work also facilitated the eventual transformation of the research project into a public health, malaria control program. While the Siaya bed net trial was an effort to produce global health knowledge, it depended heavily—as is often the case in internationally funded studies—on people like Odhacha operating within national public health organizations and networks.

KEMRI-CDC had to hire hundreds of new staff, including field workers, drivers, and data managers to make the project run. They brought on former research staff from the ABCP, including field coordinator Michael Onyango and sector supervisor George Okoth, who lived in Siaya and gained experience collecting data, mosquitoes, and other specimens around Asembo Bay. They hired others from Asembo based on recommendations from current staff, such as Onyango, and interviews. Although at the time CDC staff thought they were hiring field workers through a mostly independent evaluation process, it became clear that communities in Asembo often self-selected people, such as village chiefs and others already in managerial positions, to interview for the work. CDC researcher S. Patrick Kachur recalled that salaried jobs were few and far

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81 Amos Odhacha, interview with author; Simon Kariuki, interview with author.
82 Amos Odhacha, interview with author; Simon Kariuki, interview with author.
83 Michael Onyango, interview with author; George Okoth, interview with author, Siaya, October 31, 2015.
85 Penelope-Phillips-Howard, interview with author; Michael Onyango, interview with author.
between in Asembo at the time, so communities often put forward their best and brightest for these positions to help prevent brain drain from the area.\textsuperscript{86}

CDC researchers needed to exercise care not hire too many community leaders for these positions who were affiliated with Kenya’s ruling party of the time (the Kenya African National Union), as a majority of those living in Asembo supported the opposition led by Luo politician Raila Odinga and his National Development Party.\textsuperscript{87} For CDC, hiring field staff was a balancing act. They needed to recruit trusted and experienced people from the study villages to ensure residents’ cooperation while at the same time show impartiality in their selections. Some community members had lingering suspicions that selections were being made unfairly from within certain social and political networks. Even so, the fact that communities were able to recommend certain of their members for field staff positions, rather than be forced to accept whoever outsiders chose, facilitated the conduct of bed net research in the area.\textsuperscript{88}

While supervisors, coordinators, and other managers working in the field were mostly men—initially about 90%—many of those who gathered data from households and addressed day-to-day issues study participants had with ITNs were women. Researchers hired women for these tasks because they wanted people who could talk easily with families about sensitive issues concerning children and death. With this in mind, they sought out midwives, preferring those had worked in community health care or research projects in the past. One former \textit{nyamrerwa} I spoke with, Sarah Atieno, said she had learned midwifery at the Saradidi Community Health Centre and worked as a

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\textsuperscript{86} S. Patrick Kachur, interview with author.
\textsuperscript{87} \textit{Ibid.}
\textsuperscript{88} Michael Onyango, interview with author.
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midwife before joining the trial.\textsuperscript{89} Not all who worked as \textit{nyamrerwas} came with midwifery experience. As Atieno described, researchers asked village communities to select people they thought could walk door to door and “keep the community’s secrets.” Sometimes communities selected women they considered trustworthy but had no prior involvement in health work.\textsuperscript{90} That is not to say the CDC hired just anyone to be a \textit{nyamrerwa}. The women hired for these positions had to be able to read English and fill out data collection forms.\textsuperscript{91} Project managers replaced \textit{nyamrerwas} during the trial when they felt the women were not doing their work well.\textsuperscript{92} Despite such staff turnover on the project, community self-selection of research workers became a key feature of erecting research infrastructure in Asembo.

Drivers played a crucial role in the trial, transporting people, objects, and data between the study site and facilities in Kisian. The CDC had to continually hire new drivers throughout the trial as roughly 10\% of their drivers died of HIV-related illness over the course of the study.\textsuperscript{93} The trial also depended heavily on data management and data managers. KEMRI administrator Benta Kamire remembered that while many people in the Kisumu area had “computer knowledge,” few had the skills to verify and clean data.\textsuperscript{94} Therefore, project managers turned to Maseno, Moi, and Kenyatta Universities for qualified data managers. By hiring numerous new staff for the ITN trial, KEMRI-CDC expanded research infrastructure in both Siaya and Kisian.

\textsuperscript{89} Sarah Atieno,* interview with author, Rarieda-Omiyomano, August 18, 2015. As is customary in anthropological studies of medical research in Africa, I use pseudonyms (marked in footnotes with *) for my informants who were involved in the trial as former participants and \textit{nyamrerwas}.\textsuperscript{90} Sarah Atieno,* interview with author.\textsuperscript{91} S. Patrick Kachur, interview with author.\textsuperscript{92} Ibid.\textsuperscript{93} Feiko ter Kuile, interview with author; Penelope Phillips-Howard, interview with author.\textsuperscript{94} Benta Kamire, interview with author, Kisumu, October 15, 2015. “Cleaning” data generally consists of going through data to correct or remove inaccurate or corrupt records.
KEMRI-CDC researchers also had to convince people to participate in the bed net study by the ITN distribution period of November-December 1996. To do so, they relied heavily on resident field staff. Chiefs played instrumental roles as gatekeepers, and researchers approached them at the beginning of the trial to ensure their cooperation and blessing. According to Michael Onyango, some chiefs worked for the CDC on the project and therefore agreed to allow KEMRI-CDC to conduct research in the area. Chiefs held meetings (barazas) to tell residents in the study area about KEMRI-CDC’s study. Here residents voiced concerns about, for example, the fact that in many people’s one- or two-room huts, bed nets would be dangling dangerously close to cooking fires. CDC researchers also went to central locations, including schools and the big market in Nyalima, to explain the study to communities at special meetings. They relied on Odhacha, Onyango, and George Okoth to translate project goals and activities into the local language, Dholuo, and concepts comprehensible to laypeople. Sometimes the team used unique methods to familiarize people with the study. The research team held football matches between teams from different villages, Okoth remembered, and told players about the bed net trial over loud speakers during breaks in the game. In order to convince Asembo residents to participate in the production of biomedical knowledge, researchers had to work through existing social and cultural systems and practices. Researchers, in other words, exerted considerable effort to create the necessary

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95 Michael Onyango, interview with author.
96 Many people outside chiefs’ circles did not show up barazas, especially if they were working and running errands during the day. Based on my interviews with people in Siaya, that still seems to be the case today. Penelope Phillips-Howard, interview with author.
98 Penelope Phillips-Howard, interview with author; S. Patrick Kachur, interview with author; Michael Onyango, interview with author; Amos Odhacha, interview with author; George Okoth, interview with author.
99 George Okoth, interview with author.
conditions for biomedical knowledge production in the specific context of Siaya. Such attempts to transform local circumstances of scientific practice into a negligible factor within the experiment would be underplayed as results of the trial were reported.

Translating ‘research’ in Siaya

The process of translating KEMRI-CDC’s ITN experiment for the study population entailed much more than translating from English to Dholuo. Scientists learned this lesson at multiple points during the trial. First, as is standard in RCTs, researchers had to obtain consent for this trial from Siaya residents. Researchers and supporting staff traveled the region to obtain written consent from every participating household, using the opportunity also to explain what the study entailed. Even before having someone translate the consent form into Dholuo, CDC researchers had to tailor their explanations of what this trial required for participants. Rather than claim that KEMRI-CDC wanted to test children’s blood for signs of anemia, the consent form explained that researchers were testing for “lack of blood,” the local denomination for anemia.100 Researchers also framed the project as an endeavor to intervene in public health locally rather than to produce biomedical, global health knowledge. “As you know,” the first line of the form begins, “your village is taking part in the CDC/KEMRI bednet study which aims to improve the health of young children and pregnant women in Asembo.”101 The consent form promised participants free treatment for ill children and

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100 Bednet study cross-sectional survey consent form [English version], 1996, CDC Archives, Atlanta. For more on how people in this are described anemia and blood more generally, see P. Wenzel Geissler, “‘Kachinja are coming!’: Encounters around medical research work in a Kenyan village,” Africa 75, no. 2 (2005): 173-202, 190-193.
101 Bednet study cross-sectional survey consent form [English version], 1996, CDC Archives.
referral to either the Provincial Hospital or Lwak Hospital—KEMRI-CDC’s Asembo-based field station during bed net study—for extremely ill and anemic children.  

This is a possible reason why one woman in Asembo could not recall participating in bed net research, but did remember “signing up for hospital” with KEMRI-CDC. Thinking back, Phillips-Howard guessed many people did not fully understand the purpose of the trial even though a representative of the household signed the consent form. This may be more the case for women and children, as men often signed consent forms for the household.

While most people in the Asembo study area agreed to participate in the study, some refused and others showed reluctance. A large percentage residents who refused to participate lived in the ABCP area, where KEMRI-CDC had been taking children’s blood for a few years already as part of that earlier project. As P. Wenzel Geissler described in his article on blood-stealing idioms among residents of Uhero, in neighboring Bondo district, people there thought of blood as a measure of life and vitality. They associated blood with kinship and ancestral ties, as well as land, agriculture, and productivity. In many communities, people connected blood handling to witchcraft. Furthermore, CDC researchers sent participant’s blood to Atlanta to be tested for HIV for the ABCP, which

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102 Bednet study cross-sectional survey consent form [English version], 1996, CDC Archives. Although this particular consent form did not say, CDC also promised to treat people’s livestock for diseases as well. Residents of Rarieda-Omiyomano, interviews with author.

103 Esther Adhiambo,* interview with author, Rarieda-Omiyomano, August 18, 2015.

104 Penelope Phillips-Howard, interview with author. Melissa Graboyes has discussed issues of consent in East African research projects in Graboyes, The Experiment Must Continue, 87-118.

105 Penelope Phillips-Howard, interview with author.

106 Geissler, “‘Kachinja are coming!’,” 186. Although I myself did not interrogate Siaya residents about the meanings of blood in my interviews, discussions with informants from Gem and Homa Bay suggested some of these same understandings of blood. For more on the history of blood taking in medical research projects in East Africa, see Luise White, Speaking with Vampires: Rumor and History in Colonial Africa (Berkeley: University of California Press, 2000); Graboyes, The Experiment Must Continue, 21-50, 128-154.

107 Jane Alaii, personal communication.
heightened anxieties around blood taking. Based on my conversations with people from Siaya in 2015, as well as studies of medical research elsewhere in East Africa, it seems some people may have also thought researchers were using the blood to make medicines to sell on the U.S. and European markets.

To alleviate these fears during the bed net trial, KEMRI scientists brought village chiefs and community advisory boards into the laboratories at Kisian so the chiefs could see what scientists were doing with the blood, which they then reported to residents. The consent form also allowed participants to restrict certain types of testing on their children’s blood or long term storage of blood for future testing. Truly tailored to circumstances in Siaya, KEMRI-CDC’s consent form told residents who wanted to restrict certain blood testing to relay this information to Onyango, who would then tell KEMRI-CDC researchers. Getting people to agree to sleep under ITNs and have their children’s blood drawn to test for malaria parasites and anemia indicators was fundamental to producing knowledge about ITN efficacy.

Realities in ‘the field’ also challenged scientists’ research goals and designs in other ways. One difficulty KEMRI and CDC scientists remember was explaining

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108 There were extremely high rates of HIV, sometimes referred to as “the big disease,” in the area during the 1990s. As my research assistant, Molly, described, many women found HIV positive were abandoned by their husbands and often ended up living alone. Others did not know exactly what researchers did with blood they took, but did not understand that it was being tested for medical research purposes. Residents of Rarieda-Omiyomano and Nyawita (Bondo), interviews with author, August-September, 2015. Michael Onyango, interview with author; Simon Kariuki, interview with author; Jane Alaii, personal communication. Geissler also explored anxieties around HIV and blood testing in, Geissler, “‘Kachinja are coming!!!’” 180.

109 Molly Omany, personal communication, September 2015; Michael Onyango, interview with author; Graboyes, The Experiment Must Continue, 23.

110 Simon Kariuki, interview with author; Jane Alaii, personal communication.

111 Bednet study cross-sectional survey consent form [English version], 1996, CDC Archives. Michael Onyango gained a great deal of experience negotiating desires and anxieties about blood of research participants on the one hand and researchers’ desires and goals on the other during the Asembo Bay Cohort Project, which he drew on for the bed net trial as well. Michael Onyango, interview with author.
randomization and the need to randomize. While many people seemed eager to receive bed nets, Kachur recalled, many were suspicious of randomization. They thought that Kenyan research staff primarily chose their kin to receive bed nets. Researchers also sought to dispel rumors that villages whose chiefs they did not like were not selected to receive bed nets. To make the selection process transparent, researchers orchestrated big ceremonies where representatives picked the number ‘1’ or ‘2’ out of a hat to determine whether their village would receive bed nets or be entered into the control group.

Researchers and staff chose to frame the number selection, Onyango recalled, as “some villages are getting bed nets now, and the rest are getting bed nets later.” He explained,

What we realized was that when you tell people that the study, it will be two years. After two years you will all get nets. Some did not believe in that and say, ‘two years all of us will be dead.’ But we just, ‘Please two years is not a long duration.’ But most of them were really like ‘aye, aye! Two years, two years is too long. Make it six months.’ Some, ‘make it three months.’[...] I just had to talk to them, ‘the way the study has been designed, we can only get that data if it is done two years.’

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112 S. Patrick Kachur, interview with author.
113 Penelope Phillips-Howard, interview with author.
114 Villages—the unit of analysis—were divided into groups, or clusters, of 10 (forming a sector) for the trial. Within these groups, villages were matched by measurements such as child survival rate to ensure that all the villages with the lowest rates of child survival, for example, did not all end up in either the intervention or control arm. As Penny recalled, a researcher from the CDC heard about this randomization method from a different study, and the KEMRI-CDC team applied it here. George Okoth, interview with author; Penelope Phillips-Howard, interview with author.
115 Michael Onyango, interview with author; Jane Alaii also suggested that people in control groups worried they would not get nets if KEMRI-CDC ran out of money. I think this helps show the difference in, for example, CDC scientists’ perspectives and the perspectives of participants regarding research: while CDC scientists considered universal distribution of nets after the trial an ethical necessity of medical research, participants saw bed nets as a kind of uncertain windfall.
As the challenges of randomizing illuminate, translating research design into practice required much negotiation. Staff like Onyango and the nyamrerwas, who were from the area, were critical to this process.

Finally, in preparation for the trial, research staff had to demonstrate to participants how to actually hang the nets above sleeping spaces in their homes, including mats and sofas where children typically slept. They did so during the distribution period in village centers, as well as in the homes of families who did not attend distribution meetings.¹¹⁶ Researchers also gave out leaflets along with the bed nets that described how to properly care for ITNs. Getting people to assimilate ITNs into their household furniture, however, proved difficult using these, somewhat passive methods alone. Staff carried out a house-to-house monitoring campaign in the month before the trial’s intervention period and found that families in roughly half the homes they visited had not hung nets correctly or even taken the net out of the package.¹¹⁷ Kenyan field staff who could actively communicate with Asembo residents were crucial to implementing the intervention at the center of the experiment.

Making biomedical knowledge in Siaya

Throughout the trial scientists tailored, tinkered with, and translated scientific protocols into experimental practices. Kenyan research staff, field workers, and trial participants helped make this transformative work, and thus the production of statistically-significant results, possible. Attending to the work that these “invisible

technicians” performed points to the contingency and important social basis of RCTs, which are often presented as standardized, mathematical tools for determining the efficacy of medical interventions.\textsuperscript{118}

A few months into the trial, Jane Alaii together with some CDC colleagues conducted a Participatory Rural Appraisal survey in which they learned that many people were either not using the project-issued bed net or not using the nets correctly.\textsuperscript{119} This occurred for a number of reasons. Former trial participants and research staff reported that some people felt these free bed nets were tools scientists could use to draw people’s blood while they slept.\textsuperscript{120} Because Nyanza had been a major site for family planning projects in the past, some thought that these beds nets—dosed with pungent chemicals—might reduce fertility. They were suspicious that the government, represented by KEMRI, distributed the nets to curb the population in this opposition-supporting region.\textsuperscript{121} Furthermore, some recipients did not think the nets—deemed the property of project staff until the end of the trial—were truly free, and were afraid that scientists would return and ask them to pay for the net if they were found using it. If they did not have the money to pay for the bed net—then considered a luxury item—people thought the researchers would take their land instead.\textsuperscript{122} Residents’ previous encounters with health projects, the


\textsuperscript{119} A Participatory Rural Appraisal is an anthropologic research method commonly used in international health and development projects. The survey is intended to gather the opinions of people living in rural communities so planners can then incorporate those opinions into the development and management of projects among those communities.

\textsuperscript{120} Residents of Rarieda-Omiyomano, interviews with author, July-August, 2015; Benta Kamire, interview with author; Michael Onyango, interview with author; Jane Alaii, personal communication.

\textsuperscript{121} Penelope Phillips-Howard, interview with author; Residents of Rarieda-Omiyomano and Nyawara (Gem), interviews with author, July-August, 2015.

\textsuperscript{122} Jane Alaii, personal communication.
government, and other outsiders informed their initial expectations of and responses to ITNs.

Sometimes the perceived physical effects of ITNs troubled residents as well. Jane Alaii learned in her social science work that some found sleeping under a net hot and uncomfortable. Many stopped sleeping under their nets during the hot and dry season, when nuisance mosquitoes were less prevalent. When people came into contact with the permethrin insecticide on the net before it had dried properly, the net would make their skin itchy. Some trial participants developed rashes from the insecticide. While only a few people were allergic to permethrin, a number of people I talked to recalled that the chemical provoked coughing fits, which in turn suggested the net might kill children. While many trial participants (around 70%, according to one survey) used bed nets as intended during the trial, a number of others did not due to sensory perceptions and social preconceptions of how the tool worked. Initial efforts to educate the population about the new technology and the project had limited effect.

To ensure people used their bed nets, Jane Alaii proposed random evening spot checks in households from the intervention group, to which other researchers agreed. Okoth and the sector supervisors helped carry out random checks with the help of community elders, who were familiar to trial participants. Nyamrerwas also went household-to-household to convince people to use ITNs. One former nyamrerwa told me she went to “refusal homesteads” to remind people about the benefits of nets as

124 Residents of Rarieda-Omiyomano, interviews with author.
125 Ibid.
127 George Okoth, interview with author.
researchers understood them.\textsuperscript{128} She visited households in her village to make sure people hung their bed nets correctly since incorrect use could lead to infective mosquito bites. Early adopters among study participants were also important to building trust in bed nets. Women who used bed nets continued to bear children. Young children of families using bed nets, residents noticed, did not get sick with fever as often as before.\textsuperscript{129} Of course, not all children who slept in households with bed nets survived, and in those cases the families continued to think bed nets were dangerous tools.\textsuperscript{130} Nevertheless, those who observed that net-using neighbors did not suffer—especially at a time when many young children in Asembo died from malaria—were more likely to use them too. Understanding and ensuring compliance among trial participants, making the trial work, was critical to the production of biomedical knowledge. Ensuring ITN compliance depended much more on the work of researchers and staff living in ‘the field,’ including Alaii, than it did on scientists coming in from Kisumu, Nairobi, or Atlanta.

When they learned that not everyone in the intervention group was using their nets regularly, Alaii and Phillips-Howard initiated activities to improve communication and education about bed nets in villages. They tried to do so in a way that fit with existing community practices. For example, the two investigators had staff talk with participants about the proper use of bed nets during meetings of church and women’s groups since more people attended these than chiefs’ barazas—an observation more careful social science research before the start of trial would have revealed. Researchers also organized drawing contests in schools in which children drew pictures about using

\textsuperscript{128} Sarah Atieno,* interview with author.  
\textsuperscript{129} Residents of Rarieda-Omiyomano, interviews with author.  
\textsuperscript{130} Penelope Phillips-Howard, interview with author.
and chemically treating ITNs correctly. Project staff staged community theater shows about ITNs and held ceremonies where nyamrerwas sang songs about the trial.\textsuperscript{131} They were certainly not the first to use such creative tactics in ITN trials.\textsuperscript{132} Still, these “community” oriented education activities illustrated how compelling people to use the new technology of ITNs took significant effort and engagement with intended users. Merely providing access was insufficient for success—a lesson lost in the transformation of ITNs from experimental objects to fully consolidated, biomedical objects.

CDC researchers also considered giving gifts to ensure participation. Onyango and lead CDC researchers discussed the possibility of offering incentives to mothers who allowed researchers to draw blood from their placenta after they gave birth and answered questions about the cause of a child’s death in the household.\textsuperscript{133} At first they considered giving coffins as incentives to mothers whose child died—an expensive item that, Phillips-Howard recalled, people asked her for frequently.\textsuperscript{134} They ultimately decided against these measures since mothers “might connect the death, as if it is now the bed net project which is causing deaths and we are aware.”\textsuperscript{135} They decided instead to offer small incentives to mothers at birth to provide placental blood within six hours of delivery “because,” as Onyango said, “this is like welcoming” the child. “You have to motivate this family that when they give birth they can keep that placenta.”\textsuperscript{136} Additionally, KEMRI-CDC paid nyamrerwas per delivery, incentivizing them to attend births and help

\textsuperscript{131} Penelope Phillips-Howard, interview with author; Alaii, et al., “Community reactions to the introduction of permethrin-treated bed nets for malaria control during a randomized controlled trial in western Kenya.”\textsuperscript{132} See, for example, VM Marsh, et al., “Evaluating the community education programme of an insecticide-treated bed net trial on the Kenyan coast,” \textit{Health Policy and Planning} 11, no. 3 (1996): 280-291. \textsuperscript{133} Michael Onyango, interview with author. KEMRI-CDC scientists used the placenta in their investigation of malaria in pregnancy.\textsuperscript{134} Penelope Phillips-Howard, interview with author. \textsuperscript{135} Michael Onyango, interview with author.\textsuperscript{136} \textit{Ibid.}
collect information from mothers. Social and economic relations between scientists, research staff, and participants provided a foundation on which the collection of biomedical data could take place. However, such measures were not always appreciated in scientific publications, which instead focused on the universality and generalizability of knowledge produced about ITNs in Siaya.

Research staff also had to grapple with difficulties posed by Asembo residents’ mobility. During funerals, which were frequent in Siaya during the concurrent AIDS epidemic, many family members from outside Asembo would come and stay in households involved in the trial. Out of politeness, hosts who were in the intervention group would let visitors use the bed nets, a practice which almost certainly led collected data to suggest lower ITN efficacy. Sometimes visitors would take the bed nets with them when they left the study area. Onyango remembered going all the way to Kisumu to retrieve a net from the trial, mainly to discourage others from giving their nets away. Onyango more generally acted as an important mediator between the scientific needs of CDC and KEMRI on the one hand, and communities in Asembo on the other. In our interview, he said people would refer to him as a CDC guy and go to him with questions or concerns about the research. Confronted with these issues, he recalled, “I also told them that, ‘I cannot bring something bad to you because I will be here forever. If there is anything wrong, you may blame me forever.’”

The insecticide component of the intervention presented unanticipated challenges as well. According to the research protocol, researchers and other staff such as

\[\text{Ibid.}\]
\[\text{George Okoth, interview with author.}\]
\[\text{Michael Onyango, interview with author.}\]
\[\text{Ibid.}\]
nyamrerwas and sector supervisors would gather all the bed nets every six months for re-treatment with insecticide. Staff told participants to bring their nets to a central location where researchers would dip the nets into permethrin. KEMRI and CDC scientists described this as a drill, an activity which required an army working for one month biannually. For some, the treatment process was simply a “nightmare.”

Some people simply did not bring their nets to be re-treated. Others took issue with the re-treatment process. People considered nets as part of their private beddings and therefore refused to show their bed nets in public. Even Odhacha was surprised by this development. “I’m a Luo,” he told me, “but some things I didn’t know.” While Alaii conducted sleeping surveys early in the trial to understand the compatibility of people’s sleeping habits with the experiment’s intervention, researchers did not initially interrogate the study population’s ideas about the meaning of and social norms regarding bed nets. This, again, reflects a lack of appreciation for social inquiry as an integral, rather than adjacent, part of RCTs.

A number of participants had concerns about dipping their nets in a communal washbasin, and about the order in which nets were treated. Many men did not want to have their nets dipped in the same insecticide solution that was just used to treat the net of a menstruating girl. Family hierarchies also mattered. Both John Vulule and Odhacha described how men wanted their net dipped before that of their daughter-in-law. For these reasons, people wanted to have nets dipped at their homes where they...
could more easily control the treatment process. Doing so for thousands of households would have been even more logistically challenging and time consuming than treating nets at a center. Therefore, Odhacha and the rest of the research team had to learn to negotiate village, homestead, and household relationships in the dipping process instead. Such social labor was critical to ensuring scientists could gather data and measure the effects of insecticide-treated bed nets.

As researchers on previous bed net trials had discovered, getting insecticide to study sites could also be a challenge. Since insecticide was a crucial part of the technological intervention being tested, delayed or insufficient insecticide might compromise scientific results. KEMRI-CDC faced one such challenge in August 1998 when the US Embassy in Nairobi—the way point for all of the incoming insecticides for the study—was bombed and destroyed. The bombing caused a nine to twelve month delay to receiving insecticide. Like people’s refusal to dip their nets in insecticide, this delay threatened to change the identity of the technology and intervention itself. Researchers folded this incident into the study, using the experience to show that the efficacy of ITNs reduced markedly if not treated after six months. Events and circumstances in Kenya shaped global health knowledge about ITNs.

The trial also required entomologists to convince people to let them into their homes—sometimes at night—to count and collect mosquitoes for laboratory analysis. John Gimnig, an American Society for Microbiology fellow who came to the CDC to

146 Amos Odhacha, interview with author.
147 Feiko ter Kuile, interview with author.
work with Bill Hawley, traveled with KEMRI entomologists and other Kenyan field staff to carry out this intrusive work.\textsuperscript{149} Gimnig’s description of entomological fieldwork reveals the centrality of Kenyan scientists and staff in making local claims about ITNs.

“When I was out in the field,” he told me,

I would be sort of managing [a] team, […] supervise them, making sure they were doing things right. And most of the interactions with the household […] [were done] either by the KEMRI person I was with or by one of the local staff. And most of those interactions were conducted in Dholuo, the local language. So I would kind of sit there and listen and then occasionally they would turn and say ‘Okay, this is what they said.’ You know, they usually would give me an overview of the conversation, certainly if there were any issues or questions that came up they would bring those up. […] Once we got into the household, people were, they were just, you know, ‘Go ahead. Do what you need to do.’

Entomologists also had to hang Columbian curtains (nets that hang off eaves) around people’s houses in the evenings to collect mosquitoes exiting. This was a process many participants found entertaining.\textsuperscript{150} Vulule remembers that study participants sometimes had a difficult time understanding the point of entomologists’ activities.

“Some were at times amused,” he said. “Why are we chasing mosquitoes? Because whereas they appreciate the fact that mosquitoes might cause malaria, just to have our vehicles driving around chasing mosquitoes…at times they couldn’t fathom why we had so much interest.”\textsuperscript{151} Mathenge, who came onto the Siaya trial from Nairobi, remembers that people would ask him why he “would come all this way just to chase mosquitoes.”\textsuperscript{152}

\textsuperscript{149} John Gimnig, interview with author, Atlanta, April 1, 2015. Field staff working with KEMRI and CDC entomologists were hired on a casual basis, often on the recommendation of existing Kenyan staff. It is therefore likely that many of those workers hired on a casual basis were relatives, or at the very least friends, of Kenyan staff.
\textsuperscript{150} John Gimnig, interview with author.
\textsuperscript{151} John Vulule, interview with author.
\textsuperscript{152} Evan Mathenge, interview with author.
If this trial was an orchestration of people, activities, knowledges, and skills, it was an orchestration in which not every player knew what was going on or why.

_Mobility and ‘the field’_

‘The field’ of Asembo, and later Gem, was not the only site where scientists and research staff produced knowledge about ITNs. Physical laboratories in Asembo as well as in Kisumu (Kisian) also functioned as important sites of knowledge production. Many mornings, Mathenge remembers, entomologists brought and sorted mosquitoes in a makeshift laboratory in Asembo. They used basic dissection kits to analyze mosquitoes before sending them off to KEMRI labs in Kisian with more sophisticated equipment.¹⁵³

The KEMRI-CDC team also did cross-sectional surveys for about six weeks each year during the trial. Intensive data collection in the field developed into intensive work in Kisian laboratories. Immunologist Simon Kariuki remembered working long hours analyzing blood samples in the lab. He, other researchers, and lab technicians supported field work at the same time they contributed to knowledge about ITN efficacy. “We did those cross sectional surveys for about one month or six weeks,” he told me.

And it involved everyday waking up around five in the morning, so that [KEMRI-CDC field researchers] will be in the field. If they have to leave Kisumu and be in the field by eight, they had to leave at five, and pass by the labs, pick the drugs, pick the ice packs for samples, and whatever supplies they needed to go to the field. […] And then if [the children surveyed] have fever, then the slides will be brought here and given priority and had to be read first so that the next day [researchers] can take the drugs in the field. So by the time they finish all that, back in the lab it’s about nine pm at night. And then you have to process those samples, and so on, until one am. Sometimes people in the lab would leave at one am. And the next day by five, six am they needed to be back in the lab.¹⁵⁴

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¹⁵³ Ibid.
¹⁵⁴ Simon Kariuki, interview with author.
Making and being able to make local claims about ITN efficacy in Siaya depended heavily on the work of laboratory scientists and technicians in Kisumu, and the coordination of their work with that of those traveling to and from ‘the field.’

The preceding description makes clear that researchers and their staff did not simply conduct the bed net trial in Siaya. The performance of the field experiment unfolded through the transcontinental circulation of people, objects, knowledge, and capital. The last leg of this circulation—from Kisumu to Siaya—could sometimes be the most difficult and precarious to complete.\textsuperscript{155} Nyamrerwas and field staff collected data for thousands of people on standardized paper forms, which drivers transported between Siaya and Kisian in land cruisers on a regular basis. Study participants did not have phones, as most people in Siaya do now. If someone in Kisian wanted to follow up with a participant about their response on the paper forms, he had to physically go to Asembo and find that person.\textsuperscript{156} Scientists who wanted to provide people results from their blood test had to supply drivers with tiny bits of paper containing information on where to find them in the district.\textsuperscript{157} Paper functioned as an essential technology of knowledge production about ITNs in Siaya.

Moreover, as Principal Investigators, Phillips-Howard and Hawley had to find and pay field staff with cash every week.\textsuperscript{158} Salaries were crucial to the success of the bed net

\textsuperscript{155} P. Wenzel Geissler has discussed this phenomenon elsewhere. “The field station is, thus, a well-connected conduit of people, materials, and data linking peripheral villages to global centers of scientific investigation, an intersection in rapid global circulations. At the same time, this enclave of world-class scientific possibilities is physically separated from the surrounding countryside—and the circulation of people, specimens, and data between this realm of science and surrounding public health and care institutions is at times more challenging than information flows and travel to international centers.” Geissler, “What future remains?,” 146-147.

\textsuperscript{156} Benta Kamire, interview with author.

\textsuperscript{157} Feiko ter Kuile, interview with author.

\textsuperscript{158} Penelope Phillips-Howard, interview with author.
experiment. Part way through the trial, many nyamrerwas threatened to go on strike if they did not receive higher wages.\textsuperscript{159} Benta Kamire, the main administrator at the KEMRI-CDC field station during the trial, played an important role in maintaining the circulation of paper, cash, and other materials within and between Kisian. Sometimes, she recalled, she would even have to send drivers to hand-deliver letters to administrators in Kisumu town to ensure all provincial stakeholders were included in stakeholder meetings.\textsuperscript{160} To produce biomedical, global health knowledge, scientists relied on those who built and facilitated links between sites and groups involved in the bed net trial.

The bed net trial required a lot of work and coordination, but that is only the half of it. Much of what has been described so far has been about activities in Asembo. Based on census data from the early 1990s, the years leading up to and during the Asembo Bay Cohort Project, CDC researchers thought a trial with some 55 to 60 thousand participants in Asembo would be enough to show a 20% reduction in child mortality due to ITN use. However, census data from 1996—the year researchers planned to distribute nets—indicated that child mortality in Asembo was actually lower than researchers expected. Low child mortality rates meant it would be more difficult to show ITN use was the cause of any increase in child survival. High HIV-related mortality in the study area, which was estimated at 20% among children under five, also meant it would be especially difficult to demonstrate that a malaria vector control tool could save lives.\textsuperscript{161} Frantically recalculating how many people they would need to maintain the study’s statistical power (the probability that the experiment would reject a false null hypothesis, or false

\textsuperscript{159} Bill Hawley, interview with author.
\textsuperscript{160} Benta Kamire, interview with author.
\textsuperscript{161} Penelope Phillips-Howard, interview with author; Phillips-Howard, et al., “The efficacy of permethrin-treated bed nets on child mortality and morbidity in western Kenya II.”
negative), Allen Hightower and Feiko ter Kuile reported the team needed to include about 70,000 more people.\footnote{Email correspondence, Feiko ter Kuile and Allen Hightower, 1996, CDC Archives; Penelope Phillips-Howard, interview with author.} This meant they had to do everything over again in Gem, distributing nets at the end of 1997, while continuing to collect and analyze data from Asembo.

The research infrastructure KEMRI-CDC set up in Gem was much sparser than that in Asembo, according to Phillips-Howard and ter Kuile, and targeted primarily toward measuring reductions in child mortality. As a result, it was more difficult to oversee. Both researchers acknowledged that, in the end, it was difficult to assess bed net use in Gem in great detail. Things that slipped under their radar—people siphoning off permethrin insecticide to use for agricultural purposes, for example—may have actually diluted results from the study on ITN efficacy in Siaya.\footnote{Feiko ter Kuile, interview with author; Penelope Phillips-Howard, interview with author.} While some former trial participants in Gem remembered researchers as, “the white men coming from Asembo into Gem Central,” they tended to remember much less than their Asembo counterparts about what researchers actually did.\footnote{Mary Otiu Owoche,\* interview with author, Nyawara, August 27, 2015. Residents of Nyawara, interviews with author, August 2015.}

Taking a field science perspective, this account of KEMRI-CDC’s ITN trial reveals a complex performance of global health science.\footnote{Schumaker, \textit{Africanizing Anthropology}, 6.} Conducting the experiment required a large number of people utilizing different types of skill and expertise. Although CDC scientists did define what they wanted and needed done in order to make knowledge useable for scientists, policy makers, and donors around the world, they could
not have made local and specific claims about ITNs in Siaya on their own. Communication, socializing, travelling, and being present were critical to the production of biomedical knowledge. Only by looking at these practices and the many ‘invisible technicians’ involved in this work, is it possible to understand how ITNs became understood as universally applicable, biomedical tools.\textsuperscript{166}

**Disseminating Results: The Afterlives of ITN Research**

KEMRI, CDC, and Kenya Ministry of Health representatives from the trial disseminated results of the study to various stakeholders, including study participants, field workers, Kenyan health officials, and members of the international health community. In communicating with international stakeholders in particular, they scaled up the claims they had made about the efficacy of ITNs in Siaya and consolidated ITNs as a universally applicable, biomedical technology. Researchers scaled up scientific findings to substantiate the mass roll out of ITNs in all malaria-endemic areas of Africa in a similar way to vaccines. In circulating findings as a “global public good,” however, they black-boxed the technology of the ITN, extracting it from the social and cultural world in which Siaya residents used and defined ITNs.\textsuperscript{167}

The trial produced two important findings that shaped developments in global malaria control in the twenty-first century. First, statistical results from the trial showed a 20% reduction in all-cause child mortality among children under five, and a 26% reduction among children under one specifically.\textsuperscript{168} Infants in Siaya benefitted most from

\textsuperscript{166} Shapin, “The invisible technician.”
\textsuperscript{167} Feierman, “When physicians meet.”
sleeping under ITNs since the nets reduced the number of infectious mosquito bites they received. Large numbers of infectious bites frequently caused severe anemia in infants. Researchers also converted these statistics of protective efficacy into numbers of “lives saved” per 1,000 child years, calculating 10 and 35 lives saved for children under five and children under one, respectively. Techniques of clinical epidemiology, the basic science of RCTs and evidence-based public health, distilled ITNs to the biological effects and, in conjunction with cost-effectiveness calculations, rendered ITNs commutable in a larger economy of ‘life-saving’ global health goods.

Secondly, entomologists provided data to show that ITNs had a “community-wide effect,” sometimes called a “mass effect” or “herd effect.” Bill Hawley and colleagues did a spatial analysis of epidemiological data to show that children residing in compounds within 300 meters of households employing ITNs experienced similar reductions in disease indicators as did children using bed nets. Some entomologists claimed that ITNs had a mass effect in earlier studies, but malaria researchers did not fully agree on this point. In the late 1990s, moreover, malaria scientists did not know how strong the mass effect of ITNs was. Accounting for this mass effect, health economists reduced their estimates for ‘annual net cost per life-year gained’ and ‘annual net cost per

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169 Ibid.
all-cause sick child clinic visit averted’ with ITN use. CDC scientists also mobilized the detailed quantitative evidence that ITNs had a community-wide effect to bolster a growing argument that donors should fully subsidize (i.e. provide free) ITNs for such at-risk populations as pregnant women and children under five.

After the trial concluded, around 1999-2000, senior KEMRI and CDC scientists traveled to the study area to tell people that according to their research, ITNs could save children’s lives. Remembering people’s reactions to the results, Odhacha said that one thing people appreciated about this trial was learning that malaria, rather than witchcraft, was the culprit of many child deaths in the area. It was “exciting information to the community.” I did not discern a similar excitement from my interviews with former trial participants in 2015, but many said they appreciated bed nets because now they and their family members did not fall sick with malaria as often. “You could go to the hospital for other things,” one woman told me, “but not for malaria.” Participants in the control group were excited to receive bed nets at the end of the trial. Giving participants the therapeutic or intervention proven to be most effective is a typical and ethical practice in RCTs. Yet by giving Siaya residents health resources, seemingly as

175 Bill Hawley, interview with author; Penelope Phillips-Howard, interview with author.
176 Amos Odhacha, interview with author.
177 Residents of Rarieda-Omiyomano and Nyawara, interviews with author.
178 Amos Odhacha, interview with author; Jane Alaii, personal communication.
gifts, CDC and KEMRI researchers also cultivated an identity as public health providers in the region.\(^\text{179}\)

In many ways disseminating scientific results was a kind of performance. KEMRI and CDC researchers held ceremonies in Kisumu and Nairobi for the Ministry of Health and major donors, including the UK Department for International Development (DFID) and USAID. A couple of Kenyan and CDC researchers from the trial reported study results, focusing on the reduction of mortality among children under one and the ‘community effect’ of ITNs.\(^\text{180}\) Filled with music and speeches, these ceremonies functioned as displays of international support for malaria control in Kenya. Researchers also brought field workers into the Kisian field station to report the results. Field workers received certificates of accomplishment as part of the performance.\(^\text{181}\) Such certificates are highly desired in Nyanza today as community health workers use them to make claims to status and experience, and secure positions on other research projects.\(^\text{182}\)

Researchers presented findings to the international malaria control community at the WHO and in academic conferences and journals, as is standard practice. They also disseminated trial results through the American media and popular science publications.\(^\text{183}\) Some of the popular reporting outlets presented scientific data along with marketing messages for donors. “The study also shows,” one article stated, “that a

\(^{179}\) Recalling the changes that occurred in the region after the ITN trial, George Okoth also noted, “KEMRI-CDC, especially thereafter, was like a substitute for the Ministry of Health, because I should think they were more on the ground than even the Ministry of Health.” George Okoth, interview with author.

\(^{180}\) Penelope Phillips-Howard, interview with author.

\(^{181}\) Bill Hawley, interview with author; Penelope Phillips-Howard, interview with author.

\(^{182}\) For more on the ways East Africans engage global health research as an economic system and means of employment, see Ruth Prince, “Precarious projects: Conversions of (biomedical) knowledge in an East African city,” *Medical Anthropology* 33, no. 1 (2014): 68-83.

remarkably low-tech and relatively cheap intervention can have more impact than many snazzy scientific advances.” The author cited findings from the trial showing ITNs had a “herd effect,” protecting residents who lived near households with ITNs but did not own nets themselves. In doing so, the author reinforced claims leveraged by scientists that bed nets were cost-effective, global public goods.

It is important to note, however, that policy makers at the WHO made ITNs a pillar of their new ‘Roll Back Malaria’ campaign before researchers published results from the Siaya bed net trial. “Although we were sure that this was the most important study that was being done, was going to answer the question about whether or not the nets worked in a very high transmission area,” S. Patrick Kachur remembered,

I knew the rest of the world wasn’t sitting around on their hands waiting for those results. They were moving forward. But the direction that they were moving forward was on a rather smallish scale and focused a lot on developing ways to make it possible for people to afford to buy a bed net, or to afford to buy the insecticide retreatment once they had it.

The trial answered many open research questions about the efficacy of ITNs, but the results strengthened support for, rather than turned the tide of global malaria control. “At the international level,” Phillips-Howard recalled, “it was the lobbying and the demanding for, ‘look at all these deaths. They can be prevented. We need more money. This isn’t going to happen unless bed nets get out there. You must treat this as a social

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184 Enserink, “Bed nets prove their mettle against malaria,” 2271.
186 Researchers recalled that doing double-data entry—entering data into databases twice to decrease chances of error—on the study slowed the process of disseminating results considerably. Furthermore, researchers were able to draw on USAID funding to take their time writing up results and publish an entire supplement of the AJTMH dedicated to this trial. John Gimnig, interview with author; Penelope Phillips-Howard, interview with author.
187 S. Patrick Kachur, interview with author.
vaccine.’ You know, ‘we’ve been able to dot the i’s and cross the t’s with this study, and it needs to move forward as a public good.’ The fact that scientists could now provide statistics showing that ITNs worked anywhere, many CDC scientists told me, was important for stimulating enthusiasm about bed nets among donors. ITNs and the statistically-articulated, scientific claims now firmly embedded in the technology were construed and disseminated as global public goods.

Researchers compiled and published results in a single supplement for the *American Journal of Tropical Medicine and Hygiene*. They did not do so simply to create a storehouse of biomedical knowledge about ITNs. Researchers wanted to make the journal supplement a policy and public health teaching tool. The journal supplement included articles on the feasibility of using demographic surveillance systems instead of statistics from government health facilities to track the health of rural populations. Findings demonstrating the feasibility of using demographic surveillance systems helped justify a technology-based approach to malaria control in Africa as it de-emphasized the need to build or strengthen health facilities. Phillips-Howard and her co-authors spilled a lot of ink describing how KEMRI-CDC set up and conducted the trial so other researchers could use the bed net experiment as a model for large field trials in impoverished, rural settings. This supplement was a product designed for global consumption.

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188 Penelope Phillips-Howard, interview with author.
189 Rick Steketee, interview with author, online (skype), May 13, 2015; Feiko ter Kuile, interview with author; Penelope Phillips-Howard, interview with author; S. Patrick Kachur, interview with author.
The trial had a significant impact on the direction of the VBCRC as a center for medical research. Beginning with the Asembo Bay Cohort Project, KEMRI and CDC scientists transformed areas of Siaya into a health and demographic surveillance site. These researchers expanded surveillance activities significantly during the bed net trial to cover most of Asembo and Gem. Teams working on later medical research projects or tracking bed net coverage used the same surveillance infrastructure to collect health and intervention data from rural households. USAID and other donors started to give significant amounts of funding to the Centre because it had the capacity to collect data from large populations, allocating a lot of money for HIV/AIDS research in particular. KEMRI-CDC research projects blended into health service provision, and the institution gained substantial control over public health activities in Siaya. Because the Centre started receiving so much funding to study HIV/AIDS, which was not a vector borne disease, leadership changed the name of the institution to the KEMRI Centre for Global Health Research (CGHR) around 2004. Once a place for applied, nationally-oriented research in Kenya, the Centre had become a central hub for global health science in Africa.

Conclusion

Together with the previous chapter, this historical ethnography of KEMRI-CDC’s ITN trial reveals how global health science took shape over the 1990s. Epidemiology and the biomedical paradigm of randomized controlled trials came to characterize the production of public health knowledge, which as a result could be scaled up and

192 Larry Slutsker, interview with author.
193 John Vulule, interview with author.
generalized to populations regardless of social, political, and economic circumstances. Economics and applied anthropology also emerged as productive modes of knowing in global public health as researchers sought to sell—both literally and metaphorically—experimental interventions to intended users and potential donors.\textsuperscript{194} Scientific research drawing on these paradigms and disciplines functioned as a kind of capital, circulating internationally to attract investments in a given problem or intervention. In a period when state health services in Africa deteriorated rapidly and HIV/AIDS devastated communities across the continent, trial results undoubtedly drew attention to the need for and likely payoff (in ‘lives saved’) of international investment in malaria control. The larger context of resource scarcity in international and national health programs underlies epistemic and practical shifts in world-scale public health science.

KEMRI-CDC researchers did consider the landscape of Siaya important to their ITN trial and were very aware of how conditions on the ground affected the way they practiced science and produced knowledge.\textsuperscript{195} They learned through their experience on the trial that the social and cultural world of the research site shaped, and could even alter, scientific results. Moreover, they learned that field workers who had lived and worked in the study sites were instrumental to the production of biomedical knowledge. However, in scaling up knowledge from this RCT for the purposes of making global health knowledge, Siaya became a backdrop for knowledge production rather than an integral part of it. Furthermore, in disseminating results, researchers reified the ITN as something which can ‘work,’ which can save lives, no matter where it travels. The way

\textsuperscript{194} For more on the ways certain sciences become understood as chiefly productive in understanding natural phenomena, see Christine MacLeod and Gregory Radick, “Claiming ownership in the technosciences: Patents, priority and productivity,” *Studies in History and Philosophy of Science* 44, no. 2 (2013): 188-201.  
\textsuperscript{195} Penny Phillips-Howard, interview with author.
target populations actually used this object and incorporated it into their daily lives became detached from the function of the technology itself. Such black-boxing of ITNs in scientific trials would complicate public health officials’ efforts to scale up ITNs elsewhere in Africa. Still, this belief in the universality of ITNs animated scientists’ and international policy makers’ imagination of public health in Africa—a system based largely on disseminating individualized, inexpensive commodities regardless of a specific population’s social, economic, or ecological circumstances.

Finally, in tracking the development of global health science in a specific place, this chapter highlights the variable impacts of global health knowledge production on African communities. As Siaya was transformed into a site for global health research, Kenyan scientists gained new opportunities to contribute to the world’s knowledge about health, disease, and disease vectors. With the increase in biomedical experiments, Siaya residents gained new outlets for health interventions and health education to which they might not otherwise have access. Amidst this transformation, and as time-limited research projects came to fill in for permanent health facilities and services in the region, many residents enrolled in a new types of casual labor such as the nyamrerwa and sector supervisor. This type of labor has become increasingly important—not just in Siaya, but in Africa more broadly—as study populations have expanded to achieve sufficient statistical power in RCTs and as ‘community participation’ has become a prerequisite for many public health interventions. However, like health interventions through time-limited experiments, such labor is also quite precarious. When I was doing my field work in 2015 and early 2016, for example, the CDC had to lay off a large portion of Siaya-based staff due to problems with mismanaged funds, staff who then had to take up jobs
like driving motorbike taxis in piecemeal fashion to maintain an income. ITN research, which figured centrally in the Vector Biology and Control Research Centre’s transformation into the Centre for Global Health Research, provides an exemplary window into the multiple, ambivalent influences and implications of global health science in Kenya and beyond.
Chapter 3
Selling Insecticide-Treated Nets and Malaria Control as Good Investments in the Late Twentieth Century


![Figure 3.1. Stages of research on insecticide-treated nets, presented in Net Gain](image)

Beginning in the early 1980s, the chart shows, scientists conducted efficacy trials measuring the effects of ITNs on malaria vectors, disease, and human mortality. Then project managers and economists began studying the impact and costs of incorporating the tool into health programs. Finally, the authors predicted, health officials would include ITNs into national strategies and policies following further effectiveness studies.
The chart provides an elegant narrative model for what became a major “evidence-based intervention.” Isolating ITNs from the broader context in which bed net research and policy making activities took place, however, the chart also obscures the politics of science and technology at work in late twentieth-century international health.

This chapter explores the third moment in my biography of ITNs to see how and why ITNs were incorporated into global health policy in the 1990s, when the WHO introduced its basic strategy for combatting malaria in the twenty-first century. Although malaria vector control and transmission prevention measures had lost much traction in the post-eradication era, by the end of the 1990s, the WHO made ITNs a cornerstone of its new Roll Back Malaria program. Not only that, Roll Back Malaria’s leaders adopted ITNs as quintessential “evidence-based” interventions. What role, I ask, did ‘evidence,’ or ITN research, play in the transformation of ITNs into a main pillar of global malaria control? This chapter illustrates that ITN research—including efficacy, effectiveness, and cost-effectiveness studies—alone did not clinch the inclusion of the intervention in global policy even if it played a critical justificatory role. Moreover, ITN research had multiple, sometimes opposing effects, stimulating more careful questioning into the complexity of the intervention while reducing it into a simple biomedical commodity. The step-wise chart pictured in Net Gain insinuates an ideal relationship between science, technology, and policy. However, this relationship did not hold together so neatly in the actual history of ITNs.

Looking at the role scientific findings did or did not play in the incorporation of ITNs into global and African health policy illuminates a broader political-economic landscape shaping malaria control in the late twentieth century. The movement to adopt
ITNs into African malaria control activities was entangled with broader efforts on the part of the WHO to secure funding for malaria control and international public health more generally. As the WHO became less and less able to fund public health activities following the global recession of the 1980s, the organization looked to new partners to answer the calls for aid from member states. Additionally, African health ministries and state leaders became less able to support ailing health systems following the implementation of structural adjustment policies, though experts realized improving basic health infrastructure would be important to curbing malaria.\(^2\) Seen as inefficient or corrupt by donor agencies such as the World Bank, state leaders also became less able to secure their own financial aid from bilateral agencies that supported health projects. In this political-economic climate, agencies, organizations, and individuals with the money and resources to fight malaria heavily influenced the direction of global malaria control policy in the twenty-first century. These groups’ influence contributed to the widespread adoption of ITNs. More than just weapons against malaria, ITNs as biomedical objects provided an argument for why donors should finance malaria control in Africa in the first place.

This chapter contributes to a growing conversation on the politics of scientific data and its function as a kind of capital in the neoliberal enterprise of global health. Historians and anthropologists have examined the primacy of randomized controlled trials and cost-effectiveness data in global health decision making, and the ways this type of data is linked to donors’ desires for accountability and demonstrations of impact.\(^3\)

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\(^2\) See, for example, Dr. Marc De Bruycker, copy of conference talk sent to Dr. Craig Wallace, February 9, 1992, WHO Archives, File M2-87-59, Jacket 19.  
These scholars have also noted that it is much easier to produce randomized controlled trial and cost-effectiveness data for individual technologies, such as pharmaceuticals and vaccines, than for broad-based structural changes. Therefore, individual biomedical objects have become central to twenty-first-century global health policies and programs. Certainly measurements of ITN efficacy in reducing child mortality and ITN cost-effectiveness were critical to the adoption of ITNs into global health policy in the late 1990s. The immeasurability of or lack of data on other anti-malaria activities did ultimately preclude these interventions. Yet the production and circulation of efficacy and cost-effective measurements did not always precede calls to adopt ITNs; the suitability of ITNs for health care reform efforts in Africa could sometimes override uncertainty or incomplete knowledge. Nevertheless, in making the political case for investing in ITNs and malaria control, clinical epidemiology, economics, and complimentary modes of scientific inquiry created an exchange and (biological) use value for ITNs in an expanding market of global public health commodities. ITNs could be sold to donors as a proxy for lives saved, as a good as easily marketed as a condom, and as a material contribution to economic development in Africa. Patrons’ political preference for minimalist, market-based health and development interventions in Africa, in other words, constituted an additional desire for ITNs that exceeded the utilitarian function of the


4 Political scientist Tom Scott-Smith and other scholars have recently analyzed individualized health technologies as commodities to explain the centrality and animative influence of such objects in current humanitarian, global health endeavors. Tom Scott-Smith “The fetishism of humanitarian objects and the management of malnutrition in emergencies,” Third World Quarterly 34, no. 5 (2013): 913-928. See also, Peter Redfield, “Bioexpectations: Life technologies as humanitarian goods,” Public Culture 24, no. 1 (2012): 157-184.
technology in curbing malaria. This political value was not beside the point, but rather crucial to the success of ITNs and, ultimately, malaria control in Africa.⁵

**Developing a New Global Strategy on Malaria Control**

At around the same time researchers in The Gambia were carrying out the first trial measuring the effects of ITNs on child survival, around 1989, international health officials began to raise serious concerns about the malaria crisis in Africa. The global economic downturn, debt crisis, and rising rates of chloroquine in Africa exacerbated epidemics on the continent in the mid- and late 1980s, including in economically important agricultural regions and urban centers that had previously enjoyed low levels of malaria transmission (see chapter 1). The disease, moreover, increasingly impacted western Europe and the United States, where more and more tourists arrived home sick with malaria.⁶ Despite the growing devastation of the crisis, however, many donor agencies considered malaria control politically unpopular due to the perceived difficulties and high costs of curbing malaria in Africa. The dearth of effective tools for malaria control played a role in donor inaction. According to Don de Savigny, a researcher with the Special Programme for Research and Training in Tropical Diseases (TDR) who investigated ITNs in Tanzania, “UNICEF was big on vaccines, it was big on nutrition, it was big on many things,” during the 1980s, “but there was zero on malaria because there was nothing they could do.”⁷ WHO officials’ calls to integrate malaria control activities

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⁵ Here, I draw from Michelle Murphy’s analysis of Gross Domestic Product as having similar properties to commodities. Michelle Murphy, *Economization of Life* (Durham, NC: Duke University Press, 2017), 25.


⁷ Don de Savigny, interview with author, online (skype), July 7, 2015.
in Africa into national primary health care (PHC) systems (see chapter 1) did little to improve the situation, as governments did not have the resource capacity to build up new PHC services or monitor malaria in outlying, rural areas. Even as researchers escalated ITN testing for malaria control in The Gambia, malaria remained a largely neglected disease in the international policy sphere.

The situation began to change in 1990, when members of the WHO Executive Board said “it was worth the Board’s while to take time to look at the malaria question just as closely as the AIDS problem.” At its 85th Session in Geneva, the Board decided to organize a global ministerial conference on malaria to increase awareness about the disease. At this time, the WHO Malaria Action Programme received about $3.4 million from the WHO’s regular funds and $1.4 million from extra budgetary funding to spend on malaria control. Lamenting the lack of attention to malaria control during the current disease crisis, Malawi’s Chief of Health Services, Dr. H.M. Ntaba, called on the WHO to take action. “WHO must do a great deal more to control the disease,” he stated, including efforts to secure the support of Member States that might not be highlighting the problem not because they considered it unimportant but because in many cases their programmes were “donor-driven” in the sense that they could be implemented only if resources from donors were available. Unless WHO put the malaria problem into its proper perspective, donors would continue to shy away from it.

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8 In effect, there were few health services into which malaria activities could be integrated. Moreover, some malariologists argued that malaria control actually required some centralized organization. For an overview of malaria control in Africa in the post-eradication era, see chapters 4 and 5 of James L.A. Webb, Jr., The Long Struggle against Malaria in Tropical Africa (Cambridge: Cambridge University Press, 2014) and Socrates Litsios, “Re-imagining the control of malaria in tropical Africa during the early years of the World Health Organization,” Malaria Journal 14, no. 1 (2015): 178-186.

Ntaba “therefore hope[d] that every effort would be made to mobilize additional extrabudgetary resources, since US $1.4 million was a very inadequate sum.” With little hope the WHO would increase its own budget, establishing channels to donor funding became an important component of malaria control in Africa.

Chief Medical Officer of the U.K. Department of Health, Sir Donald Acheson, recognized that people in wealthy countries such as the United Kingdom had largely forgotten about malaria. However, given the recent slough of imported malaria cases in wealthy countries, he thought the public would soon become aware of the problem. Therefore, Acheson felt, this might be a good time to hold a global conference of ministers to help “raise the profile” of malaria. The WHO’s Deputy Director General supported the idea, arguing that “extrabudgetary resources must be sought very actively.” Citing efforts to get drug companies and medical research institutions interested in the WHO’s Global Programme on AIDS, one participant added that the WHO should spend money on cultivating interest in malaria and employing a “suitable advocate” rather than hire another epidemiologist as initially planned. The WHO’s main role in malaria control, the 85th Session of the Executive Board indicated, would be to generate interest in malaria from potential investors, thereby perpetuating the “donor-driven” nature of malaria control programs in Africa.

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10 Ibid., 63.
13 Ibid., 65.
14 Ibid., 64. For more on the Global Programme on AIDS and its leaders’ approach to attracting resources and support, see Packard, A History of Global Health, 278-282.
To prepare for the conference, WHO leaders proposed holding three interregional meetings in which malaria experts and health officials could discuss the main challenges to malaria control in Africa, Latin America, and Southeast Asia, respectively. The conference for the African Region (AFRO) was held in Brazzaville, Congo, the headquarters of WHO-AFRO, from October 21 to 25, 1991. The Brazzaville conference focused on outlining the problems faced by under-resourced areas with high malaria endemicity, along with potential action plans and control strategies for countries in this region. Assistant Director General of the WHO, Ralph Henderson, informed the Director of AFRO that conclusions from the regional conference would put forth “appropriate strategies and options for the control of malaria […] that can be sustained especially under conditions of restricted national resources.” Aware that not all malaria control options had been fully tested, Henderson also said the conference would outline areas for applied research to be undertaken in the near future.

Members of the WHO and other health and development organizations discussed the possibility of including insecticide-impregnated bed nets in malaria control activities, both in the year leading up to the Brazzaville conference and at the conference itself. Health officials considered ITNs promising, especially due to ITNs’ “low cost and the ease with which [insecticide] impregnation can be done by members of the community.” Yet conference participants did not see ITNs as miraculous, ‘magic bullet’ solutions at this time. Many contributors framed the technology as one of a variety of

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16 Dr. Ralph Henderson, Draft Memorandum to All Regional Directors, October 1, 1990, WHO Archives, File M2-87-59, Jacket 1.
17 Ibid.
personal protection measures that African communities or individuals could use to prevent mosquito bites. Furthermore, they noted that the technical efficacy of ITNs on the continent remained uncertain. The epidemiological approach to malaria, which emphasized the specificity of malaria vectors and ecologies, complicated efforts to recommend ITNs for wide-spread use. The effectiveness of ITNs “has been proven during mass campaigns in China,” offered the conference summary report. However, “in Africa, where epidemiological conditions are very difficult […] there is an urgent need for large scale trials of impregnated mosquito nets (more than 10,000 inhabitants) in the different epidemiological strata of the Region before their use is popularized.”

Echoing Tore Godal and TDR leadership (see chapter 1), WHO-AFRO members and international partners did not believe available scientific knowledge justified scaling up ITNs in Africa during this period of growing crisis.

Uncertainty about the technical efficacy of ITNs in Africa did not provide the only barrier to donors’ acceptance of the new tool. Questions about whether African communities would accept and purchase ITNs also posed major concerns. “Insecticide impregnated curtains and bednets show some promise but have not been tried on a market and consumer financed basis,” the Deputy Assistant Administrator of USAID wrote to a

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colleague in 1990.  

“Will people be willing to purchase 80% of what would be needed to protect themselves from malaria using insecticide impregnated curtains [...]? Empirical studies of the willingness to pay for non-medical malaria control measures will be very important in framing any new strategy for malaria.”

USAID sought to support studies of this kind, aiming to explore the “ways in which household and community practices can be modified towards better prevention and control of the vector and infections.”

Authors of the Summary Report on the Brazzaville conference agreed with the sentiment that individuals and communities would need to take responsibility for acquiring, maintaining, and using ITNs at home to promote sustainable vector control. This language of the market place, relatively new to conversations about malaria control in the 1980s and early 1990s, proliferated as donors promoted neoliberal policies that placed a greater burden on individuals to cover the costs of health care. As cheap, individualized commodities that families could employ in the name of malaria prevention, ITNs fit well into market models of public health, even if they had not been fully proven within such models.

Research figured into plans for malaria control discussed at the Brazzaville conference. Ecological variability provided the backdrop and rationale for knowledge

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23 Ibid.

24 Ibid.


26 Packard, A History of Global Health, 259-266. This focus on markets and consumer behavior in vector control also dovetailed with increased recognition that many people resisted indoor residual spraying activities and that residents of rural areas overwhelmingly relied on the private sector for malaria treatment, using drugs in ways that sometimes exacerbated the development of drug resistance. Some donors even dubbed malaria a “private-sector disease.” Lawrence Barat (World Bank), “Consolidated comments on RBM [Roll Back Malaria] Strategic Orientations,” December 1, 2003, WHO Archives, File M50-87-1, Jacket 2.
production. “Operational research is a key to adopting programme activities to varying situations and changing biological and epidemiological factors,” stated a summary report of the Brazzaville conference. “Its incorporation in the [national malaria control] programmes is essential.”27 Although questions about malaria drugs comprised a majority of recommended operational research questions, evaluating the efficacy of ITNs for the control of epidemics made it onto the list as well.28 Authors of the conference report called on national governments to determine the efficacy and feasibility of treated bed nets and curtains for different epidemiological zones within their state borders, interventions which should be implemented with “active community participation, including auto [self]-financing.”29 Practical concerns with incorporating ITNs into African health programs, including anxieties about the likely development of vector resistance to pyrethroid insecticides, figured into policy discussions during the early 1990s. According to the WHO and its African Regional Committee, state health officials should figure out for themselves if and how to adopt ITNs for malaria control. Scientific evidence did not justify continent-wide promotion of ITNs; however, health officials, policy makers, and donor agencies highlighted ITNs’ suitability for decentralized cost-recovery programs and cited this as a reason for African officials to investigate or try out ITNs for small-scale malaria control.

**ITNs and the WHO’s Global Malaria Control Strategy of 1992**

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28 Ibid.
29 Ibid.
Findings and conversations from the Brazzaville Conference informed the Ministerial Conference on Malaria, convened in Amsterdam in 1992.\textsuperscript{30} It was at this latter conference that the WHO officially presented its new Global Strategy for Malaria Control, attempting to put malaria back on the world health agenda. Based on the epidemiological approach to malaria, the Strategy emphasized the need to tailor activities to local ‘eco-epidemiological’ situations. The Strategy also reflected anxieties about the resurgence of malaria and past failures of eradication, as well as the fact that the WHO had few new tools or methods to combat an expanding disease problem. Early diagnosis and treatment remained the centerpiece of recommendations, despite rising rates of chloroquine resistance. Planning and implementing “selective and sustainable preventive measures, including vector control,” early detection and containment of epidemics, and strengthening local capabilities to assess a country’s malaria situation on a regular basis—all open-ended, vague, or uncertain aims—rounded out the Strategy’s four technical elements. The Strategy was not a detailed, prescriptive tool so much as a call for change cautiously undertaken by people in malaria endemic countries and whoever else could contribute resources to the effort.

The fact that the WHO moved ahead slowly with technical strategies while trying to drum up interest in supporting global malaria control was not lost on collaborating agencies. Commenting on a draft of the Strategy in August 1992, USAID representative Dennis Carroll said, “the document does not clearly communicate why, or how this 1992 strategy is different from approaches […] taken in the 70’s and 80’s since the end of the eradication era. […] Nor is there a convincing argument made that if this strategy were

\textsuperscript{30} This conference was held in Amsterdam because the government of The Netherlands was the only government who seemed willing to host.
implemented it would prove to be more effective than past strategies.”

Given that “Amsterdam [was] largely a media event,” WHO representatives prepared to defend the new Strategy to the public. Members of the WHO Malaria Unit created a list of answers to possible questions at a press conference on the Amsterdam Ministerial Conference, which included, ‘why should residents of industrialized nations be concerned about malaria, if it is not a problem in their part of the country’ and, ‘why did it take WHO and the UN Member States so long to change their policy from eradication to control?’

WHO representatives knew they would be on the defensive as the organization sought to bring malaria to wider international attention.

According to international health officials, health ministers of malaria endemic countries were supposed to adopt the Global Malaria Control Strategy and adapt it to their own specific needs. David Nabarro, Chief Health and Population Advisor at the U.K. Overseas Development Administration, reiterated that monolithic, world-scale plans for malaria control were not appropriate. Countries must not only develop their own “realistic” control plans, he felt, but they should also “develop programme proposals that cannot be refused by donors.” Nabarro’s statement highlights a main tension of malaria control policy during the new era of resource scarcity: African states should do what is most suitable for their specific malaria situation, but only using those strategies

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31 Letter, Dennis Carroll to Craig Wallace, Peter de Raadt, and Anatoli Kondrachine, August 5, 1992, WHO Archives, Geneva, M2-87-59, Jacket 11.
32 Ibid.
sanctioned by groups with necessary funds. This meant researchers and health officials in endemic countries had to produce knowledge about malaria control most likely to secure financial backing. Increasingly during the 1990s, such knowledge included calculations of medical efficacy—specifically number of lives saved—and cost-effectiveness.

ITNs and vector control more generally did not figure prominently in the WHO’s new strategy. In fact, entomologist Jo Lines remembered, in 1992 vector control “almost fell out completely” from the malaria control agenda. Since the WHO saw vector control as difficult to sustain, harmful if not sustained or tailored to local ecologies, and not cost-effective—accepting the “Garki conclusion”—it did not recommend such activities except in a few select foci.

Nonetheless, conference attendees promoted ITNs as a cheap, simple tool. Imperial Chemical Industries, a London-based chemical company, even advertised its ITNs at the pre-conference reception. Not all country representatives appreciated the WHO’s new Global Strategy and the organization’s promotion of ITNs in particular.

36 Packard, A History of Global Health; Adams, “Metrics of the global sovereign.”
38 Memo, WR Zimbabwe to AFRO Director, November 17, 1992, WHO Archives, Geneva, File M2-87-59, Jacket 19.
Dr. Stamps, Zimbabwe’s Minister of Health and Child Welfare, complained that the
WHO did not respond to his critiques of the new global strategy. Like his predecessors in
Zimbabwe, and before independence, Southern Rhodesia, Stamps opposed directives
from Geneva concerning malaria control, arguing they were inappropriate for the
country. “We are advised to reduce our vector control programme without logical
explanation,” Stamps reported in his speech at the Ministerial Conference. “The
achievable objective of controlling malaria transmission in agro-industrial estates in
endemic areas is despised and the offer of unconventional inappropriate insecticide
impregnate nets, with its immense logistical and health education problems is promoted
through the appropriate commercial multi-national agencies.”

Stamps also took issue with the presence of Imperial Chemical Industries at the WHO conference, objecting to
WHO encouraging commercial firms to make a profit from malaria prevention.

According to Stamps, insecticidal nets were not for Zimbabwe.

The WHO-AFRO Director’s response to Stamp’s critique highlights how the
scarcity of resources available for malaria control in Africa informed official support for
ITNs. “Use of impregnated bednets,” the Director wrote, “is one of the few cost-efficient
methods of malaria control in countries of high endemicity, which may be supported in a
sustainable way. Therefore this intervention is encouraged by the WHO,” despite the lack
of knowledge about the technology’s long-term effects. Regarding the presence of
Imperial Chemical Industries, he continued, “it seems natural that companies promote
their products. We think that excessively high price of bednets in Africa compared with

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40 Dr. Stamps, Zimbabwe Minister’s Speech at the Amsterdam Ministerial Conference, October 1992,
WHO Archives, File M2-87-59, Jacket 19.
41 Memo, WR Zimbabwe to AFRO Director, November 17, 1992, WHO Archives, File M2-87-59, Jacket
19.
Asia is the result of poor offer of the product.” Competition in the impregnated bed net marketplace “might reduce the prices and make bednets affordable to the bulk of the African population.” With little room to negotiate, WHO regional officials embraced ITN commodities and called on state ministries to promote the new tool, even though they had limited evidence for the efficacy of ITNs on the continent.

Excitement around ITNs continued to build within the WHO following the 1992 Amsterdam conference, especially as the TDR-sponsored ITN trials got underway. Bed net treatment was simple, straight-forward, and could be carried out at the village level, even in places with no vector control program currently in operation. As researchers pointed out later in the 1990s, while malaria control by preventing transmission fell out of favor, such an approach was “being re-considered using insecticide-treated nets […] which do not require a large national programme infrastructure for implementation”—something most African countries did not have and donors such as the World Bank actively opposed. Evidence of success from China’s impregnated bed net trials and programs continued to boost confidence in ITNs within the malaria control community, even if this evidence did not translate easily into promises of success in Africa.

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42 Ibid.
WHO officials and malaria experts recognized the limitations and challenges to using ITNs for malaria control in Africa. For example, members of the WHO Malaria Unit, Pierre Carnevale and Awash Teklehaimanot, noted that ITNs would not be very efficacious in situations where vectors were exophilic (fed outdoors) or zoophagic (fed mainly on non-human animals), and where people slept outdoors.\(^\text{46}\) It would also be difficult to implement ITNs in places where people were not already using bed nets, they felt, for “financial and cultural reasons.”\(^\text{47}\) Given evidence that African populations could describe benefits of using ITNs and still decide not to use the tool suggested that “there is no single solution applicable everywhere with the same expected efficacy.”\(^\text{48}\) WHO officials and experts were keenly aware of the limitations of ITNs, limitations which could not be overcome necessarily by developing further knowledge about ITN efficacy or cost-effectiveness.

These same experts also conceived possible plans to overcome the challenges of implementing ITNs on a large scale in Africa. Some suggestions, such as providing nets at a “reasonable price” and using targeted health education messages,” proved too simplistic in practice.\(^\text{49}\) Other suggestions were more ambitious, such as creating provincial bed net centers that could “serve as a focal point for promoting bednets, providing training in impregnation, and assuring the supply of bednets and insecticides.”

\(^\text{46}\) This is a point members of the Carter Center’s Ethiopian malaria program seemed to overlook in 2007, insisting on distributing ITNs in the country’s Amhara Region, where vectors were exophilic. They claimed they chose this method because it is what donors would support. Randal Packard, personal communication, 2017.


\(^\text{48}\) Ibid.

\(^\text{49}\) Ibid.
This provincial center “could also serve to promote community participation in malaria control activities in general,” a position international health officials pushed for as part of more general calls to decentralize health care in Africa.\textsuperscript{50} Various potential social and political arrangements of ITNs swirled in the imaginations of international health officials and scientists even as late as the mid-1990s. Just as ITNs had political valence for policy makers seeking to decentralize and privatize African health systems, so too did ITN interventions have a yet-to-be-worked-out political component.

Researchers, in fact, began discussing operational aspects of implementing ITNs before the four TDR-sponsored ITN efficacy trials concluded (see chapter 1). Members of TDR and others who were involved in bed net trials and projects in Africa convened an international meeting on ITNs in Dar es Salaam in November 1994. Christian Lengeler, Jacqueline Cattani, and Don de Savigny compiled conversations from this meeting into the book \textit{Net Gain}, mentioned in the introduction. As the book reveals, researchers, NGOs, and health officials had tried to implement ITNs in Africa within small-scale projects, even before scientists published results from most of the ITN efficacy trials. However, experiences from these projects elucidated pitfalls and questions more than they provided models for successful implementation.\textsuperscript{51} Furthermore, researchers and NGOs carried out most of these small-scale projects, providing few examples that could inform sustainable, long-term ITN distribution. According to the authors, future studies of ITN effectiveness would fill in such gaps in operational knowledge and encourage the expansion of ITN activities.

\textsuperscript{50} \textit{Ibid.}
\textsuperscript{51} Lengeler, Cattani, and de Savigny, eds., \textit{Net Gain}.
The 1994 Dar es Salaam conference marks an unexpected but important node in the history of ITNs in Africa: the first major push for social marketing as a distribution method. USAID first adopted social marketing in the early 1970s. Leveraging the “flexibility and innovativeness of the private sector,” the development agency aimed to distribute ‘efficiently’ and stimulate demand for contraception in low-income countries targeted for family planning.\(^5\) USAID did this work through private voluntary organizations such as Population Services International (PSI), which used advertising and marketing techniques to create and increase demand for contraception commodities.\(^5\)

Theoretically, by selling health commodities well below market price, PSI’s social marketers could also target public health commodities to intended, often impoverished populations better than one could using traditional commercial markets. Other development agencies, including the World Bank and the U.K. Department for International Development (DFID), later embraced social marketing during the 1980s and 1990s as part of broader advancements of privatization and New Public Management—an approach to health care stipulating that the government should ensure public services are provided but not necessarily provide them itself—in international health and

\(^5\) U.S. Agency for International Development, Project Paper, “Contraceptive Social Marketing II,” 1988, 3, National Archives and Records Administration (NARA), College Park, MD, RG 0286 (Agency for International Development), P 560, ARC# 6171647. The United States was the dominant donor for population control and family planning activities in the late 1960s and 1970s. Due to political push back at home and abroad, especially from Catholic groups who opposed US government support for contraception, USAID funneled money for family planning through NGOs, universities, private agencies, and international organizations rather than give aid to countries directly. The agency embraced ‘supply-side’ distribution methods, which aimed to create ‘unmet needs’ and therefore demand for previously undesired commodities simply by supplying those goods on the market. For more on the history of U.S. aid for and approaches to family planning, see Packard, *A History of Global Health*, 204-225 and Murphy, *Economization of Life*, 59-72.

\(^5\) PSI specialized in social marketing and eventually spearhead many social marketing campaigns of non-contraceptive commodities, including insecticide-treated bed nets. Murphy, *Economization of Life*, 69-72.
development. These agencies sought to use behavior change communication and advertising at the core of the social marketing approach to transform target populations into long-term consumers of contraception, nutritive food, oral rehydration salts, condoms (for HIV/AIDS prevention), and other public health goods.

Perceived successes with previous social marketing campaigns inspired attempts to use the approach to promote the adoption and use of insecticidal nets, particularly insecticide retreatment, in Africa. “At that conference, there was a guy called Tim Manchester […] working in Dar es Salaam for a group called PSI,” Don de Savigny remembered,

And they were social marketing condoms all over Africa. And he heard about our meeting up at Kunduchi Beach hotel and started clamoring to be part of it. And we didn’t know him. It was all bed net people. And we didn’t know anything about social marketing. And he said, ‘I want to talk on the agenda. I want to talk about social marketing.’ And he was very insistent. We said ‘no’ a few times. He was really a good salesman. And so we said, ‘okay, you can have fifteen minutes. We’ll squeeze you in.’ We had a pretty full program. And he got up, and it went for about an hour, hour-and-a-half. It was incredibly fascinating. Everyone was riveted. And [that] was the moment where we said, ‘ah, this was our way out. This was our way forward. This is how we’re gonna get past this problem of dipping nets.’ […] what he said actually was a route that we started to take.

Around this same time, Jayne Miller, who had worked with Jo Lines and others on bed net research in Tanzania, developed a bed net home treatment kit for her PhD project, thereby commoditizing insecticide treatment. Miller went to work with Manchester at PSI shortly thereafter. Within two years of the Dar es Salaam conference, Christian Lengeler and a team in Tanzania set up one of the first studies of an ITN social marketing project,

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55 Don de Savigny, interview with author. The problem researchers encountered with net retreatment were two-fold. First, people did not go to have their nets re-treated for various reasons, including cost. Second, it was very difficult to sustain regular mass treatment activities researchers undertook for the trials (i.e. gathering everyone at a village center for net dipping).
KINET, in southwest Tanzania, drawing on Miller’s home treatment kit to do so.\textsuperscript{56} Social marketing was one of a few avenues pursued for ITN distribution during the 1990s, though one that already enjoyed strong support from DFID, USAID, the World Bank, and other donor agencies.

As coordinator of the TDR-sponsored ITN trials, Lengeler shared preliminary results from the experiments with people at WHO headquarters in 1995. Although “WHO was absolutely not interested,” Lengeler remembered, and the director believed ITNs for malaria control would not work, regional officials from WHO-AFRO continued to promote ITNs for personal protection at this time.\textsuperscript{57} At the 45\textsuperscript{th} Session of the WHO Regional Office for Africa, held in early September 1995, the Regional Committee “invite[d]” member states “to strengthen the commitment of health workers and communities to the sustainable implementation of […] appropriate case management and individual protection through the use of insecticide-impregnated mosquito nets and other materials.”\textsuperscript{58} Stressing the important role communities would have to play in malaria control, the committee also “felt it necessary that priority be given to the promotion of preventive strategies […] includ[ing] the use of impregnated mosquito nets, environmental hygiene and the use of insecticides for vector control where appropriate.”\textsuperscript{59} The Regional Committee recognized that economic obstacles threatened widespread adoption of nets and felt that health programmers needed more data from operational research exploring how community-led initiatives could help overcome

\textsuperscript{56} Schellenberg, et al, “KINET: a social marketing programme of treated nets and net treatment for malaria control in Tanzania, with evaluation of child health and long-term survival.”
\textsuperscript{57} Christian Lengeler, interview with author, online (skype), November 5, 2015.
\textsuperscript{58} World Health Organization Regional Office for Africa, WHO-AFRO Meeting, 45\textsuperscript{th} Session of the WHO-AFRO, held in Libreville, Gabon, 6-13 September 1995.
\textsuperscript{59} Ibid.
economic constraints. With no assurance that resources necessary to sustain ITN programs would materialize, WHO-AFRO members left open the possibility for alternatives. Nonetheless, they increasingly coalesced around the ‘community-based’ intervention.

**Translating Research into Policy**

If results from The Gambia associating ITN use with reduced mortality spurred initial excitement about ITNs in 1991, the four TDR-sponsored ITN trials in The Gambia, Navrongo, Kilifi, and Oubritenga precipitated conversations about the new intervention.

“There’s never been an intervention that’s had such a huge effect on under five mortality,” Don de Savigny said, remembering the enthusiasm generated by the scientific results. “And our back of the envelope calculations on cost-effectiveness put it right down in there in the range of immunizations, and so on. So we knew we had a winner.”

People outside TDR did not necessarily share this confidence, a fact that bed net researchers de Savigny, Jo Lines, Bob Snow, and others lamented looking back on the period. Research teams tried to publish results from the mortality trials together in the *Lancet*—a highly influential journal that could sway opinion on the acceptance of health interventions—but the journal did not take them. “Back then,” de Savigny continued,

*Lancet* was a medical journal, and a preventive intervention that was a non-vaccine or a non-drug was not interesting. It didn’t matter the public health power of this intervention […] And they [Lancet editors] said, ‘well, you know, a few years ago Steve Lindsay and Greenwood and Bob Snow published…we know bed

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60 Don de Savigny, interview with author.
61 Al Sommer and other advocates for vitamin A supplementation, for example, seriously discredited results from the massive deworming and enhanced vitamin A (DEVTA) study conducted in India in the early 2000s in a *Lancet* article. Consequently, results from the DEVTA study, which showed that vitamin A supplementation had essentially no impact on child mortality were not published until nearly ten years after the end of the study. Packard, *A History of Global Health*, 323-327.
nets save lives. Big deal.’ And so it was rejected. And we lost six months, the world lost six months. You add up how many children died in a six month period from malaria, this is a consequence of not being able to talk out loud about a publishable result.62

Researchers eventually published trial results in *Tropical Medicine and International Health* in 1996. Yet even then, it took a while for the international community to commit to providing any significant resources for ITN activities in Africa. Scientific results of ITN efficacy and cost-effectiveness by themselves did not translate immediately into policy action.

In March 1996 members of TDR and other experts involved in bed net activities attended a WHO Regional Meeting on the use of insecticide-impregnated materials in Africa, trying again to generate political support for the intervention. Reviewing findings from the ITN efficacy trials, WHO-AFRO called “for a ‘phased and continuously monitored introduction of treated nets’ in Africa.”63 In other words, they reiterated support for the intervention. Later that year, at the 46th Session for WHO-AFRO, TDR Director, Tore Godal, urged African health officials to put their eggs in the ITN basket rather than wait for the elusive malaria vaccine.64 Godal recognized that “in areas where bednets were uncommon or where the level of use was low, a rigorous information and education campaign would be necessary to promote widespread use by the communities.” Therefore, “surveys on knowledge, attitudes and practice might be required to define the most appropriate strategies to be used.”65 Support for ITN programs in Africa existed in

62 Don de Savigny, interview with author.
65 Ibid.
1996, but the knowledge needed to run the programs successfully did not. For Godal and others, tailoring ITNs to African settings would be a main job for public health and malaria control programs going forward.

Still, results of ITN efficacy in reducing child mortality were critical to legitimizing the technology for malaria control in Africa, an endeavor many donors “write-off” as a potential waste of money during the 1970s and 1980s.66 “We did go through an incredibly dry phase from the end of the global malaria eradication programme through to the 80s of making malaria a far less specialized thing,” Bob Snow recalled.

It became embedded in primary health care. No one had a malaria thing that they could then pursue. And then bed nets actually became that. It became a malaria specific intervention. […] it became the champion of all the trials. They were fabulous results. And […] it’s not right to say, as people were saying, ‘well we don’t know what to do.’ Actually, then we could say, ‘we do know what to do.’ And there were two things we could do: to treat malaria properly with the right drug, and put a child—or as many household members as you could—under an insecticide-treated bed net. And that was perfect because that’s all donors needed. They needed to know that it was simple, and […] they only need two things, and [they] could afford it. And I think that transformed everything.”67

Additionally, authors of TDR’s 13th programme report claimed, findings from the ITN efficacy trials “emphasized the underestimated contribution of malaria to child mortality in Africa and the potentially large benefits of malaria-preventive interventions.”68 The trials provided the proof-of-concept necessary to show the suitability of ITNs for public health funding and the suitability of malaria control to health and development goals.

66 Anne Mills, interview with author.
67 Bob Snow, interview with author, Nairobi, August 6, 2015.
Consolidation and Fragmentation during the late 1990s

In essence, the core activity of international malaria control during the 1990s was convincing donors and African governments to support malaria control, even though a specific, detailed plan for controlling the disease in Africa remained uncertain. WHO and TDR representatives, collaborating experts, and African health officials tried to do drum up support by holding meetings at which they stated their own commitment to malaria control and called on others to commit resources to the implementation of WHO-sanctioned strategies. After many years of discussing the need for malaria control, WHO Director-General, Hiroshima Nakajima, committed $20 million for the ‘Accelerated Implementation of Malaria Control’ in 34 African countries. This, WHO members hoped, would lay a foundation for national malaria control programs and provide donors with confidence that progress was possible with necessary inputs. At times, selling malaria control as a good investment and establishing political commitment to the cause appeared an end in itself rather than a means to an end.

The scientific community pursued parallel efforts to draw support for malaria research and research capacity in Africa, creating a mini-silo within the larger international malaria control efforts. In 1996, scientists came up with the idea to develop a multilateral organization that would coordinate and encourage malaria research around the world. Backed by agencies such as the Wellcome Trust and, most importantly, the US National Institutes of Health (NIH), this idea developed into the Multilateral Initiative on Malaria (MIM). Launched in January 1997, MIM worked in partnership with TDR—an organization with very similar goals of supporting research and research capacity but

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which, after internal restructuring in the mid-1990s, had limited resources to fund many activities.\textsuperscript{70} MIM aligned with prevailing trends of creating multilateral collaborations around single diseases, a trend also embodied in the Roll Back Malaria partnership.\textsuperscript{71} The Initiative promoted basic research on new malaria drugs, vaccines, and mosquito genomes—research better suited to laboratories in the global North than African research sites and less connected to ongoing malaria control activities. Initially considered a possible coordinator for malaria activities in Africa in the twenty-first century, MIM became yet another, separate piece of the growing international malaria control contingent.

Despite the increasing attention paid to malaria research and control, African leaders remained frustrated by the continued lack of resources. In June 1997, the Organization of African Unity (OAU) met for its 33\textsuperscript{rd} ordinary session in Harare, Zimbabwe. At the meeting participating heads of state adopted the Harare Declaration of Malaria Prevention and Control in the Context of African Economic Recovery and Development, restating their commitment to malaria control and to the WHO’s Global and Regional Malaria Control Strategies. After years of bringing malaria into the limelight, however, many national programs were still just beginning to implement malaria interventions. The OAU noted that tools for malaria control were available that could reduce deaths and illness in Africa, “but are not accessible, for various reasons, in

\textsuperscript{70} World Health Organization, “Tropical Disease Research. Progress 1995-96,” 13\textsuperscript{th} Programme Report for TDR (Geneva: WHO, 1997). TDR still constituted a model for malaria research despite its declining prominence. WHO Director-General Hiroshima Nakajima applauded the organization for its ability to “coordinate[s] multicentre and multicountry studies effected through networks created among research groups, institutions, ministries and industry. This process involves minimal investment in infrastructure and produces effective, decisive results. In this way, new products are developed very cost-effectively.”

\textsuperscript{71} For more on the emergence of this trend in international health during the late 1990s, see Packard, \textit{A History of Global Health}, 279-280.
The OAU called on the private and NGO sectors, along with multi- and bilateral agencies to provide technical and financial resources for malaria control in Africa. At the same time, they hoped that such efforts would “build a foundation for sustainable malaria control” in the twenty-first century, and not become a temporary patch for the problem. Selling malaria control to donors, including through ITN commodities well-suited to under-resourced health systems, was a main aim of OAU policy makers.

Although researchers, TDR, and members of WHO-AFRO began to investigate implementation strategies for ITNs in Africa by 1997, the Harare Declaration still left their options open. Thinking about sustainability and development, the OAU called on African leaders to support micro-financing schemes for income generating projects “aimed at basic environmental and household improvements which contribute to the prevention and control of malaria.” OAU officials included multiple possible prevention measures and articulated aims of decentralizing malaria control in their priority areas of action, echoing the WHO’s 1992 Global Malaria Control Strategy. The OAU recommended Health Ministries support public campaigns for and “sensitize” populations to adopt house screening and personal protection measures, including mosquito nets, which could be carried out by families and communities. Aside from the “selective use of vector control measures,” the OAU did not list any other tools or methods for preventing disease. Drug treatment continued to dominate priorities, much as it did in international policy. Thus, while ITNs remained important to imaginaries for

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decentralized malaria control in Africa, given the lackluster financial support for the intervention, ITNs did not monopolize such imaginaries.

Major donor agencies, led by USAID, finally consolidated support for ITNs in late 1997. Riding a wave of support in the U.S. Senate for global infectious disease control, USAID representative Dennis Carroll convened an International Conference on Bednets and Other Insecticide Treated Materials in Washington, D.C. in October of that year.\(^{75}\) It was at this conference that Christian Lengeler presented a meta-analysis of all the ITN efficacy trials—excluding, of course, the ongoing trial in Siaya (see chapter 2). For Lengeler, this was where researchers “won the war of making the results known and getting interest of all the big guys at the time.”\(^{76}\) Funding agencies “are a little bit reluctant to take on new things,” he told me but if they see that their neighbors think it’s a good idea, then suddenly the interest is much stronger.”\(^{77}\)

Even though Carroll invited public health practitioners to participate in this conference, which grew out of his and other USAID representative’s excitement about the ITN trial results, the organizers did not intend the conference to deal with ITNs as a technical public health measure. Participants pointed out that any ITN program would


\(^{76}\) Lengeler, interview with author.

\(^{77}\) Christian Lengeler, interview with author. The United States proved to be a very important donor of malaria control in the twenty-first century. In fact, Jo Lines said the ITN research community “should have gotten the Americans on board sooner” to help prevent the delay that occurred between ITN trials and implementation in Africa. Jo Lines, interview with author.
require strong health care and health information systems in African countries—which most malaria endemic countries did not have—and certain technical questions, such as the ITN coverage needed to have an effect on malaria, remained uncertain. Yet the conference, which featured presentations by social marketing agency representatives as well, focused on figuring out ways to get African “consumers and potential consumers” to accept, desire, purchase, and use ITNs. Those with the resources needed to take ITNs forward as a malaria control intervention in Africa approached ITNs as commercial products—albeit ones with health benefits—that could succeed in Africa with precise marketing research, appropriate communication, and strong, market-based distribution systems. In taking this approach to ITNs, they black-boxed the effects of ITNs on mosquitoes, environments, other malaria control activities, and public health systems. Embracing ITNs for their political value as commodities that could be delivered through the private sector—not simply the technology’s biomedical efficacy—they sought to develop ITN programming in Africa around markets.

**Roll Back Malaria**

With new interest in malaria control from wealthy countries, the incoming Director-General of the WHO, Gro Harlem Brundtland, established the Roll Back Malaria (RBM) program in 1998. This development marked an important node in the history of ITNs. Through this program, ITNs became a main pillar of global malaria control. The WHO, World Bank, UNICEF, and UNDP jointly sponsored the multilateral program, which was supposed to coordinate the increasingly fractured international

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malaria control effort. Brundtland received support for the program from the leaders of major industrialized countries at the 1998 G8 Summit in Birmingham in the name of helping impoverished African countries better integrate into the global economy.\(^79\) RBM, she claimed, would be a “pathfinder” program, an experiment and model for major public-private partnerships involving clusters across the WHO, not simply the cluster for Communicable Disease Control.\(^80\) Brundtland also hoped RBM could make the case for including health activities into development priorities, stressing the impediment malaria posed to both economic progress and good health in Africa and the global South.\(^81\)

In addition, Brundtland sold RBM as an endeavor in health sector development.\(^82\) “Rolling Back Malaria,” she told the World Health Assembly in May 1998, “is no victory unless health systems are equipped to sustain the gains.” In fact, elements of the RBM plan initially included promoting decentralization of health systems, supporting intersectoral cooperation around malaria control, and developing community-based health financing mechanisms, which the World Bank pushed for in African countries beginning in the 1980s.\(^83\) Brundtland touted RBM as something new and more than just “a revamped vertical programme,” reminiscent of past failures in the WHO’s eradication

\(^{79}\) Communiqué, Birmingham Summit (G8), 17 May 1998, University of Toronto Online Library, http://www.g8.utoronto.ca/summit/1998birmingham/finalcom.htm. Under this broad goal, G8 leaders also promoted debt relief mechanisms for these countries. Roll Back Malaria, which promised debt relief to African state leaders who joined the program, constituted one such mechanism.

\(^{80}\) Letter, Gro Harlem Brundtland to Prime Minister of Canada, Jean Chrétien, June 8, 1999, WHO Archives, File M50-372-2, Jacket 1.


However, the program inherited most of its components from previous malaria control policies. Like the 1992 Global Malaria Control Strategy, the RBM program included rapid diagnosis and treatment, disease prevention, early detection of epidemics as main technical strategies. Since ITNs had garnered significant attention as a disease prevention measure, RBM policy makers recommended the intervention as a key strategy. Doing so, they constituted the public health commodity as a straightforward means by which the private sector and development donors could contribute to the fight against malaria.

An important element in Brundtland’s plan to attract financial resources for health-related causes was to present decision makers with “solid evidence.”\textsuperscript{85} Statistical results and measurable goals were key. ITNs, scientists felt, had the evidence base needed to secure scarce resources, overwhelming dedicated to HIV/AIDS at this time. Christian Lengeler published his meta-analysis of ITN trial results, also known as a Cochrane review, in May 1998, around the same time Brundtland proposed RBM to the World Health Assembly.\textsuperscript{86} Many felt Lengeler’s Cochrane review provided “conclusive proof” of the biomedical efficacy of ITNs.\textsuperscript{87} “Most Cochrane reviews, to be honest, say ‘we need more data’ as the concluding comment,” Bob Snow told me.

This one didn’t. You don’t need more data. This is pretty [good] evidence that it reduces morbidity, it reduces child mortality. Also, because we looked at this, it

\textsuperscript{85} Ibid.
\textsuperscript{86} Cochrane reviews are systematic reviews supported by a non-profit organization and collaboration of researchers and medical professionals, intended to support health care decision making. These reviews were inspired by the work and ideas of Scottish epidemiologist Archibald Cochrane, who believed synthesized results of randomized controlled trials could identify ineffective forms of health care, which in turn could be purged from the health system in the name of financial savings and more efficient care. Jeanne Daly, Evidence-Based Medicine and the Search for a Science of Clinical Care (Berkeley and New York: University of California Press and Milbank Memorial Fund, 2005).
\textsuperscript{87} Anne Mills, interview with author.
reduces hospitalization for malaria. You can reduce the incidence of anemia. This is fantastic. I think the pooled analysis showed that you could reduce all-cause childhood mortality by about seventeen percent. And there was nothing else out there—not an immunization strategy, not a clean water sort of thing—could have that size of an effect. 88

Clinical epidemiology and biostatistics transformed ITNs into proxies for lives saved. 89

However, as someone personally involved in many Africa-based ITN studies as a researcher and TDR trial coordinator, Lengeler recognized the gap between efficacy trial results and the effectiveness of an ITN program. Results from the Medical Research Council’s effectiveness trial in The Gambia revealed that achieving high net re-treatment rates in cost-recovery programs presented an especially difficult obstacle. 90 Lengeler even suggested gathering more data on the impact of untreated bed nets due to the high likelihood many people in program areas would not be sleeping under a treated net. 91 Malaria control programmers, he and a number of others agreed, needed more data on ITN effectiveness. 92 Lengeler also noted that the efficacy of ITNs in high risk areas—a question KEMRI-CDC scientists were in the middle of investigating in Siaya—remained uncertain, and that such uncertainty festered concerns ITNs might simply shift the age profile of severe malaria. Nevertheless, Lengeler felt questions about long-term impact should not impede the scale up of ITNs during the current malaria crisis. “Given the

88 Bob Snow, interview with author.
89 Redfield, “Bioexpectations.”
92 For examples of calls from academic and African public health communities for more operational and effectiveness research on ITNs in preparation for RBM, see articles published in the Round Table Discussion, “Rolling back malaria: action or rhetoric?,” Bulletin of the World Health Organization 78, no. 12 (2000): 1450-1455.
strength of this evidence,” he reported, “there is a need to promote the large-scale
application of this tool in the frame of malaria control programmes in endemic areas.”

Even given the “fantastic results” from ITN trials, RBM policy makers did not
limit their recommendations for possible malaria prevention measures to ITNs alone. As
stated in the Abuja Declaration on Roll Back Malaria, presented in 2000, RBM leaders
called on African heads state to help 60% of the at-risk population “benefit from the most
suitable combination of personal and community protective measures such as insecticide
treated mosquito nets and other interventions which are accessible and affordable to
prevent infection and suffering.” These interventions included house screening,
environmental management, and other measures that fit into decentralized health systems.
In practice, however, these other methods did not figure into assessments of African
malaria control programs or attract financial support. Environmental management, house
screening, and mosquito repellent did not have the scientific markers of a life-saving,
‘evidence-based’ intervention, as ITNs did. Without confidence of health impact,
provided by clinical epidemiological, randomized controlled trial results, donors would
not invest in such activities.

Lack of efficacy data for non-ITN prevention measures also meant that health
economists could not provide cost-effectiveness calculations, “needed for the WHO Roll
Back Malaria campaign.” Development donors involved in international health
increasingly valued cost-effectiveness calculations and ‘evidence-based metrics’
beginning in the 1980s due to perceptions of a lack of accountability in health spending.

93 Lengeler, “Cochrane Review: Insecticide-treated bednets and curtains for preventing malaria.”
95 C.A. Goodman, P.G. Coleman, and A.J. Mills, “Cost-effectiveness of malaria control in sub-Saharan
A team of researchers at the World Bank, the dominant patron of international health by the early 1990s, even introduced the ‘Disability-Adjusted Life Year’ (DALY) in 1994 to quantify the global disease burden in terms of years lost to ill health and set health spending priorities according to economic measurement of human productive value. The WHO adopted the DALY to determine the global disease burden and justify spending for particular public health issues, including malaria control, during the late 1990s and early 2000s. Increased recourse to econometrics in international and global health significantly circumscribed approaches to malaria in Africa. “The lack of data,” economists from the London School for Hygiene and Tropical Medicine noted, “precluded analysis of several potentially important interventions, including environmental management, epidemic surveillance and prevention, and interventions to improve the treatment of severe malaria.” ITNs possessed a number of attributes other than evidence of efficacy that led to their adoption as a central tool for malaria control. As one of the most cost-effective malaria prevention measures for very low income countries—and one of the few with cost-effectiveness data, period—ITNs attracted much of the attention from donors and, thus, policy makers.

Furthermore, although RBM leaders originally called for 60% coverage with “suitable” disease prevention measures, they only planned to track ITN coverage, and to a lesser extent intermittent presumptive treatment among pregnant women, to measure

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progress in rolling back malaria.\textsuperscript{99} Recalling outcries against the failure of one-size-fits-all malaria eradication and observing the new epidemiological approach to malaria, RBM leaders claimed that participating states should tailor RBM recommendations to particular national circumstances. Yet, RBM’s first Program Manager, David Nabarro, declared, national malaria programs across the globe should track the percentage of children under five sleeping under an ITN.\textsuperscript{100} All malaria endemic countries, in other words, should disseminate ITNs. Measuring progress towards ITN coverage goals alongside malaria disease indicators would be critical to demonstrating impact to donors eager to make a return on their investment.\textsuperscript{101} Doing this, RBM leaders felt, would in turn convince donor agencies to continue supporting malaria control financially as well as politically.

WHO and RBM officials spent 1998 and 1999 preparing the way for the new multilateral program, a program WHO officials partly used to maintain the relevance of the organization in post-Cold War international health.\textsuperscript{102} Members of the WHO’s RBM Department worked with health officials and collaborating experts in malaria endemic countries of Africa to establish baseline assessments of malaria and document existing malaria control activities. RBM advisors also made agreements with some country teams to pilot monitoring and evaluation tools, such as surveys and questionnaires, which could

\textsuperscript{99} While the Abuja Declaration listed percentage of pregnant women using intermittent presumptive treatment as a disease prevention indicator to track, they did not recommend this on a universal scale due to issues with the lack of affordable, effective antimalaria drugs available in African countries, which continued to rely on chloroquine despite growing rates of parasite resistance to the drug.


\textsuperscript{101} In this post-Cold War period, one of the main justifications or incentives for wealthy countries to invest in health development (and child survival and maternal health in particular) in low-income countries included ensuring political and economic stability to maintain global security. For more about motivations for development after the Cold War, see Michael Barnett, “Humanitarianism transformed,” \textit{Perspectives on Politics} 3, no. 4 (2005): 723-740.

\textsuperscript{102} Brown, Cueto, and Fee, “The World Health Organization and the transition from “international” to “global” public health.”
be used continent-wide to track the progress of RBM goals. Essentially, Roll Back Malaria assumed control over many disparate malaria control activities moving into the twenty-first century. This included the African Initiative for Malaria Control in the 21st Century (AIM), created by an ad-hoc committee at the May 1998 World Health Assembly and subsequently dubbed ‘Roll Back Malaria in Africa.’ RBM’s ascendency meant that the still limited funds designated to fight malaria would go to the RBM partnership and not to WHO headquarters (HQ), which was responsible for funneling resources to WHO regional offices. “As demand for resources in HQ exceeded projected income,” Nabarro told WHO Regional Directors in 2000, “HQ has had to prioritize RBM work, postponing or, in some circumstances, canceling lower priority activities.”

RBM leaders also resolved to coordinate malaria research and “support multi center studies for the development of vaccines, drugs and tools for malaria control.” This followed the TDR model, a model that made multi-sited testing of biomedical technologies the gold standard for tropical disease research. “I was on the Steering Committee for those [ITN] trials,” de Savigny remembered,

And at the end of the trials, they said, ‘Hey, great. Job done. Trials were a big success. Let’s forget…now it’s finished.’ And that was around ’98. Well, it was ’96 the trials were done, and we wanted more research. And so a bunch of us who were in the [TDR] Bed Net Working Group, which was being dissolved, said, ‘No, no, no. This job is not finished. It’s just started. We know “what,” but we don’t know “how.” You know, we have to do some “how” research. How are we

going to get people sleeping under ITNs?’ And TDR was still in this kind of technology development mentality and thought that was not so interesting.\textsuperscript{106}

Funding and bureaucratic issues also deflected attention away from calls for operational research. Director-General Brundtland moved TDR into the WHO’s Communicable Diseases cluster in 1998, seeking to bridge the gap between basic research and disease control. During the restructuring, WHO leaders phased out the operational research unit of the Communicable Diseases cluster.\textsuperscript{107} TDR, which saw an over $10 million reduction in income from 1993 to 1998 and expanded its disease profile to include tuberculosis and dengue fever, did little to fill the funding gap.\textsuperscript{108} Unsuccessful at getting TDR to fund necessary operational research on ITNs, de Savigny, Lengeler, and other researchers carried out small-scale ITN implementation projects—for example, KINET—themselves.

In addition, the transition of power over malaria work to RBM—a group primarily dedicated to control activities and still trying to convince donors to invest in the cause—may have reinforced gaps in knowledge about ITNs. De Savigny continued,

So Roll Back Malaria was created in ’98. And of course ITNs became a big, big chunk of RBM’s effort, correctly. And so TDR looked at that when we were trying to say, ‘we have to do this implementation research,’ and said, ‘oh, no, that actually is RBM’s job now.’ And then we went to RBM and said, ‘well, no, that’s research. That’s TDR’s job.’ […] TDR…no guts to say, ‘we have to now do the ‘how’ questions.’ This hand-off never occurred.

As a result, the identity of ITNs as unconditional biomedical objects that could be deployed like vaccines in any setting—an identity cultivated in the published results of


\textsuperscript{108} \textit{Ibid.}, 85. During this time, TDR’s donors also increasingly designated their funding for specific causes and types of research (from $1.2 million designated funding in 1996 to $9 million designated funding in 2000), curtailing some of TDR administrators’ control over budget allocations.
randomized controlled ITN trials and crystallized through KEMRI-CDC’s Siaya ITN trial—became further entrenched in RBM policy and the technology itself.

In the year leading up to the African Summit on Roll Back Malaria in 2000, where African heads of state would dedicate themselves to the new program, RBM leadership pursued the question of how to implement ITNs by relying on those with the capacity and support to disseminate ITNs. If nobody was going to fund operational research on ITNs, monitoring programs as they unfolded seemed to be the alternative. Due to donor agency support for decentralization and privatization of public health, as well as lack of funds, most all of these pilot programs involved marketing schemes. Like USAID and other donors, RBM policy makers increasingly focused on how to make physically available and market ITNs to at-risk populations, approaching ITNs as products whose essential, biomedical utility simply had to be revealed to intended users. Social marketing, in other words, reinforced the view that ITNs reduced mortality anywhere, regardless of local contingencies, and further diverted attention away from operational research questions. The fact that RBM leaders had to help scale up ITNs quickly to maintain and attract support from patrons encouraged such an approach to the technology-commodity. Questions about appropriate coverage goals in different epidemiological settings, the role of ITNs in places with indoor residual spraying, and how to coordinate ITN activities on a national scale fell by the wayside.109

Under the influence of such donor partners as USAID, DFID, and the World Bank, RBM officials and consultants promoted social marketing as an ITN distribution

method in RBM’s early years. Leaders of these influential development agencies considered social marketing a cost-effective, “versatile tool for addressing health care market failures and distortions” that could stimulate new demand for health commodities in under-resourced settings.\textsuperscript{110} This aligned with WHO and RBM officials’ desire for “efficient” and “sustainable” ITN distribution systems in Africa, which analysts claimed, basically entailed “encouraging development of the commercial sector.”\textsuperscript{111} In 1999 RBM officials commissioned a “Strategic Plan for ITN Social Marketing” from PSI/Europe, funded by DFID. RBM officials proposed to present the plan to donors in the spring of 2000. Citing PSI’s experience social marketing for family planning and AIDS prevention programs, RBM called on the organization to identify strategies for product and brand positioning, distribution, promotion, behavior change communications, and social mobilization.\textsuperscript{112} How could countries and partner organizations, RBM officials wanted to know, mobilize available resources to sustain the mass marketing of ITNs?

RBM officials considered the participation of other organizations in trying to establish and facilitate ITN markets in Africa as well. The U.S. development group Crown Agents, for example, offered its services in negotiating bulk purchases of nets and chemicals from manufacturers to aid the uptake and continued supply of ITNs. “We are


aware that a major part of RBM is the provision of insecticide treated bednets (ITN’s) which are such a simple yet effective way of preventing malaria thus potentially saving millions of lives,” Director of Procurement Sales and Marketing, David Jamieson, wrote. “This initiative of course depends on the availability of good quality nets at an affordable price and in the quantities required to deliver optimum results.”113 Just as cost-effectiveness calculations and randomized controlled trial results helped create equivalencies between ITNs and vaccines or pharmaceuticals on the level of ‘cost per-life saved,’ marketing groups compared and equated ITNs with other health commodities.114 “The impact of the RBM Programme on the market for bednets,” Jamieson noted, “has many similarities to the affects [sic] on the demand for male latex condoms after Cairo and in response to the HIV/AIDS pandemic.” Therefore, RBM partners should look to experiences with condom supply and demand to strengthen ITN social marketing.115 At a time when Brundtland tried to convince patrons wary of centralized state programs and the ‘inefficient’ UN system to invest in public health, logics of the marketplace became normalized as an aspect of global malaria control.116

Even though RBM leaders supported ITN distribution through social marketing, they did not force all African governments to pursue this approach. Those with resources to carry out ITN programs could do so whichever way they wanted, as experiences from Tanzania reveal. In October 1999 researchers, Tanzanian health officials, NGO representatives, and members of major health and development agencies attended an

114 For more on this process, see chapter 2.
116 Packard, A History of Global Health, 277-278. For an example and articulation of this sentiment, see, Letter, Dr. F.-Eckart Freiberg to the Director of the WHO Malaria Eradication Programme, October 25, 1992, WHO Archives, File M2-87-59, Jacket 18.
international conference on ITNs in Dar es Salaam. Those involved in monitoring Tanzania’s nascent, PSI-run Social Marketing of Insecticide-Treated Nets (SMITN) scheme presented some of their findings. They did “a socioeconomic analysis of net ownership under social marketing,” Don de Savigny remembered,

and we found the worst socioeconomic gradients of any intervention in history. We found a tenfold difference between the upper quintile and the lower quintile, even in remote rural areas where everybody is poor. Still, the upper quintile was ten times more likely to have an insecticide-treated net than the lower quintile. So that’s a huge inequity. And social marketing, where people had to pay the market price or somewhere near the market price was inequitable and had to be replaced by full subsidy. That result allowed us to move to the voucher, a fully-funded voucher.117

De Savigny and others proposed distributing ITNs through a voucher scheme in 2000, which the Tanzanian government and its partners finally initiated in 2004 with support from the new Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM)—a development I describe further in my discussion of ITN implementation in chapter 5.

Nevertheless, development agency donors clung to social marketing, a distribution method that they could support without having to build a whole new distribution system or improve permanent health education infrastructure. According to many of the method’s supporters, social marketing also represented a stepping stone toward nearly compete management of ITN distribution activities by ‘sustainable’ market forces, which, in theory, would obviate the need for continual investment and inputs from donors.118 “The reason we thought social marketing was such a smart idea and

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developing the private sector was such a good idea,” Christian Lengeler recalled, “was because there was no money for public nets” during the first years of RBM. Due to prevailing beliefs about the efficiency and cost-effectiveness of markets in governance, social marketing dominated efforts to scale up ITNs in the new age of Roll Back Malaria even though the method did not always prove effective at catering to very poor populations in Africa.

On April 25, 2000, heads of state and other delegates from 44 African countries met in Abuja, Nigeria for the first African Summit on Roll Back Malaria. Country representatives signed the Abuja Declaration at the meeting, pledging to commit themselves to the goals and approaches of Roll Back Malaria, which included halving malaria mortality by 2010 through the use of prompt diagnosis and treatment, ITNs, and intermittent presumptive therapy for pregnant women. By signing the declaration, African leaders also agreed to allocate required resources to carry out RBM activities in their respective countries and waive taxes and tariffs on mosquito nets, insecticides, and other materials required for control activities. In exchange for committing their countries to RBM, state leaders would benefit from debt relief granted by development agency partners. Additionally, they put themselves in the position to receive aid for

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119 Christian Lengeler, interview with author.
120 S. Vyas, K. Hanson, and J. Lines, “Assessing the impact of ITN scaling up activities: Consumer marketing surveys in Nigeria,” Paper presented at the Third MIM Pan-African Malaria Conference, Arusha, Tanzania, 2002; Obinna Onwujekwe, Kara Hanson, and Julia Fox-Rushby, “Inequalities in purchase of mosquito nets and willingness to pay for insecticide-treated nets in Nigeria: Challenges for malaria control interventions,” *Malaria Journal* 3, no. 1 (2004): 6-13; Bob Snow, interview with author. DFID analysts also noted that social marketing was not meant to cater to the poorest populations. However, since social marketing organizations typically collected aggregate sales data rather than sales data segmented by, for instance, socioeconomic status, in the early 2000s, the agency could not determine the success of most social marketing projects in reaching the very poor. Meadley, Pollard, and Wheeler, “Review of DFID approach to social marketing,” iv-v.
malaria control activities from private, academic, NGO, and other bilateral partners who
joined Roll Back Malaria. As cheap, simple commodities that organizations and
individuals alike could help supply, ITNs constituted a large percentage of this aid in the
twenty-first century.

**Conclusion**

The opening image of this chapter portrays an ideal relationship between
scientific research and public health policy in which the progressive accumulation of
scientific findings directly feeds and shapes the policy making process. This relationship
is encapsulated in the term ‘evidence-based policy,’ which the leaders of Roll Back
Malaria used to describe their new strategy for global malaria control in the twenty-first
century. However, this chapter has shown, the relationship between scientific evidence
supporting ITNs and the inclusion of ITNs in global malaria control policy was not as
straightforward as the opening image suggests. International and regional health officials
included ITNs in recommended control strategies, even if only marginally, before
scientists conducted randomized controlled efficacy trials with ITNs in Africa. For them,
ITN commodities provided a way to curb malaria in Africa without the need for
centralized public health infrastructure or substantial financial, technical, and human
resources. While clinical epidemiological data from randomized controlled trials and
cost-effectiveness calculations bolstered the political capital of ITNs during this post-
Cold War period of international development, such data alone did not elevate ITNs to
their central place in global policy—certainly not immediately. Inter-agency politics and bureaucracy, and the exigencies of actually running ITN programs in Africa with few resources, hindered the neat translation of science into policy. Depictions of evidence-based policy making, then, should include historical circumstances and political contexts to illuminate fully the role of science in public health policy.

In fact, a close examination of the historical circumstances of ITNs’ adoption into global policy reveals the key role ITNs played in mobilizing financial resources and donor interests for malaria control in Africa at a time when many considered the endeavor politically unpopular. Health officials, development patrons felt, could easily include ITNs into decentralized, market-based health systems, thereby promoting the tenets of structural adjustment reforms. ITNs, in other words, proved politically appealing even if traditional approaches to malaria control, like indoor residual spraying, did not. Randomized controlled trial results, social marketing approaches, and gaps in operational research all worked to black-box ITNs as universally applicable, biomedical objects, underwriting donor agencies’ plans to deliver the vector control tool as a private sector, public health commodity in Africa. The transformation of ITNs into a tool for saving the lives of African children, rather than just for controlling malaria, also appealed to donors interested in the former goal, predominant in international development at the time. Moreover, international policy makers argued, African health officials could easily tailor ITN distribution to specific epidemiological situations in their countries. Such arguments helped address donor concerns with financing another failed attempt to combat malaria.

122 For more on the political valence of randomized controlled trial and cost-effectiveness data in neoliberal global health regimes, see Adams, “Evidence-based global public health”; Adams, “Metrics of the global sovereign.”
using a one-size-fits-all approach, even if RBM leaders stipulated that all participating
governments adopt ITNs to secure donor funding for malaria control. For donors and the
health officials who courted them, ITNs carried substantial value in the “global health
economy,” derived from certain types of scientific evidence—evidence whose
contingencies and conditions of production became obscured as health officials and
academics ‘sold’ the scientific commodity to patrons. Marshalling data on ITN
efficacy and cost-effectiveness, researchers and policy makers did not just claim ITNs
were useful tools for controlling malaria in Africa; they also sold malaria control as a
worthy investment in the twenty-first century.

123 U.S. Congress, Senate, Subcommittee, 
Combatting Infectious Diseases, 8.
In 1992, after months of meetings and workshops on the country’s worsening malaria situation, Kenyan Minister of Health James Angatia and his colleagues published Kenya’s first National Plan of Action for Malaria Control. They did so nearly coincidentally with the WHO’s Ministerial Conference on Malaria, where health officials, development agencies, and other stakeholders from Africa and across the globe officially endorsed the organization’s new Global Strategy for Malaria Control. Moreover, they crafted this strategy with advice and support from experts at major development and scientific agencies, who were keen on ensuring Kenya developed a plan that drew on the latest recommendations for malaria control in Africa and was palatable to potential donors. Although some WHO consultants remained skeptical about the viability of ITNs for malaria control in Africa at this time—especially in areas of intense transmission such as Kenya’s Siaya district—the “community-based intervention that could also be linked to existing PHC [primary health care]” appeared in Kenya’s national strategy.1 “The GOK [Government of Kenya] will encourage communities to adopt the most appropriate technologies,” the Plan stated.

In the case of insecticide-impregnated fabrics, the individual or collective dipping methods employed should be based on local customs, traditions, and preferences. Once a community has adopted the use of impregnated materials as an appropriate intervention, the MOH [Ministry of Health] should encourage community members to sustain the programmes through cost-sharing.2

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2 Kenya Ministry of Health, “Kenya National Plan of Action for Malaria Control,” 41, KEMRI-CGHR Archives. Members of international health agencies, notably UNICEF and the WHO, adopted the concept of “appropriate technology” in the 1970s and 1980s, referring to small, simple technologies that communities in low-income countries could employ in a decentralized system. Health officials used the...
ITNs, health officials felt, were appropriate for Kenya.

Building from the previous chapter, which looked at the inclusion of ITNs in global health policy, this chapter interrogates African health officials’ experiences adopting ITNs into national health policies such as the 1992 National Plan of Action. Historians who have studied recent efforts in global malaria control and malaria control in Africa have done so mainly from the perspectives of multilateral organizations and policy makers from the global North.\textsuperscript{3} Doing so, they have situated ITNs into a larger set of biomedical technologies, or “magic bullet[s],” and commodities predominant in late twentieth-century approaches to global health. Kenyan officials did adopt ITNs under influences and pressure from international donor agencies, as traditional narratives suggest. Yet they did so initially within a national integrated primary health care program \textit{before} scientists published results showing ITNs reduced child mortality, \textit{before} ITNs were consolidated as universally applicable, biomedical tools. ITNs, in other words, did not always function as ‘magic bullets’ for malaria in Kenya. Kenyan officials, rather, first incorporated ITNs into national activities as commodities in the late 1980s with larger aims of decentralizing and privatizing health services in the country. The narrative of ITNs in Kenya thus cannot be reduced to broad trends in the history of evidence-based

global health, such as the increased influence of randomized controlled trials. 

Exploring the history of ITNs in Kenya’s national health policies, then, this chapter reveals the previously ignored political function of this technology in late twentieth-century Africa.

The authors of the 1992 National Plan of Action did not adopt ITNs as an “appropriate intervention” for its ability to control malaria alone; rather, I argue, they also adopted these as “appropriate” tools for Kenya’s health sector reforms of the late 1980s and 1990s. 

Informed by the government’s broader efforts to enact World Bank and IMF structural adjustment policies, Kenya’s health reforms aimed to decentralize governance of the health sector, privatize health services, and identify new outlets for health care financing. 

With these reforms, Kenyan populations had to navigate shifting, historically contingent terrains of resource access and health care provision in the country, terrains now shaped by pressures to use markets as vehicles for development.

This chapter

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7 The geography of health services in Kenya grew out of the country’s postcolonial bureaucratic and ethnopolitical context, much to the disadvantage of Nyanza Province and other opposition-supporting regions. ITN commodities, a patch for the problem of weak health systems, thus also mapped onto these geographies of neglect. Ndege, Health, State, and Society in Kenya, 138. For other studies of the interaction between market-based health reforms and local social, political, and cultural contexts in Africa, see Ellen Foley, Your Pocket is What Cures You: The Politics of Health in Senegal (New Brunswick, NJ: Rutgers University Press, 2010); Harriet Birungi, “Injections and self-help: Risk and trust in Ugandan health care,”
highlights the ways in which Kenyan health officials, and to a lesser extent populations, negotiated such terrains using ITNs as the Kenyan state tried to both implement structural adjustment policies and finance malaria control with scarce resources. Doing so, the chapter illustrates the need to examine the history of technology adoption within the context of local public health policy formation, rather than attribute such adoption, for example, simply to the biomedicalization of global health.

Interrogating the political valence, and indeed utility, of ITNs in Kenya during structural adjustment, as I do here, also sheds light on the global politics of translating ‘evidence’ into ‘evidence-based’ health policies. As international health policy makers increasingly looked to the practices of evidence-based medicine (EBM), namely randomized controlled trials, to adjudicate the efficacy and value of public health interventions during the 1990s, they considered “statistical, experimental, and epidemiological models of evidence [...] the gold standard.” Citing results from randomized controlled efficacy trials, Roll Back Malaria (RBM) partners advocated disseminating ITNs as “evidence-based interventions.” Kenya’s Division of Malaria Control incorporated these tools into its 2001 National Malaria Control Strategy, characterizing them as such. Kenya, of course, first adopted ITNs over a decade earlier.

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8 Since this chapter focuses on policies and policy-making, it does not deal extensively with how Kenyans actually used ITNs and engaged with malaria control programs. I describe those issues in greater detail in chapter 6.


Kenyans’ experiences adopting the intervention informed national and international discussions during the mid-1990s about how best to disseminate ITNs in Africa. These experiences, or ‘evidence,’ however, became largely irrelevant when Kenyan health officials adopted RBM strategies and targets into national policy. International donors who financed Kenya’s RBM activities ultimately had much more influence over plans for ITN programming. For Kenya’s Ministry of Health, developing an ‘evidence-based’ malaria control policy had as much to do with political negotiation to access health resources as it did with translating science into action.

**Health Sector Reform in Kenya in the 1980s**

The Kenyan government’s implementation of structural adjustment policies and associated health sector reforms during the 1980s provides the backdrop for health officials’ incorporation of ITNs into national malaria control activities. This section outlines the basic contours of those political and economic reform efforts to show why ITNs resonated so well with Kenya’s shifting circumstances. Kenya’s economy, like those of most low-income, commodity-exporting nations in the global South, was hit hard by the debt crisis of the 1970s. Spikes in oil prices, fluctuations in coffee prices, and the collapse of the East African Community in 1977 exacerbated the crisis in Kenya. The World Bank and IMF floated its first structural adjustment loan to the country in 1980 to help ensure the government could pay back its creditors.11 These two international financial institutions required the Kenyan government to adopt structural adjustment policies in exchange for this and subsequent loans. Among other things, leadership at

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these institutions aimed to transform the Kenyan economy so that it supported free-market economies and donor countries from the global North. They also pressured the Kenyan government to adopt austerity measures and reduce spending on social programs so the country could resolve its balance-of-payments problem. Since the purchase of health commodities was a major drain on the foreign currency reserves of many African countries as well as on national budgets, these items became obvious targets for spending cuts. Such economic reforms and the concurrent global recession negatively impacted Kenya’s health sector, which even before structural adjustment relied heavily on external funding.

Kenyan President Daniel arap Moi and government officials tried to adjust to the new political and economic pressures throughout the 1980s and 1990s, certainly in legislation if not always in practice. State officials put out a series of sessional papers beginning in 1980 that outlined the government’s commitment to structural adjustment, focusing initially on stabilizing the economy and amending the country’s budget deficit. This included Sessional Paper No. 1 of 1986, *Economic Management for Renewed Growth*, in which officials underscored the government’s need to increase spending on “immediately productive services” in the agricultural and industrial sectors at the expense

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15 Some World Bank officials, for example, felt that Kenya’s implementation of structural adjustment policies was “lethargic,” “patchy,” and “intermittent.” Gurushri Swamy, Summary Findings of “Kenya: Structural adjustment in the 1980s” (Washington, D.C: World Bank Chief Economist’s Office, Africa Regional Office, 1994).

16 Maxon and Ndege, “The economics of structural adjustment.”
of health, education, and other social services.\textsuperscript{17} The paper’s authors promoted cost-sharing with citizens, NGOs, and private industry in the health sector to make up for the state divestment. The Ministry of Health used the 1986 sessional paper as a framework for the country’s five-year development plans beginning in 1988-1989.\textsuperscript{18} In doing so, Kenyan officials were turning away from their predecessors’ calls for universal, state-sponsored health care in Kenya’s immediate post-independence period.

As Kenya’s health system buckled under the pressure of divestment in the mid-1980s, Kenyan officials prioritized the need to find alternative financing mechanisms in the health sector—a goal for which they received “assist[ance] by the World Bank.”\textsuperscript{19} Based on discussions with the Bank and other development donors, the Kenyan government introduced a plan to implement user fees in government health facilities in August 1989. User fees ultimately deterred many of Kenya’s poor from using state health facilities, so much so that the government suspended the fees from 1990 to 1991 while it modified service charges and created new institutions to improve revenue generation and use of funds.\textsuperscript{20} While the government introduced exemption programs for the very poor to mitigate the impact of new health care costs, such programs faltered (as they did elsewhere in Africa) as civil servants, health workers, and other non-poor populations found ways to exploit exemptions.\textsuperscript{21} The World Bank also pushed the Kenyan

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government to improve and expand its national health insurance scheme, a scheme supported by individual contributions and which covered only 10 percent of the population in 1985. These and later declarations of reform placed increasing responsibility on individuals to pay for health care, even though a large portion of the population continued to live in poverty.

The World Bank also pressured the Kenyan government to devolve responsibility for organizing health care to district officials as part of larger efforts to dismantle what Bank leaders saw as a massive and obstructive central bureaucracy. The government tried to decentralize health development planning to districts in July 1983 by adopting a District Focus for Rural Development strategy. In practice, district-level officials only maintained nominal control over their health services since they did not have a means of generating revenue themselves. They still relied on funds from the central government, which often distributed resources according to political loyalties. The government reiterated its commitment to decentralize state services in its 1986 sessional paper, *Economic Management for Renewed Growth*. As part of its efforts to guide Kenya’s health care reform, the World Bank advocated establishing resource allocation mechanisms and accounting systems within districts to avoid issues with revenue-generation that hindered decentralization efforts during the 1980s.

The government tried to devolve responsibility for health care in other ways during this period as well. Because it was “no longer possible for the government to do

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everything in the health sector,” the Minister of Health called on NGOs and the private sector to take on a greater role in health care financing. The U.S. Agency for International Development (USAID), U.K. Department for International Development (DFID), and other donors funneled funding for health projects through NGOs during the mid-1990s, when many governments placed sanctions on Kenya for human rights abuses. This accelerated trends from the 1980s, where donors increasingly provided funds directly to NGOs for service provision—a response, in part, to Moi’s practice of maintaining centralized control over resources meant for local development initiatives.

Finally, as part of its stated commitment to health care reform, the Kenyan government agreed to invest more resources into “cost-effective” preventive and promotive services. Many working in international health during the 1970s, during the rise of the primary health care movement, criticized governments in developing countries for investing so much in largely urban, hospital-based curative services. Internationally, in fact, Kenyatta National Hospital in Nairobi “became a symbol for all that was wrong with the health sector in developing countries.” The expensive, tertiary care it provided, critics argued, diverted state funds away from programs that would address the wider burden of disease in Kenya, a burden shouldered mainly by poor, rural populations. In practice, the call to invest more in the country’s preventive and promotive services translated to more money for “the expansion of both demand and supply of family

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planning services." This focus on family planning, a key component of the World Bank’s support for maternal and child health programs, grew out of earlier thinking about population growth as an inhibitor of economic development. Family planning (or population control) gained increased traction in Kenya in this period as the state struggled to alleviate the effects of drought and subsequent food shortages, contain rising unemployment rates, and provide social services. To a great extent, the Kenyan government’s health reforms of the 1980s reflected strategies propagated by development agencies and economists from the global North.

Malaria control received very little attention in health care reforms of the late 1980s despite new international interest in child survival and maternal health. Nevertheless, as cheap tools that could be implemented with little outside technical assistance, be sold to individuals as commodities, and prevent infectious mosquito bites, ITNs fit nicely into Kenyan health sector reforms. It is to the introduction of ITNs in Kenya at the end of the 1980s I now turn.

**ITNs and Primary Health Care: The Bamako Initiative in Kenya**

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The World Bank and its structural adjustment policies were not the only influences shaping health care policy reforms in Kenya at this time. The primary health care (PHC) movement in international health also played an important role, a movement itself impacted by the broader context of resource scarcity. Kenya’s Ministry of Health incorporated ITN commodities into an inchoate national PHC program in 1989. The program operated as a series of decentralized cost-recovery projects, known as Bamako Initiative projects. Health officials included ITNs in national health activities through this mechanism before researchers in The Gambia published trial results showing ITNs reduced child mortality and before Kenya’s Ministry of Health developed a unit dedicated solely to malaria.\(^{34}\) In other words, Kenya’s Ministry of Health and its partners did not initially adopt ITNs as biomedical magic bullets for malaria, or as part of any concerted attack against malaria in the country; rather, they adopted ITNs as health commodities that individuals could purchase for personal protection from malaria vectors and help finance basic health services in the process. In Kenya, ITNs became a part of policy aimed at decentralizing and privatizing health care.

WHO and UNICEF jointly introduced the Bamako Initiative in 1987 as a plan for promoting primary health care in Africa. The initiative reflected many of the changes that had occurred in international health and development during the 1980s, discussed in chapter 1. Donors gravitated toward Selective Primary Health Care over the course of the 1980s as economic constraints stymied efforts to build up PHC services in Africa. Jim Grant, who became the Director of UNICEF in 1980, embraced the tenets of selective PHC, steering UNICEF toward meeting basic health needs in low-income countries with

\(^{34}\) For more on The Gambia trial and its importance to the history of ITNs in global malaria control, see chapter 1.
a few cheap and “appropriate” interventions delivered in a decentralized fashion.\textsuperscript{35} The WHO, dependent on donations from member states, followed suit. The Bamako Initiative encapsulated this narrow, selective approach to PHC perpetuated by major aid organizations and decision-making bodies.

In 1987, representatives from the WHO and UNICEF met with African heads of state in Bamako, Mali for the 38\textsuperscript{th} WHO African Regional Committee meeting, during which they discussed the future of PHC in Africa. Leadership at the WHO and UNICEF wanted to find a way to build and sustain PHC services on the continent at a time when African governments faced severe financial constraint, compounded by structural adjustment. They convened this meeting in the same year that Jim Grant and UNICEF began promoting “adjustment with a human face,” an approach to development that “utiliz[ed] the economic crisis and constraints to direct more attention to cost-effective ways to meet human and social needs in the long run.”\textsuperscript{36} The Bamako Initiative, UNICEF leaders felt, could address long-term health needs by “focusing on strengthening district health systems, of which well-run peripheral health systems are an important component,” including through the use of user fees.\textsuperscript{37} The Initiative would promote basic health care delivery, essential drugs, “appropriate financing mechanisms,” and community involvement.\textsuperscript{38} These core elements invoked ideas that WHO Director-

\textsuperscript{35} Packard, \textit{A History of Global Health}, 249-266.
\textsuperscript{38} \textit{Ibid.}
General, Halfdan Mahler, had popularized in the 1970s, such as the primacy of communities in operating basic health care systems on a local level. At the same time, in promoting health provision based on principles of community self-financing, the Bamako Initiative endorsed creating and expanding markets for health commodities in Africa.

President Moi signed the Bamako Initiative in 1987, displaying Kenya’s political commitment to the new pro-poor policies of UNICEF and other international donors. Members of the Division of Vector Borne Diseases (DVBD), Ministry of Health, and the UNICEF set up Bamako Initiative projects in 1989, creating the first mechanism for disseminating ITNs in the country outside research trials or individual development projects. Kenya was one of the first six African countries to actually implement Bamako Initiative projects, and the only one in East Africa to do so in this first round.

While Bamako Initiative projects in West Africa emphasized improving the quality of services within existing health facilities, Kenya’s Ministry of Health focused on extending basic health services to populations with little access to government health facilities. Some referred to this as the “East African model” of the Bamako Initiative. The Ministry attempted to increase access to health care by setting up community pharmacies that stocked a small selection of essential drugs, bed nets, and insecticide solution. These pharmacies operated on revolving fund schemes with the idea that after

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41 George Ndege discussed how harambee (meaning ‘all pull together,’ sometimes translated as ‘self-help’) projects begun under Jomo Kenyatta helped perpetuate uneven development of health facilities around the country. Those communities with wealth and/ or access to political resources were able to build more health facilities than were poor, politically marginalized groups (especially in Nyanza). Ndege, Health, State, and Society in Kenya, 138.
43 Ibid.
obtaining initial inputs from donors, communities could sell and replenish commodities in a self-sustaining manner. Each pharmacy served from 500 to one thousand households, or five to seven thousand people.\footnote{Letter, Dr. HM Oranga to David Evans, November 25, 1994, WHO Archives, File T22-181-19.} With Bamako Initiative projects, the government tried to fill gaps in the country’s health infrastructure by establishing markets.

Kenya’s Bamako Initiative projects also advanced the government’s and the World Bank’s goal of decentralizing health services. Community health workers sold health commodities at the pharmacies and were responsible for disseminating health education messages. They reported to locally-elected Village Health Committees, who were responsible for managing pharmacy accounts and drug stocks as well as developing exemption policies for those unable to pay.\footnote{McPake, et al., “The Kenyan model of the Bamako Initiative,” 127.} As part of these decentralization efforts, the Ministry of Health eventually set up District Health Management Teams (DHMT), which were supposed to monitor and supervise projects, providing another layer of oversight.\footnote{Snow, et al., “Strategic development and activity for Roll Back Malaria in Kenya 1998-2000,” 48.} DHMTs, and later District Health Management Boards (DHMB), became new managers of public health funding and services in Kenya’s rural areas. This aspect of the Bamako Initiative dovetailed with Kenya’s health care reforms under structural adjustment, reforms the World Bank hoped would wrest control over health development and financing away from Nairobi bureaucrats.\footnote{Anangwe, “Health sector reforms in Kenya.”} Proposing to study equity in Kenya’s Bamako Initiative projects, Dr. Oranga and colleagues emphasized this link. “In this time of decreasing resource allocation per capita to the health sector,” they stated,

it is unlikely that the health system will be able to expand its planning and monitoring capacity. It is therefore important and in the interest of the health

\footnote{Letter, Dr. HM Oranga to David Evans, November 25, 1994, WHO Archives, File T22-181-19.}
system and communities that the latter group takes a larger role in planning, implementation and monitoring of their own PHC services.  

Bamako Initiative projects helped extend the government’s stated goals of health care reform, even if the state did not invest a lot of its own money into it.

Without the support of UNICEF, in fact, it is unlikely Kenya’s government would have been able to establish Bamako Initiative projects. The Ministry of Health had little financial capacity to initiate or sustain the projects. It contributed in other ways, such as selecting project sites and criteria for determining project sites. However, it left many of the operational aspects to personnel at the district and sub-location levels as well as NGOs. UNICEF, an organization with an extensive history procuring health commodities and technologies for developing countries, procured much of the supplies for Kenya’s Bamako Initiative. Indeed, as members of the CDC’s Malaria Branch reported, “the project seems quite popular, however, all nets are imported from Thailand, and UNICEF’s role is more predominant than that of the Ministry of Health.”

UNICEF representatives, however, did not consider the agency’s role on the projects permanent. “Even with its broad-ranging an elastic mandate,” reported a 1986 review of UNICEF activities, “UNICEF alone cannot provide most of the basic services to children and mothers in developing countries.” Due to limited staff and the “relative

weakness of its centers of operation,” UNICEF better operated as “a supplementary force, a stimulus, a vehicle for experimentation, an added support.” Much in line with prevailing, supply-side approaches to health development at the time, UNICEF representatives felt Bamako Initiative projects could teach people to value basic health services, such as immunizations, essential drugs, and bed nets, thereby stimulating demand. In the mid-1980s, UNICEF had also made agreements with African governments that the organization would be responsible for procuring and dispatching equipment and supplies; once supplies arrived in the country, the equipment became the state’s property. Thus, UNICEF provided seed supplies, such as bed nets and insecticide, in Kenya’s Bamako Initiative projects but had little control over how people ran the community pharmacies.

The DVBD and UNICEF helped integrate malaria control activities into Kenya’s Bamako Initiative projects. Some of these activities, such as chloroquine distribution and brush clearing (also called “environmental management”) fit in with the Initiative’s focus on cheap interventions that people could organize and implement at a village or sub-location level. ITNs similarly fit with UNICEF’s interest in using “affordable technology suited to the particular needs of rural and semi-urban areas,” especially those tools that promoted child survival and maternal health. Kiambo Njagi, a longtime member of the Ministry of Health and current Project Coordinator for Kenya’s National Malaria Control Program, remembered the importance of UNICEF’s interests in child survival to ITNs in

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54 Ibid.
Kenya. “[The] Bamako Initiative came at the right time,” he told me, “because then, UNICEF was really interested in supporting mother and child. And therefore, a lot of nets and a lot of chemicals was distributed in Kenya through that method.” ITNs, which at this point scientists had shown provided children with some protection from malaria disease, became increasingly important tools in Kenya as chloroquine became less and less effective at treating malaria. As an added benefit, many in the international health community agreed, ITNs were “well suited to community participation” — a central component of UNICEF’s plans to extend PHC in Africa. ITNs thus symbolized the Kenyan government’s commitment to the policy recommendations of international donors, whom they relied on to help fund health activities in the country.

The Ministry of Health, UNICEF, and its other partners initiated the first Bamako Initiative project in Kisumu district in September 1989, followed shortly by projects in Homa Bay and Migori. The government had not invested substantially in health facilities in Nyanza Province — a province with some of the highest infant and maternal mortality rates in Kenya — as this area constituted the seat of political opposition in the country. Partly for that reason, the Ministry of Health located most of the first Bamako Initiative projects in Nyanza. Doing so, the Kenyan government could make claims to investing in rural development and in the region’s health infrastructure through the cost-recovery projects while providing little of its own funds.

56 Kiambo Njagi, interview with author.
59 Ibid. There were 23 Bamako Initiative sites in Nyanza by 1994.
Bamako Initiative projects facilitated the extension of ITN commodities into the landscapes and lives of Kenya and its population. UNICEF typically procured bed nets and insecticide in bulk since this lowered procurement costs.\textsuperscript{60} “Whenever you [went]” to the Bamako Initiative sites, Njagi remembered, you “could see a big jerry can of twenty liters of insecticide, bales of nets, and some little drugs in a very traditional hut.”\textsuperscript{61} Community health workers sold nets for roughly US $3.30 to $4.20, charging US $0.50 for an insecticide dip.\textsuperscript{62} “From the beginning,” explained one project reviewer, Kenya’s Bamako Initiative scheme “has taken the view that in the interests of sustainability, neither nets nor insecticide would be distributed free of charge. This pricing strategy has the advantage of sending a clear message that the ITN intervention involves two products, each of which has a price.”\textsuperscript{63} NGOs and research organizations extended Kenya’s Bamako Initiative by initiating their own, cost-recovery pilot projects with ITNs, as UNICEF continued to fund supplies for more community pharmacies around the country.\textsuperscript{64} From the start, ITN commodities arrived in malaria endemic areas of the country as part of broader efforts to transform citizens into health consumers.

Plans to establish self-sustaining, community-based PHC services through the Bamako Initiative did not work as intended. Unsurprisingly, cost was a major hindrance,\textsuperscript{60}

\textsuperscript{60}RM Feilden, “Experiences of implementation,” in Christian Lengeler, Jacqueline Cattani, and Don de Savigny, eds., \textit{Net Gain: A New Method for Preventing Malaria Deaths} (Ottawa and Geneva: International Research and Development Centre (Canada) and World Health Organization, 1996), 88. However, purchasing insecticide in bulk was less cost-effective if one dipped nets individually, which was typically the case in Bamako Initiative projects.

\textsuperscript{61}Kiambo Njagi, interview with author.

\textsuperscript{62}Lengeler, Cattani, and de Savigny, eds., \textit{Net Gain}, 94.

\textsuperscript{63}Ibid. “Sustainability” was a common euphemism referring to market-based approaches to health care at this time.

especially when it came to re-dipping bed nets in insecticide. Roughly 33% of respondents in one study said cost was the reason they did not use bed nets from Bamako Initiative projects. About 36% of those who did own nets, according to this study, were village leaders and others outside the target group of poor women and children. Furthermore, it was difficult in some cases for pharmacies to make enough money back to reinvest in bed net stocks. Health workers at a project in West Pokot, for example, offered loans to some people who could not afford bed nets but faced significant challenges collecting loans once people had taken the nets back home. Many community pharmacies did not keep good records of sales and procurements, making it difficult to substantiate that pharmacies actually made money on bed net sales.

‘Communities,’ moreover, did not operate as cohesively as policymakers predicted. Largely male village health committees sometimes ran into conflicts with the mostly female community health workers, who controlled the revenue from drug sales. The vision of sustainable, low-cost PHC in poor areas promoted by the Kenyan government and UNICEF did not hold together in practice.

Although UNICEF planned to give significant amounts of money to extend the Bamako Initiative in Kenya, to the tune of $2 million over 1994-1995, the organization...

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65 Lengeler, Cattani, and de Savigny, eds., Net Gain, 94. Ideally, nets were to be dipped every six months to remain active.
66 Letter, Dr. HM Oranga to David Evans, November 25, 1994, WHO Archives, File T22-181-19.
67 Ibid.
68 Lengeler, Cattani, and de Savigny, eds., Net Gain, 61, 90-110.
could not keep up with project needs. In early 1995 auditors determined UNICEF’s Kenya office had lost $10 million due to mismanagement of funds—overstaffing, overspending on nonessential items, staff using UNICEF vehicles for personal purposes, and the like. This amount represented roughly a quarter of the office’s budget for 1993-1994. As a result, UNICEF-Kenya closed down or stopped funding numerous projects and programs in the country in 1996, including Kenya’s Bamako Initiative projects. The Kenyan government could still not finance the procurement of bed nets, insecticides, and essential drugs. At that point, the Bamako Initiative essentially petered out. Practices of selling ITNs as health commodities, however, remained as Kenyan health officials continued to pursue market-based health reforms in line with World Bank recommendations.

Despite the program’s demise, Kenya’s experience with the Bamako Initiative generated important evidence for both national and international policy conversations. Members of the Special Programme for Research and Training in Tropical Diseases (TDR) and interested donors cited Kenya’s Bamako Initiative projects in discussions about how best to scale up ITNs on the continent. Importantly, Kenya provided an example of distributing ITNs within an integrated primary health care program, as opposed to a vertical malaria vector control program or strictly the private sector. Kenya Ministry of Health officials and multilateral partners, such as Beth Rapuoda and

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75 Lengeler, Cattani, and de Savigny, eds., Net Gain, 59-60.
Bob Snow, also looked back to Bamako Initiative projects in planning Kenya’s ITN strategy for the twenty-first century. Although no one had carried out much in the way of operational research to determine the effectiveness of Bamako Initiative projects, largely due to the limited availability of resources to do so, Rapuoda and others could claim to RBM leadership that Kenya already possessed some of the human infrastructure at the district or ‘community’ level to scale up ITNs. Kenya, in other words, was prepared to accept and implement malaria control resources patrons provided.

**ITNs and the Development of a Malaria-Specific Program in Kenya**

At the same time Kenyan health officials and foreign partners tried to expand PHC services in the country, the Ministry of Health initiated efforts to craft a plan for national malaria control specifically. They did so as members of the international health and development community and African ministers of health raised increasing alarm over the malaria situation on the continent, calling on wealthy donors to help provide relief (see chapter 3). Kenya’s malaria control policies, however, did not merely reflect the state of current knowledge about malaria control in Africa; like Bamako Initiative projects, such policies also encapsulated and promoted Kenya’s economic and political reforms of the 1990s. Indeed, for Kenyan health officials and their development partners, crafting and honing national malaria control policy entailed reorganizing Kenya’s public health bureaucracy as much as it did refining technical disease control strategies based on new scientific knowledge. It was as much a process of political negotiation as a technical endeavor. As individualized commodities that fit easily into health care markets and

decentralized, ‘community-based’ programs, ITNs remained a stable part of Kenya’s malaria control policy during the 1990s. Attending to the place of ITNs in Kenya’s malaria-specific policy, this section outlines a parallel narrative of the politics of ITN adoption in Kenya, in which the Ministry of Health used ITNs to cope with the country’s malaria problem under conditions of resource scarcity and continued political pressure from the World Bank.

Malaria had never disappeared from Kenya, but it became a larger, more visible problem during the late 1980s. Increasing poverty and the decreasing efficacy of chloroquine exacerbated malaria mortality in areas malaria was endemic, especially among children. This drew the attention of UNICEF and other agencies that focused on improving child survival in low-income countries. Due to a convergence of mostly non-natural events, malaria also began to ravage Kenya’s “economically important highlands” in 1988 after nearly thirty years of quiescence. Development projects and population pressure forced people to start living closer to mosquito breeding sites. One woman I interviewed in the highlands of Gucha, in fact, remembered that mosquitoes became a problem when people started dividing land into smaller parcels and living closer to their tea plantations. The Ministry of Health also attributed malaria epidemics in the usually temperate highlands to global warming and climatic changes. This phenomenon was not unique to Kenya. Data from 1989 showed malaria had also become a leading cause of

78 Ibid., 16.
79 Esther Nyaboke,* interview with author, Nyamache (Gucha), November 21, 2015.
81 Packard, The Making of a Tropical Disease, 177-216.
outpatient morbidity, and major burden on health facilities, in the country.\textsuperscript{82} The WHO’s 1992 Ministerial Conference on Malaria drew new international attention to the deteriorating situation. “So around 1992,” Njagi recalled, “the Ministry and other partners agreed, we cannot keep saying that malaria is the leading cause of morbidity and mortality in Kenya if we are not going to work very hard and give it the predominance it requires.”\textsuperscript{83} Thus, Kenyan health officials began to identify malaria as a disease and development crisis in Kenya and Africa more broadly, singling it out among the wide array of problems targeted (at least theoretically) in PHC services.

In this context, the Ministry of Health developed the country’s first National Plan of Action for Malaria Control in 1992. UNICEF and USAID supported the policy making endeavor financially, sponsoring policy workshops and consultancies with American malaria experts.\textsuperscript{84} Some members of these agencies, along with Kenyan scientists, government officials, and physicians, contributed recommendations as well.\textsuperscript{85} Kenya’s Ministry of Health used this plan to outline the state’s commitment to malaria control for these and other important donors. They did so by advocating the use of strategies and tools that the WHO promoted in its 1992 Global Malaria Control Strategy.\textsuperscript{86} This was important since, the report described, the Ministry would require “substantial input” from donors to carry out the first two years of its plan, which involved testing interventions in

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\textsuperscript{82} Kenya Ministry of Health, “Kenya National Plan of Action for Malaria Control,” 13, KEMRI-CGHR Archives.
\textsuperscript{83} Kiambo Njagi, interview with author.
\end{flushleft}
pilot projects across the country. As a result, the Ministry focused heavily on case management through rapid diagnosis and treatment of malaria, dedicating 37.7% of its malaria control budget for this strategy alone.

The Ministry also used language of development to bolster its case for the plan, presumably to foreign development agencies who would be footing the bill. “Malaria,” Health Minister James Angatia wrote, “remains one of the most pressing health problems and impediments to social and economic development globally.” Malaria not only had a negative impact on people’s health and survival, but on “the country’s economy and productivity as well.” In other words, Kenyan officials adopted the belief, or cultural model, that health was a prerequisite for social and economic advancement, which predominated in international health during the 1990s. This cultural model resonated with major funding agencies such as the World Bank, the leading investor in international health during the decade, who prioritized economic development.

Kenya’s 1992 National Plan of Action for Malaria Control reflected the country’s new economic situation and health care reform efforts. Some of the plan’s broad objectives included “improve[ing] and sustain[ing] community-based services for reducing malaria morbidity and mortality” and “empower[ing] community members to

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protect themselves from malaria related illness and death.”\textsuperscript{92} The Ministry of Health included ‘personal protection measures,’ such as ITNs, into the plan in pursuit of these goals: “the introduction and promotion of personal protection in the programme is an important intervention that empowers communities to control malaria themselves.”\textsuperscript{93} Such language perpetuated participatory, ‘good governance’ rhetoric promoted by the World Bank, as well as ideas that the state would not be responsible for either financing or managing health service provision.\textsuperscript{94}

‘Personal protection measures,’ or methods individuals could use to reduce their contact with mosquito vectors, featured much less prominently in the plan than did antimalarial drugs, garnering only five percent of the Plan’s five-year budget.\textsuperscript{95} It seems the Ministry intended to allocate much of this money for scaling up ITNs nationally following pilot tests, an endeavor already underway in western Kenya (see chapter 2). Kenyan health officials, in other words, planned to expand the use of ITNs in the country—recognized as the “epicentre for chloroquine resistance across the continent”—before researchers had conducted major randomized controlled efficacy trials with

\textsuperscript{92} Kenya Ministry of Health, “Kenya National Plan of Action for Malaria Control,” 29, KEMRI-CGHR Archives.
\textsuperscript{93} Kenya Ministry of Health, “Kenya National Plan of Action for Malaria Control,” 3, KEMRI-CGHR Archives.
\textsuperscript{95} Kenya Ministry of Health, “Kenya National Plan of Action for Malaria Control,” 8, KEMRI-CGHR Archives.
ITNs. Although the WHO’s Global Strategy promoted “prevention measures” for malaria, and decentralized, community-based control programs, the agency hesitated to embrace ITNs as an ideal, ‘global’ solution. Therefore, the WHO and its Global Strategy did not promote ITNs specifically as much as Kenya’s plan did.

Research also figured centrally in this early iteration of Kenya’s malaria control plan. Part of the reason for this was that following the WHO’s failed attempt at global malaria eradication, those working in malaria control stressed that malaria was highly local. As one contributor to the *Lancet* summarized in 1988,

> Any attempt to incorporate control of malaria vectors into a primary health care programme must be based on sound local knowledge. The clinical pattern of malaria, the nature and behavior of the dominant vector mosquito, and the nature of any anti-mosquito measures already in use in the community must be carefully documented before any intervention is planned.

This belief informed Kenya’s 1992 National Plan of Action for Malaria Control. The country’s malaria experts and health officials, the authors claimed, would “pilot specific vector control interventions in different ecozones within Kenya, including epidemic zones, with a view to expanding activities to other similar malarious areas.” After two years of pilot testing, health officials imagined expanding “bed nets and other innovative interventions for personal protection” to other malarious areas of Kenya, especially “chloroquine resistant areas.” In this case, evidence-based on knowledge produced in and for Kenya—as opposed to ‘universal,’ generalizable knowledge produced

97 Christian Lengeler, interview with author, online (skype), November 5, 2015.
99 “Malaria, mosquito control, and primary health care,” 512.
101 Ibid., 5.
elsewhere—served as a key component of the country’s plan to fight malaria in the country.

Existing bureaucratic structures in Kenya did not make it easy to implement a malaria-specific policy in the early 1990s. Prior to Kenya’s 1992 plan, a variety of divisions oversaw malaria control in the country, primarily the DVBD and, to a lesser extent, the Division of Environmental Health. The Ministry of Health split this work up according to whether divisions dealt with malaria vectors, disease, or mosquito breeding sites; prevention, treatment, surveillance, or education. When the government tried to extend PHC to low-resource areas—often loci for malaria as well—through the Bamako Initiative, it integrated malaria control activities into the wide-range of PHC services. While Kenya’s Ministry of Health developed a national plan for malaria control in 1992, then, it did not actually have a separate division or program for malaria control through which to channel and organize funds for the endeavor.

Many of Kenya’s malaria control policy activities during the remainder of the 1990s thus revolved around reorganizing the country’s public health bureaucracy to accommodate the goal of malaria control; they did not revolve around refining technical strategies using new research. The Ministry developed a National Malaria Control Programme in 1994 based on strategies from the 1992 Strategic Plan. It created a Malaria Control Unit (MCU) under the DVBD within the new Programme. The MCU also brought together personnel from the Ministry’s Environmental Health and Health

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102 According to Kenya’s 1992 Plan of Action for Malaria Control, the Ministry of Health had given the DVBD and Division of Environmental Health 3.3 million Kenyan shillings for the 1992-1993 funding period. “Other costs, including patient care, health education campaigns and input by NGOs” the plan’s authors noted, were “difficult to isolate but substantial.” Kenya Ministry of Health, “Kenya National Plan of Action for Malaria Control,” 1, KEMRI-CGHR Archives. Kiambo Njagi, interview with author.

Surveillance Divisions. Under the leadership of Dr. Beth Rapuoda, a parasitologist from the DVBD, the MCU was supposed to coordinate, direct, and supervise Kenya’s new National Malaria Control Programme. Over the next four years, the MCU participated in education and training of district health staff and provided guidance on combating malaria epidemics in the highlands.\textsuperscript{104} Previous divisions of labor remained, however. The Ministry’s Curative Division continued to deal with different aspects of malaria than did the MCU, which was grouped in with preventative and promotive services.\textsuperscript{105} The MCU lacked a clinician until 1999, even though clinical treatment of malaria was a cornerstone of Kenya’s malaria control policy.\textsuperscript{106} Overcoming the country’s fragmented institutional oversight of malaria, in some senses moving from a horizontal PHC to a vertical, disease-specific approach, proved no easy feat.

The British government played an important role in Kenyan efforts to make a national malaria-specific program as it increased its provision of medical and public health aid to the country. This relationship, of course, had historical roots. Henry Foy of the Wellcome Trust established a malaria research program in Nairobi around 1949. Subsequent members of the Wellcome Trust, including Bill Watkins and Bob Snow, continued malaria research in partnership with KEMRI during the late twentieth century.\textsuperscript{107} The Wellcome Trust put a lot of resources into malaria research in Kenya during the 1990s, including a major ITN trial on the coast in 1993-1994.\textsuperscript{108} Later in the decade, researchers from the KEMRI-Wellcome Trust partnership, including Snow,
participated in the selection of interventions for Kenya’s national malaria control strategy.\textsuperscript{109} DFID also gave money to support research and bed net distribution activities in Kenya.\textsuperscript{110} They participated in “capacity building,” helping set up Kenya’s new MCU on the Kenyatta Hospital campus.\textsuperscript{111} The British government remained a major donor for Kenya’s malaria control activities through to the twenty-first century, funding the country’s ITN social marketing campaigns.

The technical strategies laid out in Kenya’s National Malaria Control Programme, including the use of ITNs, changed little from 1992. The program again called for improving services within communities to reduce morbidity and mortality, and empowering communities to protect themselves from malaria illness and death—goals for which ITNs seemed well-suited.\textsuperscript{112} “Using current and completed research findings to target appropriate interventions to regional malaria problems”—a difficult task given the lack of resources to do so—remained a key, aspirational strategy as well.\textsuperscript{113} Kenya’s new MCU maintained commitments to decentralizing health activities and finding ways to share funding responsibilities among individuals, communities, and non-governmental and private sector partners. It did so to fit the Programme into Kenya’s new 1994 Health Policy Framework, which extended World Bank-led health reforms and principles of structural adjustment.\textsuperscript{114} The MCU had to combat malaria in the country, but in a way that fit Kenya’s ongoing political commitments and economic reforms.

\textsuperscript{109} Bob Snow, interview with author, Nairobi, August 6, 2015.
\textsuperscript{110} Snow, Mwenesi, and Rapuoda, “Malaria situation analysis for Kenya,” 55-56.
\textsuperscript{111} John Ouma, interview with author; Letter, Dr. AV Kondrachine (Chief, MAL) to WHO Rep in Kenya, Feb 10, 1995, WHO Archives, File M2-370-23KEN.
\textsuperscript{113} Ibid, 15.
\textsuperscript{114} The World Bank outlined recommendations for health sector reform in developing countries in its 1993 World Development Report, \textit{Investing in Health}. The Bank’s core recommendations, such as decentralizing health services, implementing user fees, encouraging competition among health care providers in the public
International interest in controlling malaria in Africa informed Kenya’s national policy and programmatic activities as well. In 1995, the WHO’s Africa Regional Office (WHO-AFRO) selected Kenya as one of the countries to test out an accelerated implementation of malaria control activities. WHO-AFRO had identified malaria as one of the highest priority diseases in the region during the decade (see chapter 3). Due to the large amount of malaria cases (about six million outpatients per year), deaths, and epidemics in Kenya—along with the fact that the country actually had a National Malaria Control Programme—it seemed to be a suitable test site. Through its Bamako Initiative projects, Kenya had also embraced a “community based approach for malaria control in the African Region,” which WHO-AFRO promoted as the future of malaria control on the continent. Thus, at the same time extra-national influences and agencies informed the creation of Kenyan national health policy, Kenya’s political commitments and epidemiological situation thrust the country onto the international stage as a potential model for malaria control in Africa.

In this representative position, Kenya’s National Malaria Control Programme adopted specific technical objectives, derived in part from recommendations of the WHO’s newly established Task Force on Malaria Control in Africa.

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115 Letter, Dr. Ebrahim Samba (Director, WHO-AFRO) to Secretary of Kenya’s Ministry of Health, December 15, 1995, WHO Archives, File M2-370-23KEN.
116 Ibid.
117 This echoes the way the World Bank held up Kenya as a model for successful structural adjustment policies and health reforms in 1993—more so for Kenya’s political commitment to and efforts to implement reforms than for any health benefits reforms brought for citizens. World Bank, World Development Report 1993: Investing in Health.
health officials felt, these objectives could entice further investment from potential patrons in antimalaria activities, not just for Kenya but for the region more broadly.\textsuperscript{118} Kenya’s MCU’s adopted the goal of ensuring 60% of targeted households had at least one insecticide-treated bed net—then considered one of “the two major interventions in the control of this plague [malaria]” in Africa—by the year 2000.\textsuperscript{119} Needless to say, research, bilateral, and non-governmental agencies who carried out pilot projects and other activities with ITNs in Kenya during the late 1990s did not reach this target. WHO-AFRO and the World Bank later called on Kenya’s Ministry of Health to provide a plan of action for national malaria control support following the announcement of Roll Back Malaria. Health officials did so from 1998 to 2000, incorporating plans for ITN distribution into the new iteration of its malaria control plans.\textsuperscript{120} In multiple ways, creating and implementing national malaria control policy in Kenya during the 1990s was an international endeavor in which Kenyan officials navigated the interests and advice of various donors to gain access to health resources. Partly due to the technology’s political salience, ITNs remained a durable piece of Kenya’s health policy throughout this process.

**Rolling Back Malaria in Kenya**

Researchers, international health officials, and donor agencies became increasingly interested in malaria control in Africa around 1997, culminating with Roll


Back Malaria in 1998. In conjunction with outside technical advisors and donors, Kenyan health officials incorporated Roll Back Malaria recommendations into a new, “evidence-based” National Malaria Control Strategy in 2001. This strategy, intended in part to convince donors to invest in malaria control in Kenya, solidified the place of ITNs as a main pillar of Kenya’s malaria control activities. In addition, it redefined the type and role of ‘evidence’ in the country’s national malaria control policy.

President Moi signed the Abuja Declaration to Roll Back Malaria in April 2000, pledging to incorporate RBM recommended strategies into Kenya’s national malaria control strategies.121 By joining the public-private partnership and adopting RBM-sanctioned control strategies, the Kenyan government sought to share the costs of public health activities with foreign donors. In contrast to the Bamako Initiative, which promoted community-based cost-recovery schemes for PHC service provision, this new, more heavily donor dependent financing strategy focused on a specific disease target and specific, national-level disease control measures. Despite the new sources, scale, and organization of financing, however, the decentralized, privatized strategies for ITN provision used in Bamako Initiative projects—the politics of public health—remained intact when Kenya adopted RBM recommendations.

Roll Back Malaria partners established a set of goals, or targets, for African countries to strive for and use to demonstrate progress to donors. These goals included ensuring at least 60% of those at-risk for malaria could “benefit from the most suitable combination of personal and community protective measures such as insecticide treated

mosquito nets and other interventions which are accessible and affordable to prevent infection and suffering,” which essentially entailed scaling up ITNs. While Kenyan health officials had already adopted and worked to disseminate the intervention in the country, RBM goals put the government under pressure to disseminate ITNs across the country very quickly to meet coverage goals by 2005. Unlike international or Kenyan national malaria control policies from the early and mid-1990s, these goals did not make gestures to the ‘localness’ of malaria within ecologically diverse countries. Such characteristics of Roll Back Malaria, as I explore in chapter six, impacted the way Kenya’s Ministry of Health disseminated bed nets in the twenty-first century.

Kenyan health officials did not adopt RBM strategies overnight. Once the WHO had announced the launch of Roll Back Malaria in 1998, members of Kenya’s National Malaria Control Programme and KEMRI-Wellcome Trust, conducted a situation analysis for the country. Essentially, the authors of this analysis outlined the extent of Kenya’s malaria situation, along with all the malaria control activities, partners, and projects in Kenya. Such information would lay the groundwork for future RBM-related activities. They also planned to disseminate this situation analysis to various participants in Kenya’s malaria control activities, including those in the private, non-governmental, and research sectors, in order to raise awareness about what others were working on at the time. During the 1990s, malaria control activities in Kenya operated in a variegated patchwork, a problem exacerbated by the government’s efforts to decentralize and diversify funding sources for health services under structural adjustment reforms. Trying

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123 Snow, Mwenesi, and Rahuoda, Introduction of “Malaria situation analysis for Kenya.”
124 Ibid.
to stitch together this patchwork by collecting and distributing information about Kenya’s malaria-related activities, the MCU and its expatriate partners prepared to enact a national program based on a ‘global’ framework.

Whereas Kenya’s previous malaria control policies recommended personal protection measures more broadly, the authors of this situation analysis narrowed their discussion to ITNs specifically. This made sense given the growing international consensus around ITNs after Christian Lengeler published his Cochrane Review of the intervention (see chapter 3). For the authors, however, Kenya’s experience showed that scientific research did not always drive disease control policy. “It is notable,” they wrote, “that efforts to introduce this preventative strategy in 1990 begun before the definitive clinical trials were completed in 1995. Thus providing an example of where research is not always required before policy recommendation.”¹²⁵ In addition, the authors described and assessed the country’s ITN activities, most of which had been small, community-based cost-recovery projects. They noted that, “whilst there is a growing trend toward ITBN promotion and distribution more imaginative and appropriate delivery approaches must be explored to improve coverage.”¹²⁶ Getting people to re-treat bed nets—a challenge UNICEF representatives noted in Bamako Initiative projects—was particularly important if this intervention was to have “a demonstrable impact on child survival.”¹²⁷ These problems of increasing ITN coverage and getting people to re-treat nets remained major challenges in the first years of RBM, even though health programmers working in Kenya and other African countries recognized such problems years in advance.

¹²⁶ Ibid, 56.
¹²⁷ Ibid.
Kenya’s Ministry of Health, technical advisors (notably Bob Snow), and members of donor agencies met together to prepare a national malaria control strategy over the following two years in line with RBM-recommended strategies. Among other things, this new strategy called for the creation of a new Division of Malaria Control (DOMC), which continues to direct malaria control in Kenya today. Due to the Kenyan government’s need to mobilize substantial external resources for malaria control, state health officials had to engage with the interests, priorities, and ideas of multiple international partners and potential contributors. In one policy document, head of the DOMC, Sam Ochola, and his colleagues described this as “a process of selecting evidence-based approaches, broad stakeholder participation and harmonisation with the National Health Sector Strategic Plan.”¹²⁸ Behind the scenes, this was somewhat difficult to do. It “was an interesting departure for me,” Snow remembered, “because I was a hardcore scientist who had never had to work within a political arena with people who had their own opinions on how things should be done, and […] at that time, less concerned about evidence, more concerned about what they used to do.”¹²⁹ Developing an ‘evidence-based’ malaria control policy had as much to do with political negotiation as translating scientific findings into a plan of action.

The process of developing a national malaria control policy in conjunction with various stakeholders—mainly development agencies and the organizations these agencies contracted out for development projects—heavily shaped Kenya’s strategy for scaling up ITNs. In particular, donors had tremendous influence on how to integrate ITNs into

¹²⁹ Bob Snow, interview with author.
national policy since they were the ones putting up the necessary resources. “There were those hardcore advocates for private sector delivery of bed nets, and there were those like myself,” Snow told me, who thought it should all be free [...] We ended up coming up with a structure of an enabling environment, and everyone would have a piece of the pie, knowing full well, of course, that those who had the money to do things only ended up doing them. That was social marketing at the time.\textsuperscript{130}

Furthermore, not all donors agreed on how to do things. Snow continued,

USAID, DFID, DANIDA—everyone had their own agenda. [...] I was someone completely independent. And the Director of Medical Services at the time actually felt that that was a useful contribution for him to have someone that was independent and could just tell donors, ‘look, frankly, your contribution to this strategy is a fleet of Toyota land cruisers. Actually, that’s not what we need.’ Where it’s harder for the Director of Medical Services to say that from a political point of view.\textsuperscript{131}

Tailoring Roll Back Malaria recommendations to Kenya’s specific situation—the stated aim of the new malaria control strategy—meant in large part negotiating the competing interests of those entities required to fund malaria control activities.

In Kenya, the DFID-funded private voluntary organization Population Services International (PSI) ultimately had significant influence on the country’s malaria control activities.\textsuperscript{132} PSI carried out small-scale ITN social marketing projects in Kilifi in 1997 following KEMRI-Wellcome Trust’s large ITN trial in the area.\textsuperscript{133} Social marketing fit with trends in privatizing health services in Kenya and Africa more broadly through the implementation of user fees. This strategy, however, floundered in Kilifi. Just four months after PSI introduced a cost-retrieval system for insecticide treatment in Kilifi as

\textsuperscript{130} Ibid.
\textsuperscript{131} Ibid.
\textsuperscript{132} For more on the history and theoretical approach of PSI, see chapter 3.
\textsuperscript{133} Snow, Mwenesi, and Rapuoda, “Malaria situation analysis for Kenya,” 56.
part of its social marketing project, coverage of net re-treatment dropped from about 60% to 7%\textsuperscript{134}. Over 80% of mothers who did not bring their child’s net for retreatment claimed they could not afford the service, priced at 25 Kenyan shillings (less than one US dollar at the time). “Community financing mechanisms described in Tanzania (Makemba et al. 1995) and The Gambia (Mills et al. 1994),” KEMRI-Wellcome Trust researchers claimed, “require established village or community structures not well defined among the scattered settlement populations along the Kenyan Coast.”\textsuperscript{135} Yes, this drastic drop in coverage could have resulted from the fact that the population there had previously enjoyed free services as part of ITN research project. Nevertheless, issues with price expectation did not change the reality that for many people in Kilifi’s impoverished communities, “food often took priority over other expenditures for the limited household cash resources.”\textsuperscript{136} ITN social marketing did not yet prove its viability in Kenya.

In the end, though, those who put up the money directed how to move forward with ITN activities in Kenya. Drawing on money from the largest funder malaria control in Africa for the first four years of the twentieth century—DFID—PSI took on a leading role in shaping Kenyan malaria control policy. “Social marketing was the happy comprise by many to say that, ‘well, we’ll make poor people pay a bit and then they’ll value it and we will create that long term net culture,’” Bob Snow remembered. “I think all the evidence we had accumulated in Kenya, at least, [showed] they were all absolute failures in reaching coverage levels that were needed to impact transmission and make a

\textsuperscript{135} \textit{Ibid.}, 23.
\textsuperscript{136} \textit{Ibid.}
dent in malaria mortality.”\textsuperscript{137} Although Kenya’s MCU invited many partners to the table to help craft the country’s malaria control strategy, collaboration had its limits. According to one policy document, PSI “did not participate fully during the early consensus building exercise but rather preferred to present the social marketing case directly to the Deputy Director of Medical Services.”\textsuperscript{138} ‘Evidence’ from Kenya did not support social marketing, but donor funding did.

Therefore, while the Ministry of Health made some organizational changes following the launch of Roll Back Malaria, many elements of structural adjustment and health care reform remained embedded in Kenya’s malaria control policy. The government still had little money to devote to scaling up ITNs, malaria drugs, and other interventions. As with Bamako Initiative projects, the Kenyan government could not fund the procurement or distribution of these resources, leaving this task to non-governmental agencies, such as PSI. Instead, its primary goal in this new strategy was to create an “enabling environment” to facilitate the long-term growth of a commercial market in nets and insecticides.\textsuperscript{139} Following recommendations from Roll Back Malaria partners, it proposed to do so by lowering taxes on nets and insecticides to reflect the new “public health value” of these tools.\textsuperscript{140} According to the new strategy, the Ministry of Health would also be in charge of regulating commodities on the ITN market, and participate in

\textsuperscript{137} Bob Snow, interview with author.
\textsuperscript{140} Kenya Division of Malaria Control, “Insecticide-Treated Nets Strategy,” (Nairobi: Kenya Ministry of Health, February 2001), 11. Prior to state efforts to lower taxes and tariffs on bed nets, the government taxed these commodities as luxury goods. About 40\% of cost of nets was just from tax. The Kenyan government had increased taxes on “non-essential” imports, such as bed nets, substantially under structural adjustment in the 1980s as a strategy for redressing its balance-of-payments. Maxon and Ndege, “The economics of structural adjustment,” 175-176.
“demand creation” by funding Information, Education, Communication (IEC) activities. The Bamako Initiative in Kenya contained the seed of this market-based approach to ITN delivery—an approach which came into full bloom during the RBM era. Despite experiences showing cost-recovery schemes did not increase ITN uptake rapidly in Kenya, multilateral, bilateral, and NGO partners continued to support this approach in the country in the name of promoting “sustainable” public health programming. In this donor-dominated process of evidence-based policy making, only certain aspects of ITNs—namely their biomedical efficacy—seemed to require substantive demonstrations of proof. The politics of public health did not.

**Conclusion**

By tracking how and why Kenyan health officials incorporated ITNs into national health policy from the late 1980s to the establishment of Roll Back Malaria, this chapter has illuminated the shifting relationship between international, or global, health policy and national health policy in the late twentieth-century. Kenyan state officials began to reform the health sector according to the interests of international development agencies during structural adjustment. In doing this, they used ITNs to extend health services in the country on the cheap, relying on external donors to procure materials and on communities to sustain local ITN markets. In other words, state officials did not initially adopt ITNs for their medical utility alone, much less based on evidence from randomized controlled trials. Experiences from pilot projects with ITNs in Kenya showed that cost-recovery mechanisms hindered the uptake of this technology. However, patrons financing

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Kenya’s expanding malaria control activities continued to sell nets to at-risk populations, believing this was the only way to create a self-sustaining public health program in a country with such a meager health budget. Operational, or practice-based, evidence generated in Kenya dissipated as health and development agencies created a generalized, continent-wide malaria control policy. When Kenya’s Division of Malaria Control reintegrated global policy measures into national policy—a policy whose strategies would have to be supported by massive amounts of external funding—this evidence also fell by the wayside.

Finally, in exploring the adoption of ITNs in Kenyan health policy, this chapter has demonstrated the utility of using material artifacts as a window into the political goals and ideologies undergirding government policies and plans. Kenyan officials adopted ITN commodities to achieve a particular organization of people, things, and capital in Kenya—in this case, market-based health reforms promoted by the World Bank. They embraced a political imaginary of public health whereby citizens purchased and employed individualized commodities to combat a complex vector borne disease. For many reasons, ITNs did not effect the “transform[ations] of social and political lives” that Kenyan health officials and their international, donor partners imagined. Still, this ‘evidence-based’ technology embodied the political interests of the Kenyan state and

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their partners as much as it did scientific knowledge. For the Kenyan state, ITNs were not merely biomedical technologies; they were technologies of policy.
Chapter 5
Tinkering with Technology and Markets in the Scale-Up of Insecticide-Treated Nets in Africa

When I set out to do oral history research for this project, many interviewees and interested parties wanted me to answer the question of why it took so many years to scale up ITNs—an evidence-based, life-saving intervention—in Africa. Some felt this delay, widely publicized in scientific literature and the popular media, resulted in many needless child deaths that could have been prevented. By understanding the delay, they hoped, we might better understand how to take a public health intervention from evidence production to implementation quickly and spare those lives. The question of why the delay in ITN distribution is not the focus of my dissertation, which instead seeks to know how and why health officials scaled up ITNs on such a massive scale in the first place. However, in this chapter those questions merge, the reasons ITN roll out sputtered in the first half of Roll Back Malaria’s history being intimately linked to the reasons ITNs became so desirable: decentralization, market fundamentalism, and the politics (or anti-politics) of being a biomedical commodity in global health.¹

Combining insights from the anthropology of development and the sociology of international organizations, this chapter examines how Roll Back Malaria (RBM) policy was translated into public health practice. In particular, it attends to the ways in which the construction of ITNs as biomedical commodities during the 1990s shaped the way these technologies were later applied in malaria control projects and programs across Africa. RBM policies and guidelines did not simply dictate how African malaria control officials and their expatriate partners scaled up ITNs as a health intervention. Rather, as David Ferguson, The Anti-Politics Machine: “Development,” Depoliticization, and Bureaucratic Power in Lesotho (Cambridge: Cambridge University Press, 1990).

Mosse described in his case study of a rural development project in India, malaria control officials in large part had to “translate” their ITN activities into the language and goals of RBM to access donor funding.\(^2\) The extent to which malaria control program officials were successful in their translations, and in cultivating outside experts versed in the language and procedures of global health public-private partnerships, often meant the difference between enjoying ITN resources and struggling to do without. Heavily dependent on foreign aid to support malaria control activities, including ITNs, African health officials and expatriate ‘experts’ tailored ITN distribution strategies to models and criteria laid out by donors. The fact that experts in fields such as economics, business management, and marketing came to dominate malaria control policy implementation in the name of ‘efficiency,’ ‘accountability,’ and cost-effectiveness meant that many ITN distribution attempts did not address some fundamental operational issues in different African settings.\(^3\)

At the same time, the RBM Secretariat and World Health Organization/Roll Back Malaria Department (WHO/RBM)—members of which administered the extensive public-private partnership from Geneva headquarters—responded strategically to the demands of partners and donors to secure extra budgetary resources for RBM in Africa.\(^4\)


\(^3\) Other scholars have investigated the failures of so-called ‘experts’ in health and development to implement and carry out policies in specific places, which they connect to these experts’ lack of knowledge about specific, local conditions in places targeted for aid. Judith Justice, *Policies, Plans, and People: Foreign Aid and Health Development* (Berkeley: University of California Press, 1986); Timothy Mitchell, “Can the mosquito speak?,” in Timothy Mitchell, *Rule of Experts: Egypt, Techno-Politics, Modernity* (Berkeley: University of California Press, 2002), 19-53.

Doing so, leaders of the Secretariat and WHO/RBM translated the benefits, aims, and strategies for malaria control into the language of economic growth, free enterprise, and accountability—and more systematically, the Millennium Development Goals—while claiming a commitment to health development in Africa. As it became clear the success of RBM hinged on resources provided by donor partners, who themselves had varying and sometimes competing interests, WHO/RBM and the RBM Secretariat increasingly deferred to the efforts and priorities of these patrons. Consequently, RBM officials encouraged African countries to strengthen ITN markets and instigate behavior change in pursuit of health development in order to maintain ‘global’ political commitment to malaria control in Africa in the twenty-first century.⁵

But just as national, international, and non-governmental actors carried out ITN activities according to their opportunities and limitations for leveraging necessary resources, so too did African consumers take up ITNs according to their own constraints, priorities, and interests—a phenomenon I discuss in detail in the next chapter. Although Roll Back Malaria’s architects and partners called for, and maybe even imagined, the rapid scale-up of ITNs in Africa, continent-wide ITN coverage rates remained below 10% for the first six years of the RBM. Many people in the target groups for ITNs (pregnant women and children under five) did not purchase or sleep under bed nets for various reasons, including prohibitive costs, insufficient supply, and lack of physical access. Even those who bought untreated bed nets did not often make an effort to re-treat nets with insecticide regularly, as is necessary to achieve the full protective, public health effects of the technology. Scientists, manufacturers, donors, and program managers

⁵ Of course, for RBM officials, it was more important to secure commitment from certain governments—those of wealthy countries and countries seeking to reduce malaria—over others.
adjusted to consumer behavior, so to speak, by modifying distribution methods, subsidies, and ITN technology itself, making the now standard Long Lasting Insecticide-Treated Net (LLIN) with insecticides embedded in net fibers. Those groups involved in supporting malaria control activities, specifically the distribution of ITNs, in Africa tinkered with ITN technology and with the operation of ITN markets to address problems of low ITN coverage. In the midst of tinkering with ITN technology and markets, these groups reinforced constructions of malaria as a problem of personal and individual management rather than a systemic problem.

Historians of recent malaria control have described ITNs as being a biomedical technology and, certainly for the first years of RBM, a commodity, treating these identities or qualities as relatively stable. Historicizing ITNs and their identity as

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6 Other scholars have also examined how manufacturers around the world adjusted their practices to the tastes and consumption practices of African consumers. See for example, Jeremy Prestholdt, Domesticating the World: African Consumerism and the Genealogies of Globalization (Berkeley: University of California Press, 2008).

7 Historians of technology have recently embraced the concept of ‘tinkering’ in their work as a way to draw attention to people often omitted in histories of technology, such as mechanics and repairmen. This has been especially true for historians of technology in Africa, who have looked at how Africans creatively work to keep machines running when wholesale replacement appears out of the question. However, few historians of technology have applied the concept of ‘tinkering’ to markets, depicted in economic thought as a self-contained, self-regulating ‘mechanism’ or machine. David Edgerton, “Maintenance” in The Shock of the Old: Technology in World History (Oxford: Oxford University Press, 2007), 75-102; Joshua Grace, “Modernization Bubu: Cars, Roads, and the Politics of Development in Tanzania, 1870s-1980s,” Ph.D. Thesis, Michigan State University, 2013; Marissa Mika, “Research is Our Resource: Surviving Experiments and Politics at an African Cancer Institute, 1950 to the Present,” Ph.D. Thesis, University of Pennsylvania, 2015.

8 ITNs came to represent a neoliberal vision of public health that contrasted with the political vision embedded in indoor residual insecticide spraying. Those experts who promoted vector control through house spraying into the 1990s, such as Dr. Stamps, Zimbabwe’s Minister of Health and Child Welfare described in chapter 3, viewed malaria control as a centralized, state-organized public health program, as opposed to a decentralized, market-based activity characteristic of many ITN programs. For more on the historical intersections between different malaria control strategies and political-economic interests, see Randall Packard, The Making of a Tropical Disease: A Short History of Malaria (Baltimore: Johns Hopkins University Press, 2007).

biomedical commodities, however, opens up a window for viewing how different people and groups mobilized and shaped this identity to translate their pursuit of malaria control into the language of patrons and policy makers.\(^\text{10}\) I do that in this chapter, exploring how officials rolled out ITNs as ‘evidence-based’ technologies in Africa during the first decade of RBM, by weaving in and out of institutions, relationships, people, things, and ideas in rough chronological order. Since Roll Back Malaria was tightly linked to development and the development enterprise, I begin by situating the RBM partnership in the context of international development in the twenty-first century. Next, I examine the fractured, decentralized efforts to scale up ITNs in Africa through primarily market based approaches. I then look at the massive increase in funding for malaria control with the advent of the Global Fund to Fight AIDS, TB and Malaria, the World Bank Malaria Booster Program, and the Bill and Melinda Gates Foundation, and how these institutions, their interests, and their practices shaped ITN roll out in Africa. I also explore the emergence and approaches of humanitarian organizations dedicated to malaria, and in some cases ITNs specifically. Finally, I provide two case studies of places that at one point represented the model for scaling up ITNs in Africa: Tanzania and Zambia. Their juxtaposition not only highlights the changing trajectory of RBM’s approach to ITNs in Africa’s malaria control, but also the critical role funding and funding mechanisms have played in shaping public health on the continent.

\(^\text{10}\) For another treatment of how different groups of stakeholders located across the globe defined and redefined a medical object as a global commodity, see Matthew James Crawford, *The Andean Wonder Drug: Cinchona Bark and Imperial Science in the Spanish Atlantic, 1630-1800* (Pittsburgh: Pittsburgh University Press, 2016).
Roll Back Malaria and Development in the New Millennium

The context of development and health sector development in particular informed the trajectory of ITNs and malaria control activities in Africa. The fact that the WHO and African national health officials had to draw on the money and resources of the World Bank and bilateral development agencies to finance malaria control meant these former groups had to translate their aims into the language of development.\footnote{Mosse, Cultivating Development.} To understand the implementation of Roll Back Malaria ITN policies, therefore, it is necessary to understand prevailing approaches to development in the twenty-first century, and how leaders of the RBM drew on such approaches to advance malaria control in Africa. In trying to secure and deploy resources, as well as maintain its authority as the “brand and image as the global voice for malaria,” the RBM Secretariat constructed the problem of malaria as one amenable to individualistic interventions targeted towards biological survival and personal material prosperity.\footnote{Organization Futures LLC, Report, “RBM Malaria Partnership Global Advocacy Meeting, 1-3 September 2004, World Bank Headquarters, Washington, DC,” 2004, 2, WHO Archives, Geneva, File M50-370-4, Jacket 2.}

The effects of structural adjustment policies in the 1980s and 1990s reverberated in Africa and African health systems into the twenty-first century. Yet the World Bank’s position on development did not remain completely stable during this period. In the mid-to late 1990s economists at the Bank, including Chief Economist Joseph Stiglitz, began to question the neoclassical economic model guiding Bank policies in the 1980s. This older model, often dubbed the ‘Washington consensus,’ positioned the free market in opposition to the state and as the ideal mechanism for economic development and governance in low-income countries. Due partly to the limited or, according to critics,
detrimental effects of structural adjustment policies—in other words, market failures—
Stiglitz pushed a modified orientation to development. This ‘new’ orientation, dubbed the
‘post-Washington consensus’ or ‘new development economics’ did not do away with
market fundamentalism.13 Rather, it acknowledged that in practice, the market contained
imperfections. These imperfections, economists claimed, stemmed from incomplete
information, or “knowledge gaps,” and incomplete markets. The state could come in to
help fill in the knowledge gap to facilitate the functioning of markets. During this period,
as an example, development agency partners encouraged Kenya’s Ministry of Health to
carry out Information, Education, Communication (IEC) campaigns about the biomedical
benefits of ITNs to Kenyan populations in social marketing schemes, but not to actually
provide public health interventions to citizens (see chapter 4).14 The new development
economics privileged microeconomics—including the study of decision-making behavior
of individuals, market mechanisms, and market failures—along with institutional reform.
In addition, the paradigm carved out a new, complementary role for the state in public
health, one in which the state worked to strengthen and make public health markets
efficient.15

The new development economics, however, maintained the methodological
individualism underpinning the Bank’s neoclassical economic approach of the 1980s.
This methodological individualism posits that the economy is made up of an aggregation

13 Ben Fine, “Neither the Washington nor the post-Washington consensus: An introduction,” in Ben Fine,
Costas Lapavitsas, and Jonathan Pincus, eds., Development Policy in the Twenty-First Century: Beyond the
Post-Washington Consensus (London: Routledge, 2001), 1-27; Gerald M. Meier, Biography of a Subject: An
14 This relationship, of course, also reflected industrialized countries’ (particularly the United States’ and
United Kingdom’s) embrace of new public management strategies in health care provision.
15 Fine, “Neither the Washington nor the post-Washington consensus”; Meier, Biography of a Subject, 118-
128.
of individual agents all trying to maximize utility and value. Within this theoretical framework, individual consumer behavior, such as purchasing and using ITNs for malaria control, is the main target of intervention. This framework rests on the assumption that if consumers are armed with knowledge about the biomedical benefits and value of ITNs, then they will engage in and strengthen ITN markets. “Concepts such as class and power,” Ben Fine has argued, “cease to have any purchase” in this framework; it provides little room for historically conditioned relations in conceptions of poverty and ‘the poor.’

As a leader not only in development but also in global health financing during the 1990s and 2000s, the World Bank perpetuated this methodological individualism in approaches to disease control and poverty reduction. This helps explain the seeming contradiction between development agencies’ increased attention to pro-poor policies and malaria as a disease of the poor (of people who cannot afford to spend even $5 on a bed net), and their support of ITN social marketing, behavior change strategies shown in pilot projects to exclude the poorest members of society.

Roll Back Malaria emerged in this context of late twentieth-century international development, one which privileged decentralization in low-income countries as well as in ‘global’ public-private partnerships such as RBM. While the United Nations (UN) enjoyed more prominence in global decision making during the 1990s than it did during the 1980s, governments of industrialized countries still looked upon the UN system with distrust and disdain. Many countries saw declines in resources for development aid, whether due to the global recession or, as in the case of the United States, political aversion to foreign aid. Furthermore, during the post-Cold War era the U.S. Agency for

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International Development (USAID) could no longer justify foreign development aid in the name of curbing communist influence, making it more difficult to convince U.S. lawmakers to fund interventions abroad. Partly because, as one RBM member pointed out, aid flows were “subject to global markets, economic performance, political and policy changes with changing values for social investment such as health,” the global public-private partnership pushed forward with malaria control on somewhat precarious footing.

Industrialized countries displayed a new willingness to fund health development activities abroad going into the twenty-first century. One sees this in G8 countries’ stated commitment to help fight malaria at their 1998 Birmingham Summit (see chapter 3). However, much of donor countries’ approach to development investment, including new public management solutions; market-based, pro-growth solutions to poverty; and the valorization of accountability and efficiency, remained the same. During a time when many low-income countries continued to struggle under the weight of debt obligations, the priorities and goals of rich countries and loan-granting institutions drove international development. As essential patrons and partners of Roll Back Malaria, which primarily served as a funding coordination mechanisms and provider of technical and operational

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18 Meeting Report, “Improving the Effectiveness of Health Investments in Developing Countries: How is Performance-Based Funding Working?,” June 2005, 2, WHO Archives, File M50-370-13, Jacket 1.

19 Hulme, “The Millennium Development Goals (MDGs).”
support rather than a source of funding itself, wealthy countries and agencies heavily shaped malaria control strategies and ITN distribution in Africa.  

The Millennium Development Goals (MDGs) crystallized many of the trends and changes unfolding in the arena of international development. Derived from the UN Millennium Declaration of 2000, the MDGs were a set of goals and measurable, time-bound subsidiary targets aimed at reducing extreme poverty around the globe. Providing a guideline for poverty reduction, the MDGs were supposed to galvanize development agencies, NGOs, and private voluntary organizations (PVOs) around a common agenda—much in the way RBM was supposed to galvanize partners around a common approach to malaria control. World leaders widely adopted the MDGs as a framework for global development policy and agreed to work towards meeting the eight goals by 2015. These goals—developed shortly after African and WHO health officials brought renewed attention to the need for malaria control—including reducing child mortality, improving maternal health, and “combat[ting] HIV/AIDS, malaria, and other diseases.” This meant NGOs, private companies, university groups, and governments could now justify funding malaria control in the name of meeting international development goals. RBM benefited from the inclusion of malaria reduction as an overarching development goal. At the same time, the partnership took on new responsibilities in informing Poverty Reduction Strategy Papers (PRSPs) and debt relief initiatives for heavily indebted poor countries.

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20 According to statistics from 2001, the WHO regular budget only comprised about 10.7% of the RBM budget. The U.K., on the other hand, provided roughly 58% of the budget and continued to provide over 50% of RBM’s budget at least through 2003. In 2005, RBM Director Fatoumata Nafo-Traoré stated that over 90% of RBM’s funding came from voluntary contributions by donors. David Alnwick, Development Grant Facility (DGF) FY 2003 DGF Application Form for Roll Back Malaria, 2002, WHO Archives, File M50-372-2, Jacket 1; Memo, Dr. Fatoumata Nafo-Traoré, to Director of DDC/AFRO, February 25, 2005, WHO Archives, M50-372-2, Jacket 2.

(HIPC).\textsuperscript{22} As products widely accepted to reduce child mortality and severe malaria, ITNs enjoyed a dual identity as a technology of health and technology of development.

Having targets and goals, especially those achievable through the mass provision of a public health commodity, was important to RBM’s survival as the agency sought to attract partners. Unable to fund RBM with the WHO regular budget, the WHO established RBM as a partnership and coordinating mechanism that would facilitate the mobilization of malaria control resources in affected countries. RBM opened the floodgates for more, large public-private partnerships in disease control, where each institutional partner “work[ed] independently, but in concert, contributing where they have comparative advantage or interest.”\textsuperscript{23} Drawing on the economic theory of ‘comparative advantage’—an oft cited rationale for RBM’s organizational approach—RBM officials presented the public-private partnership as critical to the long-term operation of malaria control. “To ensure the sustainability of a new effort to control malaria,” one donor agency stated in its agreement with WHO-RBM, “involvement has been expanded beyond the traditional organizations and institutions to include innovative alliances across the public sector and with private sector entities.”\textsuperscript{24} ITNs could bring

\textsuperscript{22} The IMF and World Bank initiated the HIPC Initiative in 1996, an initiative in which the two agencies were supposed to provide low-interest loans to HIPCs in order to cancel or reduce external debt payments. The IMF and World Bank then developed the concept of Poverty Reduction Strategy Papers, documents countries must provide to access relief through the HIPC initiative which detail how the country will work to reduce poverty through the implementation of specific economic, social, and structural policies. PRSPs became folded into countries’ efforts to meet MDGs and, as such, RBM targets. For PRSPs in RBM, see RBM, Terms of Reference with Malaria Consortium, “Consultancy to develop a background paper for the Fourth Global Partners’ Meeting of Roll Back Malaria. The role of Poverty Reduction Strategy Papers (PRSPs) in supporting country plans to Roll Back Malaria,” 2001, WHO Archives, File M50-87-9, Jacket 1.

\textsuperscript{23} Annex “A,” “Contribution arrangement between her Majesty the Queen in Right of Canada and the World Health Organization. Roll Back Malaria in Africa Phase 1,” [undated], 8, WHO Archives, File M50-372-2, Jacket 1 [to Dec. 2002].

\textsuperscript{24} Ib\textit{id}. 

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ITN manufacturers, marketers, and distributors together with multi- and bilateral donors who wanted to make the most efficient use of malaria control resources.

Since RBM was also a so-called ‘pathfinder’ program of the WHO, an experimental bureaucratic entity intended to coordinate and facilitate aid for national antimalaria activities, RBM officials spent a lot of time and resources simply constructing the bureaucracy and convincing partners of its effectiveness. Following both internal and external reviews of RBM, RBM staff noted that little accountability existed among partners, some of whom carried out activities in an ad-hoc manner or lapsed on funding commitments.  

RBM officials tried to fix this by creating new online databases to improve work flow and data sharing about partner activities, developing survey instruments to elicit partner feedback on strengths and weaknesses of RBM, and securing commitments from partners to provide updates on investments. RBM had to sell its ‘business plan’ as well as its technical malaria control strategy as viable to potential partners.

RBM officials also tried to promote the idea of endemic country ‘ownership’ of the RBM movement and partnership, helping countries develop ‘inter-agency coordination committees,’ country business plans, and financial management arrangements for accessing malaria control resources. In fact, RBM documents sometimes referred to endemic countries as “clients,” a business term which suggests that countries can ask for what they want but obscures the fact that patrons with diverse

interests have almost all the power to decide what countries can ask for.\textsuperscript{28} For instance, the World Bank, one of largest potential donors for global malaria control and the agency with the greatest “comparative advantage” in assisting African countries manage new public health funding, “d[id] not operate in the world’s most malarious counties.”\textsuperscript{29} Most countries, moreover, did not qualify for the Bank’s complex, “very difficult to access” loans for RBM. “It is important to note,” one RBM official emphasized, “that there continues to be a disparity in the argument put forward by the World Bank, “money is not the issue,” and that put forward by the countries’, “money is the issue.””\textsuperscript{30} Such tensions underline that while “Coordination can appear to be a technical exercise whose function is to improve the division of labor, increase specialization, and heighten efficiencies […] this coordination, like all governance activities, is a highly political exercise, defined by power.”\textsuperscript{31} Indeed, as more funders joined the RBM movement and set their agendas and priorities, it seemed to some in the malaria control community that “countries were ignored throughout all of that process.”\textsuperscript{32}

Members of the RBM Secretariat and WHO/RBM Department navigated and sought to cultivate partnerships in this evolving funding environment to reduce malaria in Africa. They considered portraying malaria control as a good investment especially important given the competition within this funding environment, where wealthy donors overwhelmingly gave to HIV/AIDS programs and were being courted through campaigns to fight tuberculosis and other ‘diseases of poverty.’ Advocacy materials from RBM

\textsuperscript{28} See chapter 3 and the discussion of Country Coordinating Mechanisms later in this chapter.  
\textsuperscript{30} \textit{Ibid.}, 2.  
\textsuperscript{32} Bob Snow, interview with author, Nairobi, August 6, 2015.
illustrate program leaders’ anxieties about such competition. A report for one 2004 RBM advocacy meeting, for example, noted that, “Malaria doesn’t directly “touch” the north, making malaria less immediately compelling to northern audiences already being reached by strong messages on HIV/AIDS and other diseases such as TB and cancer.” In order to bolster the standing of malaria and RBM itself, the report continued, RBM officials had to convert the partnership into a movement and “Believe we have the power – that we are as important as the HIV/AIDS movement.” ‘Branding’ the RBM strategy in a similar way to Directly Observed Therapy, Short-course (DOTS) in the STOP TB campaign, the report’s authors felt, would be one way to do so.

Realizing donors wanted to see the impact of their dollars quickly, RBM officials also encouraged African countries to triage malaria control programs strategically. A 2001 template draft letter to Ministries of Health concerning RBM funding highlights the necessity of investing in ‘quick wins.’ “We believe these funds [funds provided by RBM and WHO-AFRO] can be used to leverage substantial additional internal and external resources for tackling malaria,” the letter read. “We would like these funds to be applied to helping start implementation of the part of the [Malaria Control] strategy that you feel is most likely to yield rapid and demonstrable success.” This need for visible success

appeared in recommended publicity strategies for RBM advocates, strategies such as, “Build on success: publicize successes, publish accomplishments, report results! Avoid public blame.”\(^{36}\) RBM Project Manager, David Alnwick, reinforced the importance of monitoring indicators, such as ITN coverage, in a Development Grant Facility Application Form as well. “Monitoring and evaluation of RBM action at country level,” Alnwick explained, “will be intensified, based on key outcome and impact indicators, to mobilize partnership and international support to the populations in greatest need.”\(^{37}\)

Given many states’ slow switch to effective antimalaria drugs in their drug policies—partly due to high drug costs—and the lack of easily measurable indicators for RBM-informed strategies, ITNs and achieving ITN coverage goals became critical to attracting money and attention to malaria control in Africa.

RBM officials also marketed malaria control using arguments about malaria as a cause of poverty. This strategy fit into the WHO’s broader approach to marketing global health to development agencies, embodied in Director-General Brundtland’s creation of the Commission on Macroeconomics and Health in 2000. Chaired by economist Jeffrey Sachs, this Commission was supposed to examine the links between health and macroeconomic issues, and articulate the value of investing in global disease control. Sachs and fellow economist, John Gallup, published a widely influential paper in 2001, “The economic burden of malaria,” as part of the Commission’s work. The article used data on GDP and economic growth to argue the malaria slowed growth and caused

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poverty.\textsuperscript{38} RBM, the WHO, and the World Bank made the article and some of Sachs’ other writings available on their websites, spreading this rhetoric on malaria and economic development.\textsuperscript{39} The author of a 2001 RBM State of the movement report recapitulated points made by the two economists’ argument, saying, “While RBM is many ways a humanitarian movement, it also recognizes that malaria […] is not just a major health issue affecting the poor, but a development one as well – perpetuating poverty.”\textsuperscript{40} In addition, such arguments about malaria and economic growth dovetailed with international promotion of the MDGs. In fact, RBM officials suggested messages for their partners to employ to mobilize resources that included, “essential for reaching the MDGs,” “Tackle malaria, tackle poverty,” and “Roll Back Malaria, Roll in Development.”\textsuperscript{41}

Yet another way RBM officials advocated for malaria control was by invoking the availability of existing tools to combat the disease. They stressed in their advocacy messages that malaria was preventable, curable, and controllable with available tools, such as ITNs. Such a message remains central to many global disease control marketing campaigns.\textsuperscript{42} They also invoked language of what Peter Redfield has called, “minimal biopolitics,” or action taken to govern the life and death of a population, but only to


\textsuperscript{39} Packard, \textit{The Making of a Tropical Disease}, 225.


\textsuperscript{41} While working in the WHO archives in March 2015, I overheard the making of a STOP TB advocacy video in which the video’s directors coached a medical expert on tuberculosis to deliver the STOP TB sales pitch. This sales pitch included that tools and strategies capable of wiping out TB already existed; all public health officers needed, in theory, was more money to purchase and implement these tools.
maintain people’s physical existence, or the bare minimum of life (i.e. survival). Their proposed advocacy message, “One child, one net, one life saved,” pithily captures this minimalist biopolitical approach to malaria control.

The equation of an ITN with the survival of a child, which I refer to as the biological use value of ITNs, grew out of epidemiological ITN research of the past decade, including KEMRI-CDC researchers’ explicit calculation of “lives saved” for their publication of Siaya trial results. Scientists and program staff realized the contingencies of this equation, and that ITNs would not work as well in ‘real world conditions’ as in controlled experimental conditions. Exigencies of attracting external funding for malaria control through the creation of time-limited, measurable targets and demonstrations of project success, however, drew attention and energy away from these concerns. Reaching RBM’s ultimate goal of halving malaria by 2010 was quickly reduced to reaching intermediate coverage targets of interventions by 2005 using any money available and almost any means necessary. The diverse array of public, private, and non-governmental partners who joined WHO in efforts to roll back malaria focused on exercising their comparative advantage and expertise, which in most cases related to marketing, business management, or microeconomics rather than the technical aspects of malaria or health systems. Those who were familiar with the complexities of malaria in Africa or running ITN cost-recovery projects in impoverished areas did not necessarily

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forget about the complexities of disseminating ITNs; however, they had limited room to maneuver under pressure to attract funding and scale up ITNs on national scales quickly.

**Searching for ITN distribution methods in the early years of Roll Back Malaria**

Roll Back Malaria attracted new interest and funding to malaria control in Africa. However, the partnership did not secure anywhere near enough funding to deal with factors health officials knew exacerbated malaria on the continent, including “weak health systems; large population movements; deteriorating sanitation; climatic changes and spreading drug resistance.”

Nor did the partnership secure enough resources to provide full subsidy for select, individualized interventions such as ITNs, at least during the first five to six years of the program. Due to the lack of resources, lack of experience with large-scale ITN programs, and the heavy influence of patrons who supported new public management and behavior change frameworks on public health service delivery, RBM partners agreed to encourage African countries to scale up ITNs through commercial markets. Promoted as a “sustainable” approach to ITN programming, commercial marketing reflected and further entrenched the market determinist underpinnings of health development in Africa. As a health care delivery mechanism, commercial marketing also rested on the consolidation of ITNs as biomedical, life-saving objects reduced to their effects on individual, biological survival.

State and non-governmental organizations distributed, and even sold as commodities, insecticide-treated nets in Africa prior to the introduction of Roll Back

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Malaria. Building on work by the British Medical Research Council, the Gambian government initiated a National Impregnated Bed Net Programme in 1992 in the context of an ITN effectiveness trial (see chapter 1). They introduced ITNs into all large villages through the country’s primary health care program, focusing on distributing free insecticide and promoting the benefits of insecticide-treated bed nets to prompt people to adopt net re-treatment as a health behavior. Later in the trial period, researchers and health officials introduced a small fee for insecticide treatment; treatment rates dropped dramatically as a result.\textsuperscript{48} Researchers and health program officials encountered similar problems with getting people to pay for insecticide treatment after first providing insecticide for free in places like Eritrea, Ghana, and the Kenyan coast.\textsuperscript{49} Those involved in international malaria control and RBM interpreted this data to mean that it would be difficult to convince African consumers to regularly treat bed nets with insecticide, and that one could not expect people to pay for a commodity after they had received it for free in the past.\textsuperscript{50} Such anxieties continued to inform discussions and debates about ITN distribution, making RBM partners wary of trying out free distribution on even a small scale.


\textsuperscript{50} This argument was related to the idea of many American and European economists at the time that people would not value ITNs if these products did not have a price. For a discussion of these issues, see Christopher Curtis, et al., “Scaling-up coverage with insecticide-treated nets against malaria in Africa: who should pay?” \textit{Lancet Infectious Diseases} 3, no. 5 (2003): 304-307, 306; Warren Stevens, “Untangling the debate surrounding strategies for achieving sustainable high coverage of insecticide-treated nets,” \textit{Applied Health Economics and Health Policy} 4, no. 1 (2005): 5-8.
The Gambia was rather exceptional in having national-scale ITN activities during the 1990s, a condition made possible by the country’s small size and support from expatriate partners. Nearly all other African countries that engaged in ITN distribution activities during the 1990s did not have nation-wide programs, relying instead on NGOs and research institutions to help run small-scale, ‘community-based’ cost-recovery projects. Many of these pilot projects did not actually go very far, providing more information on obstacles and problems of ITN distribution than on ways to successfully overcome those obstacles.\(^{51}\) “To date, there has been little to no documented experiences to guide successful programme implementation,” WHO/RBM officials wrote in 2000, recommending operational research on ITN distribution in countries about to undertake large-scale ITN implementation.\(^{52}\) Given the vacuum in leadership on operational research, described in chapter 3, in practice, figuring out what worked and what did not with ITN distribution fell into the hands of NGOs and PVOs carrying out distribution activities.

To make matters even more complicated, RBM officials wanted to scale up and monitor malaria control interventions in areas with no or weak health surveillance systems in place. Members of WHO/RBM recognized that one of the biggest challenges to the RBM initiative was “the inaccuracy of information on clinical cases and death due to malaria,” a result of irregular and under-reporting.\(^{53}\) As such, they recommended utilizing existing demographic surveillance sites to track reductions in mortality against

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\(^{51}\) For more on this, see chapter 4.
\(^{52}\) Agreement for Performance of Work between WHO/RBM and Dr. Fred Binka, March 2000-May 2000, WHO Archives, File M50-87-5.
the introduction of malaria control interventions. Specifically, the Department sought to support and extend the INDEPTH network, comprised of sentinel demographic surveillance sites across the continent. The INDEPTH network even included, thanks to KEMRI-CDC’s malaria research, Asembo and Gem (see chapter 2). “Community-based information on prevention and treatment practices will be critical for monitoring the effectiveness of related RBM interventions,” WHO/RBM officials claimed, especially since many people in highly endemic, resource-scarce areas often treated malaria in their homes.54 With few resources to support the strengthening of health and demographic surveillance systems in Africa, RBM officials relied on such agencies as UNICEF, PSI, and other NGOs to carry out surveys that measured malaria indicators, among other things. Such surveys included, for example, social marketing groups’ commodity availability surveys (used in RBM rapid assessments) and UNICEF’s Multiple Indicator Cluster Survey, initially designed in the mid-1990s to track progress towards child health and development goals. In some ways, WHO/RBM was piecing together a global malaria control program from existing fragments on the ground.

Indeed, in countries where small ITN projects did take place during the 1990s—including Kenya, Tanzania, and Zambia—health officials, researchers, NGOs, and PVOs set up and largely carried out distribution activities. Population Services International (PSI) played a significant role in this regard, working across the continent on ITN social marketing projects. USAID “marketed” this private sector approach to other donors, getting the U.K. Department for International Development (DFID) to invest in ITN

54 Ibid.
social marketing and PSI in the 1990s. While social marketing and supply-side approaches to contraceptive delivery did not prove very successful in family planning programs of the 1960s, PSI did enjoy some success social marketing condoms in Africa for HIV/AIDS prevention in the early 1990s—an effort ITN programmers looked to for inspiration when deciding to socially market ITNs. Furthermore, bilateral development agencies found social marketing desirable in the 1990s since this approach provided them an opportunity to cut down on expenditures. Social marketing allowed donor agencies and governments receiving aid, both of whom operated on shrinking budgets in this period, to forego “much of the infrastructure development (and costs) associated with other approaches to service delivery expansion.” Especially since many African countries did not have the infrastructure required to carry out large-scale malaria control, RBM policy makers and partners promoted the consensus view that “demand creation for ITNs” (by making ITN supplies available to intended consumers) “is the fundamental way of going to national scale.” “The long term vision for RBM,” one member of the Malaria Consortium summarized, “is a vibrant and competitive commercial sector

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56 For more on the limitations of social marketing and supply-side approaches in family planning programs, see Packard, “Rethinking Family Planning” in A History of Global Health, 215-225; Michelle Murphy, Economization of Life (Durham: Duke University Press, 2017), 60-72. For more on the connection between condom and ITN social marketing programs, see chapter 3.


supported by a functional public-private partnership for making nets and insecticides accessible and affordable to populations at risk of malaria infection.”

For multiple reasons, social marketing projects of the 1990s did not achieve high ITN coverage among those most at risk for malaria, even on a sub-national scale. Most notably, researchers and NGOs recognized that cost of nets and re-treatment services were prohibitive even if seemingly small (see chapters 3 and 4). “ITNs are a public health good but very few people are currently protected by ITNs,” one RBM consultant noted. “Governments cannot afford to provide free or even subsidised nets and insecticide for all.” The fact that many target consumers did not understand the public health meaning or significance of ITNs, especially the insecticide treatment, compounded the problem of low rates of uptake. Furthermore, agencies noted, “in the relatively poor economic climate present in many of the countries, children are given low priority in the use of such perceived “luxury” items.” Due to the inchoate nature of ITN programs and low consumer demand in Africa, ITN manufacturing and marketing remained a high-risk business with low profit margins. As a result, national malaria control programs in Africa struggled to secure steady supplies of ITNs required to meet RBM coverage goals.

Having proclaimed ITN coverage one of RBM’s three main interventions (alongside prompt diagnosis and treatment and presumptive therapy for pregnant women) and one of four “global indicators,” RBM officials tried to address the ITN supply

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60 Ibid.
problem in a couple of ways. Unsurprisingly, though, all of RBM’s strategies for promoting increased ITN coverage aimed to facilitate the growth of ITN markets in Africa and reflected neoliberal economic principles prevalent at the time. On the level of policy, RBM partners called on African countries to reduce or waive taxes and tariffs on ITNs, making insecticide and net commodities less expensive to import. Tariff reduction constituted such a fundamental aspect of Roll Back Malaria in Africa that it appeared in the Abuja Declaration to Roll Back Malaria in Africa. Members of the malaria control policy community also pursued the possibility of developing domestic ITN manufacturing on the continent, an activity which SiamDutch and other Asian companies had historically dominated. Having secured a large allotment from the Canadian International Development Agency (CIDA), Canada’s International Development Research Council (IDRC) provided money to the PVO, Program for Appropriate Technology in Health (PATH)-Canada and its director Tim Stone to conduct an ITN market analysis of Africa. Analysts found that it was possible to build ITN manufacturing on the continent. However, as Jo Lines recalled regarding his investigation of the viability of ITN manufacturing in Nigeria, donors often chose to invest in cheap commodity imports rather than in manufacturing infrastructure. As a result, only a few places in Africa, most notably Tanzania, actually fostered a domestic ITN manufacturing industry.

64 Don de Savigny, interview with author, online (skype), July 7, 2015.
Additionally, RBM welcomed partners from the private and non-governmental sectors who sought to engage in ITN activities and bolster ITN commercial markets in Africa. Drawing on funding and support from DFID—the largest patron of RBM for the program’s first five years—PSI remained heavily involved in ITN distribution and social marketing in a number of African countries during the twenty-first century. PSI’s approach consisted of behavior change communication activities—essentially, advertising the behavior of sleeping under and (insecticide) treating ITNs—and providing subsidies for net and insecticide commodities. RBM officials and consultants felt that PVOs such as PSI were much better suited and resourced to undertake behavior change communication than, for example, Ministries of Health, which often had little expertise in marketing and advertising. Bed net programs using targeted subsidies, one Malaria Consortium report explained, “will need to run a generic promotion campaign alongside the distribution of ITNs. This is likely to be most effective if contracted out to a professional social marketing or communications organisation, with the necessary skills and experience to do this well.” PSI did market specific products in different countries, including ‘Supanet’ bed nets and ‘Power Tab’ insecticide in Kenya and ‘Zuja Mbu’ nets in Tanzania. However, RBM program consultants seemed particularly drawn to the generalizability of PSI’s activities, valorizing the organization for its “systematic approaches” along with its ability to undertake “formative research” to tailor generic messages to particular markets.

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67 Ibid.
68 Ibid.
Social marketing was not the only approach PVOs and NGOs used to help scale up ITNs in Africa. USAID funded commercial marketing-focused programs through the PVOs, Basic Support for Institutionalizing Child Survival (BASICS) and NetMark, the latter of which launched in 1999 solely for the purpose of disseminating ITNs. “The BASICS approach,” members of RBM’s ITN Resource Support Network explained, “differs from many social marketing models in that it targets full-scale engagement of the commercial sector from the start in a commercially viable operation.”69 Essentially, the approach rejected subsidies for ITN commodities on the grounds that “in many countries public sector resources are used disproportionately by populations who could afford to pay for products and services in the commercial sector, creating a situation of unnecessary subsidy and limiting reach to those with the most need.”70 A main draw of this approach was that “eventually all donor and NGO support should become unnecessary, allowing them to better focus on very poor populations who are not able to procure products through the commercial sector” (emphasis my own).71 Of course, ITN Resource Support Network members stressed, all ITN commercial activities should be done under the “auspices” of national governments, which figured very marginally in these imaginaries of commercial marketing distribution strategies, much as they did in health care reform under structural adjustment.72 


70 Ibid.

71 Ibid.

72 Ibid.
It is worth looking at NetMark a bit more closely since this public-private partnership highlights how USAID sought to tinker with markets to promote ITN-based malaria control in Africa.\(^73\) Within NetMark, USAID supported a matching fund scheme for companies engaged in ITN-related activities, along with generic behavior change communication activities, to increase the commercial supply and public demand for ITNs in Africa. NetMark drew on the expertise of people who specialized in behavior change communication. Preferring to use generic, generalizable messages uninformed by specific circumstances in relevant regions, the organization targeted foreign-produced ITN advertising campaigns to wealthy consumers.\(^74\) Although these consumers fell outside the main target group for malaria control interventions, their purchases were supposed to stimulate ITN market development and ultimately lower prices on commodities for poorer populations, who most needed these products. NetMark also developed partnerships with commercial net and insecticide manufacturers and African distributors to share the risks of developing ITN markets, identify and reduce barriers to effective engagement of the commercial sector, and expand the availability of affordable ITNs by creating demand. In other words, the agency sought to use “strategic investments” to piece together ITN markets, thereby “develop[ing] systems for ensuring long-term availability of ITNs for households and communities in Africa.”\(^75\) The idea that ITNs were “the most practical and effective means for protecting the largest percentage of populations” living in the highest risk areas of Africa, seen in their ability to “cut all-

\(^{73}\) In RBM’s early years, certainly, USAID did not fund artemisinin combination therapy or other antimalaria drugs.


\(^{75}\) Dr. Anne Peterson (USAID), Testimony before the Subcommittee on Africa Committee on International Relations House of Representatives, September 14, 2004, WHO Archives, File M50-372-2, Jacket 2.
cause child mortality by 17-63%,” was key to authorizing NetMark and its market-based approach to public health service delivery. In the end, NetMark’s and BASICS’ participation in ITN distribution did not last through the decade, as donors such as the Global Fund supported and rallied behind free mass distribution campaigns.

Emphasis on scaling up ITNs through markets, and rejiggering markets to make this approach work, inflected malaria control efforts in interesting ways. ITN program and project managers and RBM reports frequently discussed the health of and threats to ITN markets. Questions about maintaining the health of ITN markets emerged particularly in conversations about introducing targeted subsidies for ITNs, which, if not managed correctly, could “crowd out” or “damage” fledgling markets. Again, strengthening and expanding the commercial sector remained an important pillar of RBM’s ITN strategy, with the aim of “promot[ing] long term sustainability and a culture of ITN use.” Social marketing with subsidized commodities, a distribution method popular with PSI, was not sustainable in such a system. According to those promoting commercial sector approaches, social marketing was best used for ‘pump-priming’ the market in areas where people were either unfamiliar with or did not purchase ITNs. Since agencies involved in scaling up ITNs could more easily track commodities and market inputs and outputs than they could malaria morbidity and mortality, they often knew more about the health of markets than they did the health of people.

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76 Ibid.
78 Ibid., 1.
79 Pump-priming refers to the process of stimulating economic activity though investment. In theory, investments in subsidized ITN commodities through social marketing were supposed to generate demand among African consumers, who would then desire ITNs enough to pay the full market price for the product(s).
Technologically determinist assumptions that treated nets would bring about positive health outcomes on their own, an assumption bolstered by statistical, randomized controlled trial results, further encouraged this narrow attention to ITN markets.

Behavior change communication, analysts noted, had also not reached its potential in RBM’s early years. For one, many countries’ social marketing programs centered early messages around the idea that malaria was a problem African consumers should address. In Tanzania, for example, communities living near communal bed net re-dipping sites did not go to have their nets treated with insecticide even though they knew why and where to get the treatment.80 “It is clear that informing and educating people are not sufficient bases for behavioural responses,” one RBM paper on ITN communication stated. “Behavioural impact will emerge only with effective communication programmes, purposively directed at behavioural goals, and not directed just at awareness creation, or advocacy or public education.”81 ITN and malaria control programmers, the report suggested, should better tailor behavior change communication to get African consumers to adopt ITNs. In other words, they did not suggest reducing their reliance on the demand creation paradigm of behavior change communication despite its initial ineffectiveness.

RBM stakeholders did not just try to tinker with markets to make ITNs work for malaria control in Africa; they also tried to tinker with ITN technology, in this case to overcome the perennial problem of low insecticide re-treatment rates. Partners from PSI, the London School of Hygiene and Tropical Medicine (LSHTM), and the Swiss Tropical Institute worked to develop a home insecticide treatment kit—essentially a single dose

81 Ibid.
sachet of insecticide people could mix with water in their own private wash bins—that could be bundled in a package with untreated bed nets. Jane Miller, a long-time member of PSI, developed and tested the home treatment kit in Tanzania as part of her Ph.D. project for the LSHTM. Funded by CIDA, this project proved successful, obviating the need for communal mass dipping campaigns such as those KEMRI-CDC researchers used in the Siaya bed net trial. PSI took up this innovation of the home treatment kit and deployed it (along with marketing campaign materials) in other African countries, hoping to convince people to re-treat nets with insecticide.

At the behest of malaria researchers and RBM officials, ITN manufacturers also tried to tinker with ITNs in response to early challenges with scaling up the technology in Africa. Manufacturers began making nets that not only embedded pyrethroids in netting fibers in the manufacturing process, but also lasted longer through frequent washes to overcome the problem of low re-treatment rates. Vestergaard-Frandsen, Sumitomo Chemicals, and SiamDutch all began making long-lasting insecticidal nets (LLINs)—PermaNet, Olyset, and Dawa Plus, respectively—during the late 1990s. The former two manufacturers submitted their LLINs for multi-village trials beginning in 2001. The WHO Pesticide Evaluation Scheme (WHO PES), a group that coordinates the testing and evaluation of pesticides for public health use, officially approved Olyset and PermaNet LLINs in 2003. By November 2004, Sumitomo Chemicals had transferred LLIN manufacturing technology to Tanzanian manufacturers—A to Z Limited in Arusha—as part of a Corporate Social Responsibility initiative, “fully realiz[ing] the importance of

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82 Don de Savigny, interview with author; Jo Lines, interview with author.
83 Memo, RBM Senior Adviser Dr. Mohammadou Kabir Cham to Dr. Fatoumata Nafo-Traoré, December 12, 2005, WHO Archives, File M50-181-3, Jacket 1.
this initiative and the political context.” By 2005, LLINs constituted roughly 80% of national demand for ITNs. This “unprecedented success in product development,” as WHO/RBM’s Director articulated it, stimulated further tinkering with ‘humanitarian micro-technologies.’ Most notably, Mikkel Vestergaard, the CEO of Vestergaard-Frandsen, branched out to develop other products such as the LifeStraw, ZeroFly food storage bag, and CarePack multi-health intervention package. The LLIN, in other words, embodied the new, innovation-centric technological hubris characteristic of twenty-first-century global health.

All of this tinkering with markets and ITN technology, however, did not have a significant impact in RBM’s first five years as problems with ITN cost and distribution persisted. In 2003, just two years before African countries were supposed to meet 60% coverage goals, RBM officials noted that only about 15% of children under-five in the African Region slept under untreated nets and about 2% slept under ITNs. Authors of the WHO/UNICEF 2003 Africa Malaria Report, pointed to poverty and low income as one of the greatest barriers to scaling up the intervention. “The price of nets has fallen substantially as a result of greater demand, increased competition between producers, and reductions in taxes and tariffs and other obstacles to trade that many African countries

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84 Memo, Dr. Fatoumata Nafo-Traoré to the Director of CPE [Control, Prevention, and Eradication] Department, March 23, 2005, WHO Archives, File M50-370-22, Jacket 1.
85 Ibid.
87 It seems the decentralization of global public health and increased reliance of the WHO, for example, on multiple, separate private sector partners for public health activities has facilitated this focus on technological innovation with small technologies, or gadgets. Partly for this reason, the character of technological hubris in twenty-first-century malaria control differs from that of the mid-twentieth century, when strong, state-directed initiatives to support and implement malaria eradication with DDT prevailed. For more on technological hubris during the mid-twentieth century, see Packard, The Making of a Tropical Disease, 150-159.
88 Including coverage of all vulnerable groups, these percentages were still less than 20% and 5%, respectively. WHO and UNICEF, “The Africa Malaria Report 2003,” (Geneva: WHO, 2003), 8.
instituted after the Abuja Summit,” authors reported; “Nevertheless, the commercial price of nets and insecticide – though falling – still puts this life-saving technology beyond the reach of the poorest income groups of the population.”\textsuperscript{89} Assistant editor of the \textit{British Medical Journal}, Gavin Yamey, went so far as to declare Roll Back Malaria a “failing global health campaign,” placing the blame on international donors’ skimpy funding.\textsuperscript{90}

Despite these problems, and since many African health ministries still did not have the logistic or financial capacity to expand ITN use themselves, RBM officials called for a more intensive, committed effort to business as usual. “The Abuja target,” they proclaimed, “will […] require synergy between public and private sector activities.”\textsuperscript{91} Therefore, while noting the inability and, in some cases, unwillingness of target populations to purchase nets—which cost about $4 excluding insecticide treatment—WHO/UNICEF still encouraged African governments to focus on ITN demand creation, stimulating and facilitating the development of commercial markets (so as to decrease import barriers and increase competition, thereby lowering prices), market priming in areas of poor distribution, and providing targeted subsidies.\textsuperscript{92} Governments, in other words, were supposed to join efforts to tinker with the market to scale up ITNs.

Recognition of the slow progress of RBM, and ITN coverage in particular, fanned the flames of an increasingly public debate between groups of malaria researchers, program managers, and other stakeholders about whether or not people should receive ITNs for free. LSHTM entomologist Chris Curtis led the charge for free ITN distribution,

\textsuperscript{89} \textit{Ibid.}
\textsuperscript{92} \textit{Ibid.}
comparing ITNs to vaccines. “We do not accept the view that scaling-up this method [ITNs] should be by making villagers pay for nets and insecticide, with subsidies limited so as not to discourage the private sector. We consider that ITNs should be viewed as a public good, like vaccines, and should be provided via the public sector with generous assistance from donors.” The rhetorical link that supporters of free, public sector distribution made between ITNs and vaccines highlighted the community benefits of both interventions (assuming a majority of people actually used ITNs regularly). A few on my informants continued to invoke this technological analogy in conversations with me when talking about their own support of free ITN distribution in both the past and present.

Jeffrey Sachs, the former Chairman of the WHO’s Commission on Macroeconomics and Health, joined the chorus supporting free ITN distribution, calling the delayed or slowed delivery of ITNs “one of the shocking crimes of our time.” Tragically,” Sachs and his allies claimed, “funds mobilised for malaria prevention and control are not used for saving lives, but are instead diverted to create new markets for bed nets that do not exist. This approach has compromised the effectiveness of malaria control efforts.” For this group of critics, donors needed to ramp up funding for malaria control and ITNs immediately.

On the other side of this debate stood Christian Lengeler, Don de Savigny, Jo Lines—a student of Chris Curtis—and some economists from the LSHTM. Although USAID, DFID, and other agencies supported private sector ITN delivery approaches,

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94 Rick Steketee, interview with author, online (skype), May 13, 2015; Penelope Phillips-Howard, interview with author, Kisumu, October 16, 2015.
they did not explicitly enter into these public debates over free distribution.\footnote{DFID did, however, fund the work of LSHTM economists.} However, Lengeler, de Savigny, and Lines, who worked to develop Tanzania’s ITN supply chain and voucher program with the Ministry of Health, domestic manufacturers, and other partners, argued passionately for their particular private sector approach. In a response to Curtis and colleagues over who should pay, these authors argued that supporters of free nets incorrectly assumed RBM only supported short-term subsidies, and that one could not use markets to increase coverage. Such ideas overlooked activities and evidence of progress in Tanzania.\footnote{Jo Lines, et al., “Scaling up and sustaining insecticide-treated net coverage,” \textit{Lancet Infectious Diseases} 3, no. 8 (2003): 465-466.} Furthermore, the authors retorted, while Curtis and colleagues cited China’s and Vietnam’s bed net programs—where the government provided insecticide treatment free of charge—as a model for Africa, those programs depended on people buying nets from the commercial sector. Supporters of the private sector side of the debate stressed to me that untreated bed nets had always been private sector products with no positive externalities (benefits to non-owners); only when you add mosquito-killing insecticide do they attain positive externalities and become ‘public goods.’ For them, then, it made more sense to only subsidize the insecticide, the product that endowed ITNs with wider public benefits.\footnote{Jo Lines, interview with author; Anne Mills, interview with author, London, June 3, 2015.} Most importantly for this group, though, was that calls for free distribution, a method that would almost certainly cripple ITN commercial markets in Africa, was simply not feasible with present and foreseeable resources. “Curtis et al make bold statements about how the world “should” be,” Lines and colleagues wrote, “but they do not address the question that confronts every
programme manager: how best to use resources that are limited and that are not enough to do everything for everyone?”

This debate endured throughout the first decade of RBM, with no side really conceding. Lines, Lengeler, de Savigny, and others continued to support their painstakingly crafted supply chain, which I describe later in the chapter, while Sachs, Curtis, and others rallied for increased resources to fully subsidize ITNs for malaria control in Africa. One group believed necessary resources would not be there while the other believed that they should be there. “We went through five, six, seven, maybe ten years of flapping around in the international community with debates about what’s the best thing to do,” de Savigny recalled. “Do you do social marketing? Do you do vouchers? Do you do free net distribution, mass net distribution? And huge fights because there was no evidence one way or the other. And this I lay at the feet of global health, the lack of leadership.”

The decentralized decision making, financing, and service delivery WHO/RBM adopted so they could at least begin moving forward with malaria control in Africa proved vital to securing resources from donors; at the same time, such decentralization threatened the cohesion and stability of malaria control programming, which would also be critical to maintaining donors’ confidence in the disease control endeavor.

Malaria program managers and international health officials responded to slow progress, entertaining various ITN distribution methods to meet coverage goals laid out in the Abuja Declaration with resources at hand. They thought about distributing ITNs as part of public health campaigns and antenatal services targeted to young children and

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100 Jo Lines, et al., “Scaling up and sustaining insecticide-treated net coverage,” 466.
101 Don de Savigny, interview with author.
pregnant women, who also constituted the target population for ITNs. In various countries, including Ghana and Zambia, health officials and RBM partners distributed ITNs alongside measles, polio, and other vaccinations and at antenatal clinics.

“Integrating ITN distribution with immunization programmes,” members of WHO/RBM felt, “can markedly benefit young children by achieving high ITN coverage with national [Supplementary Immunization Activities], as well as maintaining high coverage through routine [Expanded Programme on Immunizations].”

Such an approach would allow malaria endemic countries—otherwise limited on public health infrastructure and resources for malaria control—to “rapidly reach their short-term Abuja targets for ITN coverage and eventually reach the long-term millennium development goals.” Indeed, much of the approach WHO/RBM members took in conceptualizing distribution strategies and convincing donors to support malaria control included aspirations of doing more with less and addressing multiple health and development issues simultaneously.

Combining disease control technologies and maternal care services proved mutually beneficial for public health program managers. In Zambia a coalition of NGOs and development agencies funded a program combining the distribution of ITNs, measles vaccination, vitamin A supplements, and mebendazole, which increased coverage of

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103 Ibid.

104 This included propositions to incorporate control activities aimed at so-called ‘neglected tropical diseases’ with malaria control programming in the mid-2000s. Those from the global health and development communities involved with vector-borne diseases believed it would not take that much work to incorporate pharmaceutical therapies for the ‘neglected tropical diseases’ with ITNs and malaria drugs in distribution activities, nor malaria advocacy campaigns and monitoring and evaluation schemes. Such an imaginary highlights the allure of individualized, biomedical objects for ‘health development’ in regions with little health infrastructure and diverse disease burdens. Draft summary of UN Millennium Project colloquium, “A Malaria and Neglected Tropical Diseases Quick-Impact Initiative, held in Stockholm, Sweden, January 29-31, 2006,” WHO Archives, File M50-86-1, Jacket 1.
these interventions by 80% in the five target districts, according to a follow-up survey.\textsuperscript{105}

In Nigeria, where the Ministry of Health and partner agencies introduced ITNs into vaccination campaigns as “health incentives” in 2006, many women took their children to get vaccinated mainly to get bed nets.\textsuperscript{106} This is one reason, anthropologist Elisha Renne argued, that cases of paralytic poliomyelitis due to wild poliovirus declined in the country from 992 in 2006 to 225 in 2007, despite people’s continued suspicions that polio vaccines were actually harmful.\textsuperscript{107} Such programs did not remain for very long in most places. Bed net distribution in polio vaccination campaigns in Nigeria, for example, ceased after 2007 due to lack of funding and resources. Yet this distribution method signaled that RBM leaders recognized the need for sustained ITN subsidies alongside an “expanded commercial [ITN] market” in African countries seeking to meet RBM coverage goals.\textsuperscript{108} Even after the original Abuja target goal of 60% coverage by 2005 had passed, RBM officials and partners were still trying to figure out the best way to get nets to people.

\textbf{“Raise it, Spend it, Prove it”: ITNs and Malaria Control Financing in an Age of Plenty}

The massive increase in funding for malaria control in Africa over the first decade of the twenty-first century eventually mooted many of the debates over marketing verses free ITN distribution, though not immediately or completely. The Global Fund to Fight

\textsuperscript{105} Packard, \textit{The Making of a Tropical Disease}, 231.
\textsuperscript{106} Elisha Renne, \textit{The Politics of Polio in Northern Nigeria} (Bloomington, IN: Indiana University Press, 2010), 44-48.
\textsuperscript{107} \textit{Ibid.}, 47.
AIDS, Tuberculosis and Malaria (hereafter the Global Fund); the World Bank Booster Program; and the Bill and Melinda Gates Foundation (hereafter the Gates Foundation) played significant roles in facilitating access to malaria control interventions. These organizations and programs heavily influenced the direction of malaria control in Africa through their ability to both finance and leverage additional resources for the cause. The political priorities, governance structures, and approaches of the Global Fund, World Bank, and Gates Foundation privileged technology-commodity interventions such as ITNs over health system strengthening or ecological interventions. Consequently, these organizations became vehicles for the large-scale provision malaria control commodities, broadening possibilities for subsidizing the scale up of ITNs in Africa. At the same time, they constricted possibilities for the pursuit of national-level malaria control and health system development by only financing select tools. This section briefly discusses the history and ideological underpinnings of these organizations’ approaches to malaria control financing, particularly their attitudes toward commodities, technology, and ‘the poor’ consumer. Additionally, it examines how their approaches shaped the roll out of ITNs in Africa.

The Global Fund

Public outcries over the astronomical price of antiretroviral drugs combined with gaps in funding for national AIDS programs during the 1990s, spurred initial calls for a new financing mechanism for health commodities at the beginning of the twenty-first century.

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International health leaders proposed creating a commodity fund that would facilitate the bulk procurement of drugs, condoms, and HIV test kits, thereby lowering these products’ price and transaction costs. Furthermore, they felt such a commodity fund could attract additional donors and grant funding for combatting the HIV/AIDS epidemic. A disease crisis of such a massive proportion in under-resourced areas, representatives of the Joint UN Programme on HIV/AIDS (UNAIDS) felt, required larger scale and immediate action. The logic of quick, massive commodity transfer shaped the development and activities of this new financing mechanism.

At around the same time that leaders of UNAIDS pushed for the new commodity fund, G8 countries re-committed themselves to fighting communicable diseases in low-income countries at their Okinawa Summit in 2000. They prioritized HIV/AIDS, malaria, and tuberculosis, the first two of which appeared explicitly in the Millennium Development Goals as well. Invoking the necessity of good health for “increase[ing] human security and reduc[ing] poverty,” G8 leaders called for a new “global movement” to scale up responses to communicable diseases largely affecting the poor. The multi-institutional partnership that would be at the heart of the global movement, they stressed, would “ensure that poor people ha[d] access to information, services and commodities they need to sustain health and productivity.” It would be based on “analysis of the ways

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110 Ibid., 289. Former head of UNAIDS, Peter Piot, acknowledged the substantial pull HIV/AIDS had in attracting global health financing even before the Global Fund officially launched, quoted in a June 2001 article as saying, “if various contenders get funds for non-AIDS projects, they will have AIDS activists and UNAIDS to thank.” “AIDS Fund’s Global Challenge,” Newsday, June 17 2001, A30. LSHTM Archives, GB 0809 PIOT/5/2/7/9 PIOT/GLOBAL FUND/ARTICLES 2001-2010.


in which poor people can be enabled to enjoy better health by increasing their demand for, and access to, useful goods and services,” including by “marketing and subsidising the distribution of commodities such as insecticide-treated bed nets, condoms and even medicines through retail outlets.”\(^\text{113}\) Wealthy countries’ plans to fight communicable disease and poverty in Africa and the global South centered on the idea that the poor were autonomous, rational economic actors—albeit those with incomplete knowledge about health interventions.

Thus, while international leaders proposed ‘Global Health Fund’ to correct the failures of public health commodity markets in Africa, they still embraced market fundamentalist principles. By tinkering with the market, they felt they could, in a sense, patch together an incomplete machine meant to allocate public health resources. The fund could not only provide commodities to people of little material means, its creators claimed, but more generally provide commodities to undeveloped markets in places where resources “can’t be delivered by governments” as well.\(^\text{114}\) “The fund may underwrite the purchase of drugs, vaccines, and other commodities,” one commentator noted, “where markets are too weak to respond and stimulate pharmaceutical companies to conduct research to develop new drugs and vaccines.”\(^\text{115}\) The fact that many African patients could not afford wildly expensive antiretroviral therapies, much less cheap, low-

\(^{113}\) Ibid. Promoters of anti-poverty measures (including control of communicable diseases in low income countries) increasingly adopted the logic of national security after the September 11, 2001 terrorist attacks. Chris Patten of the Economic Commission, for example, supported the transfer of resources from rich to poor countries as part of a “fierce and relentless attack” against the evils behind terrorism, bred by high child mortality and illiteracy rates. Bernard Rivers, “The impact of the events of September 11 on private sector fundraising for global AIDS and other poverty-related issues,” October 4, 2001, LSHTM Archives, GB0809 Piot/5/2/7/2 GLOBAL FUND: ESTABLISHEMENT 2001 3 OF 3.

\(^{114}\) UNAIDS, “Briefing Note: G8 summit 2000 July 21-23,” LSHTM Archives, GB0809 Piot/5/2/7/1; Piot/UNAIDS/Global Fund/1/1; 2000.

tech bed nets, challenged idea that free market operations alone would bring about wide-scale changes in behavior and consumption patterns. Yet, donor agencies felt, an infusion of money would be enough to fill gaps or disconnects in markets, thereby encouraging competition among manufacturers and bringing down prices for intended consumers. Rapidly distributing life-saving interventions in pursuit of MDGs, rather than bolstering the ability of at-risk populations to stave off disease, constituted the primary goal of global disease control.

At the G8 meeting in Genoa in July 2001, participating country representatives formally approved the creation of a new global commodity fund to address tuberculosis and malaria along with HIV/AIDS.116 The idea that this Global Fund would incentivize private companies to develop new medical technologies—more specifically, drugs and vaccines—for the very poor by establishing a ready market (the Global Fund) for those products provided a key rationale in the creation of this new entity.117 Leveraging private sector resources, of course, meant this new public-private partnership focused on financing those ‘goods’ which the private sector produced and not, for instance, human resources. Touted as “flexible” and “outcome focused,” the Global Fund would operate outside of the UN system, which some donors considered ineffective at managing funds for health activities in low-income countries.118 The U.S. government found the global commodity fund particularly appealing; while it had not provided much funding at all to malaria control during the 1980s and 1990s, and was even slow to ramp up funding for

117 [UK], “Health in Developing Countries. A Proposed Package for Support by the International Community,” 2001, LSHTM Archives, GB0809 Piot/5/2/7/2 GLOBAL FUND: ESTABLISHMENT 2001 1of 3.
Roll Back Malaria in the 2000s, it immediately partnered with the new Global Fund to become far and away its largest patron.\(^\text{119}\)

Additionally, developers of the Global Fund adopted performance-based funding mechanisms intended to “guarantee effective use of the money which development agencies and foundation are putting into [the Global Fund].”\(^\text{120}\) Performance-based funding, in fact, is so important to the character of the Global Fund that the fund’s first Executive Director, Richard Feachem, gave it the mantra, “Raise it, Spend it, Prove it.” The “large scale financing for priority health & disease problems which cannot be ignored” provided the so-called “carrot” for recipient countries and health programs considering whether to apply for Global Fund grants.\(^\text{121}\) Certainly for the WHO and malaria control program officials seeking to meet Abuja coverage targets, such large scale financing seemed otherwise unattainable. They would have to prove the effectiveness of their malaria control activities to secure necessary public health resources.

The Global Fund did not develop without reticence or resistance. Early in its inception, government and development agency leaders expressed concerns with the new financing mechanism. Executive Director of UNICEF, Carol Bellamy, thought such a decentralized fund might “result in globally driven agendas, which could undermine our

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\(^\text{120}\) Meeting Report, “Improving the Effectiveness of Health Investments in Developing Countries: How is Performance-Based Funding Working?,” June 2005, 2, WHO Archives, File M50-370-13, Jacket 1.

\(^\text{121}\) *Ibid.*
collective country level capacity building efforts.” Moreover, she claimed, it was “critical to remember that simply purchasing essential supplies will never be enough; other elements – including strengthening health system infrastructure – [we]re just as important.” Ultimately, the Global Fund relied heavily on money from financiers who tended to value accountability and economic efficiency over building national capacity and health systems. Needless to say, the leaders of the Global Fund did not allay Bellamy and other critics’ fears.

RBM and WHO leaders recognized that the Global Fund was necessary for scaling up malaria control interventions, especially if they wanted to achieve anything approaching universal access to these interventions. The RBM movement had come too far, one WHO representative noted, to pass up this new opportunity: “WHO needs to advocate and support the global fund. GFATM [Global Fund] is the major source of financing for the majority priority disease problems which WHO and countries have successfully advocated and mobilized for, set targets and […] developed strategic operational plans and project proposals.” The advent of the Global Fund provided pathways for donors to impact the global burden of malaria, albeit ones that were relatively narrow. “So after the creation of Roll Back Malaria,” health economist Anne Mills remembered,

…and of course then the creation of the Global Fund was around the same time with the malaria being one of its three diseases. So that provided the vehicle for large scale provision of treated nets and drugs and so on. And then everyone else piled in. So then UNICEF was funding nets. DFID had some large-scale social marketing […] So the various donors took on malaria control within net

122 Letter, Carol Bellamy to Peter Piot, March 19, 2001, LSHTM Archives, GB0809 Piot/5/2/7/3 Correspondence: Global Fund 2001-2006.
123 Ibid.
124 Meeting Report, “Improving the Effectiveness of Health Investments in Developing Countries: How is Performance-Based Funding Working?,” June 2005, 2, WHO Archives, File M50-370-13, Jacket 1.
programs. [...] My perception is a clear shift from the 90s to the 2000s; [it] was the shift from the era when researchers were leading to the era when it became more working out a global strategy.125

Carol Bellamy’s caution against ‘globally driven agendas’ and Mills’ discussion of ‘global strategy’ development suggest, the ‘global’ in ‘global health’ does not refer to universal country representation in public health decision-making, nor some apolitical geography; rather, it refers to a conglomerate of public, private, and nongovernmental entities that operate through sets of business relations and recapitulate power inequalities first congealed through colonial enterprises.126 The same is true for the Global Fund.

RBM’s and the antimalaria movement’s heavy reliance on a commodity fund for resources, to the tune of 66% for all donor funding for malaria control by 2006, meant possibilities for pursuing malaria control within broader health development projects in Africa shrunk.127 As one of the few effective malaria control commodities available during the early 2000s, and one of the only ones with its own global RBM coverage goal, ITNs attracted an increasing amount of available resources.128 In fact, “insecticide treated nets” appeared in 86.8% of Global Fund malaria proposals from the first four rounds of the organization’s grant cycle.129 The Global Fund supported the procurement and

125 Anne Mills, interview with author.
127 Global Fund Working Group, “Challenges and Opportunities for the new Executive Director of the Global Fund: Seven Essential Tasks” (Washington, D.C.: Center for Global Development, October 26, 2006), LSHTM Archives, GB 0809 Piot/5/2/7/5 PIOT/GLOBAL FUND/REPORTS 2005-2006 1 OF 3. By contrast, the Global Fund provided 20% of all funding for HIV/AIDS and 45% for tuberculosis.
distribution of 11.3 million ITNs by June 2006 on the grounds of saving lives and maximizing the Fund’s impact on individuals around the world.\textsuperscript{130}

Donors’ priorities and interests influenced the roll out of commodities procured through the Global Fund since these patrons attached stipulations to their funds. As the largest single donor to the Fund, the U.S. government held significant sway in this regard. Unlike many European donors, who placed high priority on “country ownership, harmonization of systems across donors, aligning finances with national budgets, and the impact of health systems beyond the three diseases,” the U.S. and other stakeholders “focus[ed] on speed, containing costs and showing demonstratable results.”\textsuperscript{131} Well aware of the difficulties of distinguishing between “poorly set targets and poor performance,” the Board of the Global Fund continued on, trying to help countries meet intervention coverage goals quickly and secure additional resources in the pay-for-performance system.\textsuperscript{132}

More generally, Global Fund leaders’ desire for experts in financial management and coordination often outweighed the desire for experts knowledgeable about the technical aspects of malaria. Decisions to fund malaria drugs contraindicated by the WHO due to high levels of resistance “seem puzzling,” critics of the Global Fund decried, until one realises that the [Global Fund’s] Technical Review Panel is not actually a “technical” review panel. The four malaria reviewers on the Technical Review Panel are selected by a points-based system, in which “technical knowledge…and proposals show that countries submitting malaria-related applications consistently requested funds for ITNs and requested funds for ITNs more often than any other “prevention” intervention by far.\textsuperscript{130} Global Fund Working Group, “Challenges and Opportunities for the new Executive Director of the Global Fund: Seven Essential Tasks” (Washington, D.C.: Center for Global Development, October 26, 2006), LSHTM Archives, GB 0809 Piot/5/2/7/5 PIOT/GLOBAL FUND/REPORTS 2005-2006 1 OF 3.\textsuperscript{131} \textit{Ibid.}\textsuperscript{132} \textit{Ibid.}
ability to judge whether proposals are...scientifically sound” count for only 22% of that decision. By contrast, “familiarity with international processes and...partnerships and “familiarity with multisectoral approaches” count for twice as much (44%), even though it is hard to know what those criteria really mean.133

Creators and leaders of the Global Fund made sure to define the entity as simply a new financing mechanism and not a new disease control program, leaving technical review of the suitability of malaria interventions up to African countries (including highly influential donor partners) applying for grants.134 Yet by controlling the floodgates for antimalaria resources, the Global Fund exercised considerable influence on twenty-first-century disease control, sometimes in ways characterized as “medical malpractice.”135

The Global Fund also set up Country Coordinating Mechanisms (CCMs) comprised of various in-country and external stakeholders to put together grant proposals for the Fund. CCMs were supposed to facilitate “co-investment” in disease control strategies, where private companies and donor agencies along with in-country personnel shared the burden of scaling up interventions.136 However, the Global Fund did not always coordinate funding through CCMs in the first rounds of grant cycles, giving grant money to NGOs instead. They emphasized the process of securing stakeholder input over country needs or desires.137 Leadership at RBM and the WHO were aware of the threats CCMs posed to country autonomy. “The issue of partnership mechanisms are seen as way of building capacity and helping countries,” one 2005 report from a meeting on performance-based funding read. “But […] partnerships are becoming another

bureaucracy. They are duplicating existing structures and are absorbing financing and building their own capacity. Partnership mechanisms instead of supporting are taking over country ownership and leaderships.”¹³⁸ In a letter to Rwanda’s country representative, RBM Department Director Fatoumata Nafo-Traoré noted too that “most capacity development interventions have been traditionally based on expert opinions rather than on country specific needs.”¹³⁹ As such, RBM sent a scientist at the WHO’s headquarters to go to Rwanda, Kenya, and other countries to assist in Global Fund proposal writing. Sending experts from WHO or UNICEF became a common solution to problems of African countries seeking money from the Global Fund.¹⁴⁰

Writing Global Fund grants became so critical to malaria control efforts in Africa that the RBM Secretariat, the U.S. President’s Malaria Initiative (PMI)—a special aid initiative launched in 2005 under the leadership of USAID—and companies such as Exxon Mobil and Vestergaard-Frandsen allocated funding for the grant preparation process in African countries.¹⁴¹ The process of acquiring money for disease control required numerous other investments on the part of African states in navigating funding streams—investments which they also often received from external partners. RBM advocates and officials used the Global Fund proposal process to sell African health

¹³⁸ Meeting Report, “Improving the Effectiveness of Health Investments in Developing Countries: How is Performance-Based Funding Working?,” June 2005, 3, WHO Archives, File M50-370-13, Jacket 1. In addition to problems with country autonomy, African malaria control officials found that those involved in HIV/AIDS work were overrepresented in CCMs, which sometimes led to the marginalization of malaria in countries’ Global Fund grants.
¹⁴⁰ This harkened back to practices in malaria control policy making from the 1990s, where experts from the WHO and other agencies based in the global North helped African malaria control officials craft ‘locally defined’ control strategies acceptable to the WHO and major donors. For more on this, see chapters 3 and 4.
officials on the RBM program, noting that, “RBM “branding” has driven better cooperation at country level leading to successful Global Fund proposals and solid adoption of RBM strategies.”

By selling Global Fund leadership and Global Fund partners on the RBM strategy as well, RBM officials helped define what could or should be included in a ‘successful’ grant proposal. ITNs, which fulfilled RBM goals, were cost-effective commodities, and whose scale-up elicited participation from private, nongovernmental, and public sectors, became a nearly ubiquitous component of successful malaria grant proposals. The funneling of money through these channels thus helped solidify ITNs as biomedical objects applicable everywhere, regardless of local ecologies of malaria, vector populations, or social, political, and economic circumstances.

The problems of weak health systems and health data collection did not disappear from discussions completely with the influx of monies for malaria control commodities. RBM’s Working Group for Scaling-Up ITNs lamented the narrow focus on commodities in 2005, claiming that new investments by the Global Fund, World Bank Malaria Booster Programme, and PMI,

are making it easier for countries to procure the necessary commodities for their malaria interventions. But relatively little investment has so far been made in the necessary health systems by which these goods can be effectively delivered to those most in need. Hence effective coverage with ITNs remains low in many countries and meeting the Abuja and Millennium Development Goal (MDG) targets continues to be a formidable challenge for Africa where public health delivery systems are weakest.  

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Lack of investment in monitoring and evaluation proved particularly crippling for countries seeking funding. The “continued release of approved GFATM funds to countries [is] dependent upon demonstration of performance,” a WHO-AFRO briefing note acknowledged, “yet most countries have weak M&E [monitoring and evaluation] systems which are not robust enough to be used to demonstrate any such performance.”  

A 2007 Global Fund consultancy report for Chad captures this double bind for African countries of needing outside funding for malaria control activities and never receiving money dedicated to improving basic health infrastructure. Commenting on the weaknesses of Chad’s Round 6 Global Fund proposal, one consultant wrote, “service coverage indicators,” which are required for demonstrating impact, “are working from very low baselines and [I am] not sure if targets are reachable given the state of the health sector. Given the fragility of the health system, many of the indicator targets seem unreachable.”  

New financing opportunities in global malaria control continued to privilege those national programs that enjoyed some degree of political stability and existing health and surveillance infrastructure. ‘Spend it, Prove it, Raise it,’ then, is maybe the more accurate description of the Global Fund’s approach to malaria control support.  

_The World Bank Booster Program for Malaria Control_  

Amidst the slow progress towards RBM goals in Africa, the World Bank and its new president, Paul Wolfowitz, agreed to increase its commitment to RBM. The World  

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144 Briefing notes for regional director for video conference on malaria (GFATM), 2003, WHO Archives, File M50-370-13, Jacket 1.  
Bank launched a Global Strategy and Booster Program for Malaria Control on April 25, 2005, the fifth annual World Malaria Day. The Bank agreed to provide roughly $500 million in additional funds over three years through the Booster Program to “reinvigorate” existing national programs struggling to procure and disseminate malaria control interventions. World Bank representatives took care to emphasize this would not be a new initiative competing with or duplicating the efforts of RBM. Bank representatives also stressed that the program would be ‘results focused,’ aiming to scale up malaria control in ways that could illustrate “disease control impact.”

Bank experts even created a “Results Monitoring Matrix” “for laying out a more complete story on specific interventions such as the use of insecticide-treated bed nets, […] from dollar per dollar investments to tangible on-the-ground results.” This became a precursor for the World Bank-developed “Malaria Scorecard” a couple of years later, which tracked how much money major donors committed to different African countries against “clear outcome indicators such as insecticide-treated net utilization, intermittent preventive treatment, indoor residual spraying coverage, and access to effective treatment.”

While such interventions do help to control malaria, it is important to note that their ability to be measured—both theoretically and practically given the monitoring and evaluation infrastructure available in African malaria control programs—was essential to their inclusion in the World Bank Booster Program.

Referring to countries as “clients,” Bank representatives also emphasized that the Booster Program for Malaria Control would be “country-led,” and that select interventions the Bank helped procure would be tailored to each country’s specific needs. This echoed the patron-client language and approach of the Roll Back Malaria partnership, which similarly glossed over the fact that national malaria control programs in Africa tailored their ‘requests’ to the desires and criteria of patrons able to provide resources. Essentially, the World Bank sought to aid countries rapidly scale up RBM interventions, targeting those that seemed most prepared and willing to do so. Rather than explicitly dictate how each country should do so—e.g. through commercial marketing, social marketing, routine maternal and child services, and so forth—the Bank and its development partners shaped ITN distribution strategies by financing organizations such as PSI and NetMark, or funding programs like Tanzania’s National Voucher Scheme.

_The Gates Foundation_

The Gates Foundation grew to be a major player in malaria control financing in the twenty-first century, primarily in the areas of biomedical and (mosquito) genomic research. Early in the 2000s, former Microsoft CEO Bill Gates began supporting research on artemisinin combination therapies, intermittent preventive treatment in infants, and treatment of malaria in pregnancy through new consortiums based out of traditional institutional hubs for malaria research: the London and Liverpool Schools of Tropical Medicine.

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149 Ben Fine observed this disconnect between World Bank leaders’ claims of country independence and the fact that Bank experts still very much informed how countries pursued development by imposing certain lending criteria. Claims of country-led development, Fine argued, operate as a false front for the actual exercise of power in development. Fine, “Neither the Washington nor the post-Washington consensus,” 11-12.
Medicine. “Gates then funded a whole stream of large multi-country studies,” Anne Mills recalled, “and so he really took over the leadership of malaria research from TDR [the Special Programme for Research and Training in Tropical Diseases].”\textsuperscript{150} In part, Gates wanted to incentivize pharmaceutical companies to invest in therapeutic, preventive, and diagnostic interventions for a disease that over-burdened the poor. He invoked language of democratizing access to technological innovation, a common trope among Silicon Valley entrepreneurs.\textsuperscript{151} For Gates and rising philanthropists in twenty-first-century global health, the free market by itself would not democratize access and allow the world’s poorest to ‘lift themselves out of poverty’; the free market just needed a helping hand.

While the Gates Foundation did not give much attention to ITNs specifically, it did support the intervention by giving substantial amounts of money to the Global Fund, which in its early years heavily supported and financed the commodity. Beginning with a donation of $100 million in 2002, in fact, the Foundation has given about $1.6 billion to the Global Fund as of 2017.\textsuperscript{152} The performance-based funding mechanism and commodity-based nature of the Global Fund resonates with the Foundation’s own emphasis on accountability, technological innovation, and empowerment through entrepreneurship. The Gates Foundation has supported numerous antimalaria humanitarian organizations as well, many of which, as I will describe in the next section, focus exclusively on delivering bed nets.

\textsuperscript{150} Anne Mills, interview with author.
\textsuperscript{152} With his $100 million donation, Gates was the largest single private donors to the Global Fund in its first year. Associated Press “Amid High Hopes and Frustrations, Global Fund on AIDS/TB Holds First Meeting,” January 29, 2002, LSHTM Archives, GB0809 Piot/5/2/7/4 Piot/UNAIDS/GLOBAL FUND/1/3 2002.
Furthermore, when it seemed that Global Fund grants could help increase coverage of malaria control interventions to new levels, many malaria advocates and health officials began to talk about moving toward malaria elimination in certain countries. Confidence in the power of existing tools to eliminate malaria grew to such an extent that Bill Gates famously declared malaria eradication within reach at a 2007 Malaria Forum meeting in Seattle, Washington.\textsuperscript{153} International health officials and experts reflexively recoiled from calls for eradication, understanding the immense difficulty of the task. Nonetheless, the Gates Foundation set out to demonstrate that African countries could eliminate malaria with the right tools, organization, logistical support, and commitment. As part of this endeavor, he funded the Malaria Control and Elimination Partnership in Africa (MACEPA) and its activities in Zambia, a program I will explore in detail later in the chapter. Through its efforts to demonstrate the viability of malaria elimination in Zambia and elsewhere, as well as its philanthropic giving to organizations that measure dollar impact, the Gates Foundation has helped fund millions of ITNs.

In taking on, among other things, high-burden communicable diseases, child survival, and family planning, the Gates Foundation has assumed a larger role in international development. It is very difficult to argue that some of these issues do not deserve substantial resources, especially given the close links between resource-lack, disease, and death. However, it is important to note that the Gates Foundation’s strategy is and has not been the only strategy used to catalyze economic development in low-income countries. The Gates Foundation very explicitly targets poor individuals, seeking

\textsuperscript{153} Packard, \textit{A History of Global Health}, 267-271.
to ‘empower’ them to lift themselves out of poverty by using newly accessible health technologies.\textsuperscript{154} This libertarian approach, characteristic of what Peter Redfield has called “gadget capitalism,” privileges individualized tools, such as ITNs, vaccines, and pharmaceuticals over structural change and changes that require substantial state control.\textsuperscript{155} The power to direct health development lies with those who can invest in such an immense enterprise, including the Gates Foundation. The resonance of individualized, biomedical technology-commodities with the Foundation’s libertarian political ideals, I would argue, has accelerated the momentum behind “fire-and forget solutions” in global health.\textsuperscript{156}

\textsuperscript{154} Like human rights activists more generally, the Foundation subscribes to the belief that personal autonomy for all is the pathway to political and economic liberty. As Harri Englund has pointed out, this type of liberal theory not only ignores conditions of mutual dependence among the poor, they also obscure the fact that many cannot afford personal autonomy. Harri Englund, \textit{Human Rights and African Airwaves: Mediating Equality on the Chichewa Radio} (Bloomington, IN: Indiana University Press, 2011).

\textsuperscript{155} Gates’ approach to philanthropy can be contextualized in the broader political ethos of Silicon Valley engineer-entrepreneurs that emerged in the 1980s. The philanthropic activities of Bill Gates and other wealthy, tech company CEOs on the West Coast do not simply operate on logics of profit-making, as Bill and Melinda Gates emphasize on their Foundation’s website. There is a strong moral component as well, often tied to the idea that “all lives have equal value.” The way this group of wealthy business men (mostly) approach philanthropy is through technological experimentation and innovation with gadgets designed for surviving in the ‘less than ideal world.’ The mobility and democratization of such gadgets are meant to replace large scale infrastructure such as sanitation systems. Barbrook and Cameron, “The Californian ideology”; Margaret O’Mara, “The high-tech revolution and the disruption of American capitalism,” in Nelson Lichtenstein, Jean-Christian Vinel, and Romain Huret, eds., \textit{Liberal Orders: The Political Economy of the New Deal and Its Opponents} (forthcoming); Peter Redfield, “Aftermaths: Equipment for Living in a Broken World,” University of Pennsylvania History and Sociology of Science Workshop, March 20, 2017.

\textsuperscript{156} Jo Lines, interview with author. Historian of technology Thomas Hughes first introduced the concept of ‘technological momentum’ in 1969 to explain why certain technologies and technological systems persisted. He attributed this momentum, or forward-carrying force, to both technological and social factors. While some have critiqued Hughes’ concept as too technologically determinist, it is useful for understanding situations in which social groups establish infrastructure and pursue activities around particular technologies, such as ITNs. Thomas Hughes, “Technological momentum in history: Hydrogenation in Germany 1898-1933,” \textit{Past and Present} 44 (1969): 106-132; Thomas Hughes, “Technological momentum,” in Meritt Roe Smith and Leo Marx, eds., \textit{Does Technology Drive History: The Dilemma of Technological Determinism} (Cambridge, MA: The MIT Press, 1994), 101-114.
Mystifying ITNs: Humanitarian organizations against malaria

RBM advocacy and awareness creation paid off in the mid-2000s, when new humanitarian, non-profit organizations adopted malaria—and often specifically ITNs—as their cause. This included the Against Malaria Foundation, established in 2004; IVCC (a vector control non-profit), established in 2005; and Malaria No More and Nothing But Nets, both established in 2006. Religious charities such as Lutheran World Relief and Episcopal Relief and Development have also joined the effort, developing their own bed net programs that use “innovative and results-oriented approaches to saving lives.”

These charities are part of the extensive network of public-private partnerships propping up global malaria control, many receiving funding from the Gates Foundation. They advertise their work as saving and improving lives efficiently, under the assumption that someone spared bouts of malaria by using a bed net can increase their economic productivity. Many organizations have also aligned themselves specifically with the pursuit of the MDGs, and after 2015, the Sustainable Development Goals. Essentially, they are using similar methods and messages as RBM advocates to attract attention and money to malaria control in Africa and claim a stake in Africa’s economic development.

These malaria and bed net-focused non-profits reflect broader shifts in the landscape of development, one in which humanitarian organizations have essentially become part of a decentralized development apparatus. Before the 1990s, humanitarian organizations defined themselves as relief providers that offered to save individuals but not eliminate underlying causes that placed people at risk—i.e. structural factors—since

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that was “the job of politics.”\textsuperscript{158} Humanitarian organizations gained more prominence in the post-Cold War era, amidst civil wars, conditions of political instability, and wealthy countries’ skepticism of multilateral funding bodies. As they did so, states like the U.S. courted humanitarian organizations to carry out strategic and foreign policy goals, for example, by helping fight terrorism through relief aid. Humanitarian organizations also became more standardized, professionalized, and corporatized over the 1990s as donors demanded accountability and impact for their investments.

States increasingly shifted from giving to humanitarian causes through the UN to going straight through humanitarian organizations themselves, which had created their own accountability and efficiency mechanisms to secure aid. In fulfilling new duties of promoting international and human security and democracy, humanitarian organizations expanded into traditional development activities based around economic development, health rights, and empowerment of the poor. They have, however, maintained their character as independent actors trying to save individuals but not alter structural conditions that put individuals at risk.\textsuperscript{159} “In general,” political scientist Michael Barnett summarized, “while there is more aid than ever before, it is controlled by fewer donors, who are more inclined to impose conditions and direct aid toward their priorities, undermining the principle of impartiality. Funding is now a several tiered system, with the least fortunate getting the least attention.”\textsuperscript{160}

\textsuperscript{158} Barnett, “Humanitarianism Transformed,” 724.
\textsuperscript{159} Or, humanitarian organizations still portray themselves as apolitical—in other words, that they are not there to change the internal power structures of states in which they intervene—but proclaim the need to democratize access to health by ‘empowering’ the poor to become (economically) productive members of society and achieve personal autonomy. Englund, \textit{Human Rights and African Airwaves}.
\textsuperscript{160} Barnett, “Humanitarianism transformed,” 731.
As one of the “most efficient way[s] to save a life,” ITNs, or rather LLINs, have become central to the activities of antimalaria non-profit organizations, so much so that they frequently advertise bed nets as the only thing that they do (e.g. ‘Nothing But Nets’). The non-profit GiveWell, for example, ranks highly and gives substantial money to the Against Malaria Foundation (AMF), a Foundation solely focused on providing ITNs in malaria endemic areas. One of GiveWell’s directors justified their embrace of AMF, saying, “giving out nets to prevent malaria has among the best evidence of any program that charity dollars can support worldwide, and more than 20 randomized controlled trials show it works”; “[giving out nets] is really cost-effective.” AMF also stood out to GiveWell directors for “its strong commitment to transparency and monitoring.”\textsuperscript{163} Humanitarian non-profits have mobilized the language of evidence-based public health and health economics to sell bed nets to philanthropic investors, NGOs, manufacturing partners, and publics in wealthy countries.

Over the past decade or so, in fact, antimalaria non-profits have procured tens of millions of LLINs for African countries. Since 2004, AMF alone has procured nearly 50 million LLINs.\textsuperscript{164} Nothing But Nets, according to the organization’s website, has contributed 10 million additional LLINs since 2006. These charities typically arrange to distribute nets through international and local NGOs and PVOs in African countries, including the UN Foundation, Red Cross, and PSI, who are set up to undertake service delivery activities. On rarer occasions, non-profit groups will arrange to distribute the

\textsuperscript{162} Elie Hassenfeld, quoted in Thompson, “The greatest good.”
\textsuperscript{163} Elie Hassenfeld, quoted in Thompson, “The greatest good.”
nets through countries’ National Malaria Control Programs and government bodies. Nothing But Nets also sends high profile athletes and celebrities, such as basketball player Stephen Curry and television star Tom Cavanagh, on goodwill missions to hand out nets in African countries as publicity stunts meant to attract support, largely from audiences in the global North.\footnote{Nothing But Nets website, updated 2017, https://nothingbutnets.net/, accessed April 15, 2017.} Bed net charities post pictures and videos of LLIN distribution in African countries both to attract further donor support and, at least in the case of AMF, “provide an element of verification” that people actually received the commodities the charity procured.\footnote{“Information we publish,” Against Malaria Foundation website, updated 2017, https://www.againstmalaria.com/, accessed April 15, 2017.} In this way, photos and videos function like the World Bank’s “Malaria Scorecard” or databases designed to track donor impact. Using these genres of evocative media, antimalaria non-profits hope to convince everyone from individuals to large donor institutions that giving $10 for an LLIN will translate directly into saving the life of an African child.

Reducing ITNs to their most saleable quality—their ability to save individual lives, seemingly without the need for additional infrastructure—these humanitarian groups have in a sense “fetishised” ITNs, presenting them as “a miraculous curative, calcified into a standardised intervention, while being divorced from their contested origins.”\footnote{Tom Scott-Smith, “The fetishism of humanitarian objects and the management of malnutrition in emergencies,” \textit{Third World Quarterly} 34, no. 5 (2013): 913-928, 914.} They have also divorced ITNs from the reality that children in resource-poor settings die from multiple, interrelated causes “and it is hard to identify which health interventions spared a life.”\footnote{Packard, \textit{A History of Global Health}, 313.} Within bed net-specific humanitarian organizations, ITNs appear themselves as a source of value that can attract investments from agencies such as
GiveWell and the Gates Foundation, and raise the profiles of these corporation-like charities. Valorizing ITNs as biologically and economically efficient, humanitarian organizations have made philanthropic malaria control aid object- rather than human-centered. ITNs and the scientific knowledge they came to embody have been woven into the structures of capitalism that propel global public health practice in Africa.

One size fits all?: Case studies of ITN distribution in Africa

The purportedly ‘global’ nature of the RBM program did not mean African national partners designed ITN and malaria control programs the same way across the continent. Given RBM officials’ uncertainty about the best way to increase ITN coverage with the fluctuating, scarce resources at hand, they looked to different country’s experiences to compile and adjust their guidance on ITN distribution programs. The National Malaria Control and Bed Net Programs of Tanzania and Zambia came to represent two different models for ITN distribution in the 2000s, the former built around creating and steadily strengthening a domestic ITN supply chain and commercial markets, the latter built around the extensive and rapid scale up of ITNs using significant external financial and technical inputs. RBM officials and donor partners latched on to each of these as an ideal for ITN distribution in Africa at different moments, amidst a rapidly-changing landscape of malaria control resources. Briefly tracing the trajectory of Tanzania’s and Zambia’s ITN distribution activities, this section illustrates the impact of sources and mechanisms of funding on the scale up of ITNs in Africa.

Scott-Smith, “The fetishism of humanitarian objects and the management of malnutrition in emergencies,” 926.
Tanzania

Tanzania was a hot bed for ITN-related studies and projects in the 1980s and 1990s, led first by entomologists from the LSHTM and later by scientists (mainly epidemiologists) working with the Swiss Tropical Institute. Consequently, Tanzanian health officials and their expatriate partners moved much more quickly towards formulating a national ITN distribution scheme following the advent of Roll Back Malaria, discussed briefly in chapter 3. The Tanzanian National Net Programme, or NATNETS, had at its center a national voucher scheme that provided pregnant women with subsidized vouchers they could redeem at retail shops for low-cost ITNs. Within this scheme, donors paid to subsidize vouchers, used as a kind of currency, and left ITN distribution activities entirely in the hands of the commercial sector. This scheme also drew on the resources of, and sought to bolster, companies in Tanzania’s burgeoning ITN manufacturing industry. By generating consumer demand through behavior change communication with the help of social marketing experts at PSI, and stimulating the development of the commercial net sector, program designers imagined, ITN distribution could both be sustainable and cater to non-target groups.170 “Tanzania chose a combination of several elements based on an approach involving largely the private sector,” two researchers working with Tanzania’s voucher scheme claimed, based on the conviction that “one size does not fit all” and that people would need different types of nets, and the only way to deliver this choice of products was by setting-up a supply chain that would reach even remote villages. Further, there

170 Urs Heierli and Christian Lengeler, “Should bednets be sold, or given free? The role of the private sector in malaria control,” (Freiburgstrasse and Basel, Switzerland: Swiss Agency for Development and Cooperation, and Swiss Tropical Institute, 2008), 8.
was a realisation that the public health system was not strong enough to deliver ITNs consistently over the next decades.\textsuperscript{171}

Although the authors were referring to bed net products when saying ‘one size does not fit all’ here, they also used this phrase to justify Tanzania’s path toward scaling up the intervention to critics of the commercial marketing, supply chain-building approach.\textsuperscript{172}

Tanzanian health officials and their partners, including the WHO, UNICEF, World Bank, Swiss Development Corporation, and a host of NGOs, developed a proposal for a voucher scheme in 2000 after some social marketing pilot projects appeared to stall (see chapter 3). As Don de Savigny, one of the program’s architects, related to me, designing a program like this did not automatically translate into public health practice.

“We had this voucher designed,” he told me, but “no one was interested. Who was gonna pay the full cost of the net, you know? There was no money. So this thing was on the shelf from 2000 to 2003, when the Global Fund was created. Suddenly, there was money.”\textsuperscript{173} Again, the commodity-nature of ITNs was key to securing support for malaria control during the age of decentralized ‘global’ funding mechanisms.

But in those early years of RBM and the Global Fund, having a lot of money did not solve the problem of ITN implementation either. Richard Feachem, the first Director of the Global Fund, was excited to award one of the Fund’s first-ever grants to support Tanzania’s voucher program in 2002. “He kind of rushed the grant through” to be able to announce the grant at the upcoming Multilateral Initiative on Malaria (MIM) Conference, de Savigny continued,

\textsuperscript{172} Jo Lines, et al., “Scaling up and sustaining insecticide-treated net coverage,” 466.
\textsuperscript{173} Don de Savigny, interview with author.
and then hit the wall because of the bureaucracy [...] suddenly this multimillion dollar contract could not go to the Ministry of Health [of Tanzania] because they had ceilings, fiscal space ceilings. That money had to go to the Ministry of Finance. And they had not got their ducks in a row. [...] the biggest, sort of, project the Ministry could receive in those days was thousands of dollars, not millions of dollars. And so there had to be a lot more things organized administratively for that to happen.\textsuperscript{174}

This issue of absorbing the mass of new global health funding available in the 2000s did not impact Tanzania alone. Many African health ministries, which transferred responsibility for health service financing to alternative institutions and adopted budget ceilings as part of structural adjustment reforms, had to adapt to these new financial circumstances.\textsuperscript{175}

RBM officials presented Tanzania’s voucher scheme—its public-private partnership—as a model for scaling up ITN coverage in Africa during the first half of the 2000s. Following the establishment of the Global Fund, and its promise of massive increased funding for malaria control commodities, RBM officials began to think more seriously about strategies for targeting ITN subsidies to vulnerable groups, including through vouchers.\textsuperscript{176} In a draft framework for targeting ITN subsidies in Africa, Jenny

\textsuperscript{174} Ibid.

\textsuperscript{175} Thomas Bossert and Joel Beauvais, “Decentralization of health systems in Ghana, Zambia, Uganda and the Philippines: a comparative analysis of decision space,” \textit{Health Policy and Planning} 17, no. 1 (2002): 14-31. A group of health financing experts summarized the effects of global health aid patterns on health ministries in recipient countries, saying, “External assistance has often been unpredictable and volatile, especially for the poorest countries that are most dependent on aid. This unpredictability has meant that ministries of finance have been reluctant to allow ministries of health to make long-term spending commitments immediately [sic] new aid flows are received.” Eleonora Cavagnero, et al., “Development assistance for health: should policy-makers worry about its macroeconomic impact?” \textit{Bulletin of the World Health Organization} 86, no. 11 (2008): 864-870, 865.

\textsuperscript{176} The issue of targeted subsidies is one in which the variability between malaria control programs in Africa is most immediately visible. Tanzania initiated targeted subsidies through vouchers while many other programs did so through the sale of subsidized nets in routine health services, for instance, at antenatal clinics. Due to the seasonal nature of malaria in the country, health officials from Eritrea decided to target subsidies to the entire population (not just pregnant women and children) and even gave nets away for free. Jenny Hill, Jayne Miller, and Eve Worrall, Draft, “Targeting ITN Subsidies: A Framework for Programme Managers in Africa,” April 14, 2005, 18-26, WHO Archives, File M50-370-22, Jacket 1.
Hill, Jayne Webster, and Eve Worrall touted Tanzania’s National Voucher Scheme and voucher schemes more generally, saying, “as programmes evolve and ITN markets develop it may be desirable to change from a subsidised goods approach to a voucher approach so that the public sector delivery system is alleviated of the burden of supply.”\(^{177}\) Noting that a voucher scheme could also be used to supply antimalarials for the intermittent preventive treatment of pregnant women, and “indeed other health or wider public services,” they acknowledged that such schemes were difficult to sustain without external support, were not well suited to places with a weak ITN commercial sector, and were “not ideal for very poor communities.”\(^{178}\) Despite these rather significant limitations, program managers and researchers working with RBM saw vouchers as a good way to move forward with ITNs in Africa, where in many places the public sector appeared no closer to being able to support ITN activities.

Ghana’s Ministry of Health tried to initiate its own voucher program to help scale up nets in the country using Tanzania as a model. Drawing on variable support from NetMark, DFID, Exxon Mobil, UNICEF, and the Global Fund, Ghana’s Ministry of Health carried out pilot and regional-level voucher projects in the southern and central parts of the country beginning in 2003.\(^{179}\) While African health officials often mixed and

\(^{177}\) Ibid., 19.

\(^{178}\) Ibid., 20. This imaginary of using delivery systems to distribute multiple public health commodities is essentially what ‘integrated malaria control’ and ‘integrated health services’ came to refer to in the twenty-first century. This helps explain why many people considered RBM a new vertical disease control campaign while some of RBM’s advocates and leaders continued to refer to the program as a horizontal, integrated approach to malaria control in Africa.

\(^{179}\) Don de Savigny, et al., “Introducing vouchers for malaria prevention in Ghana and Tanzania: context and adoption of innovation in health systems,” *Health Policy and Planning* 27, Suppl. 4 (2012): iv32-iv43. Populations living in the southern and central parts of Ghana tend to be better off economically than those who live in the Northern, Upper East, and Upper West regions of the country. The Northern, Upper East, and Upper West regions were not targeted in Ghana’s voucher scheme due to the weak or non-existent ITN markets and discouraging market prospects there.
matched distribution and subsidy strategies in the early years of RBM—usually based on what aid NGOs, PVOs, and bilateral partners were willing to provide—mixing in a voucher program did not work well. “In Ghana,” de Savigny remembered,

[it] got fragmented. The USAID would only work in this region, DFID would only work in that region, UNICEF would only work in another region, etcetera. So they got this balkanization where in one area they would have a voucher and in another area they’d have something else. And…those two things can’t co-exist as neighbors. Either you go all, or you don’t go, because you need trust of the private sector to think that if you [a bed net manufacturer] make a net and put it there, someone’s going to buy it with a voucher.\textsuperscript{180}

In the Volta Region, for instance, some health facilities continued to sell subsidized ITNs from a previous project after the voucher scheme began. In addition, commercial partners distributed many voucher-supported ITNs to health facilities, largely to the exclusion of commercial retailers. Due to low stocks of ITNs, retailers struggled to gain a foothold in the market—which is the ultimate aim of ITN voucher schemes meant to transfer the burden of ITN distribution to the private sector.\textsuperscript{181} As Ghana’s attempted voucher scheme makes clear, the Tanzanian state and its partners had to spend a lot of effort actually coordinating the function of ITN markets in the country; the simple provision of goods and some logistical support did not fix the problems of incomplete markets or difficulties with increasing ITN coverage.

Another thing that separated Tanzania from Ghana, and indeed many African countries trying to scale up ITNs, was the presence of a somewhat robust domestic bed net manufacturing industry, which emerged in the 1990s. Sunflag, a textile company established by Satyadev Bhardwaj in Kenya during the 1930s, was the first company to

\[180\] Don de Savigny, interview with author.
manufacture bed nets in Tanzania. Then around 1997, Don de Savigny recalled, he and a group of other researchers and members of PSI convinced Anuj Shah and Binesh Harria at A to Z Textiles Limited to enter the bed net market. Specifically, the researchers encouraged Shah and Harria to start making green, rectangular nets that people in Tanzania seemed to prefer. “And so we organized this meeting with the Chamber of Commerce” in Dar es Salaam about the future of ITNs, de Savigny told me,

And the guy from Sunflag shows up. He hangs his white net on this white wall. […] the last five minutes before the thing starts, Binesh and Anuj from A to Z walk in and they hung up this incredibly beautiful six foot-by-six foot green net on the other wall. And it said ‘Made in Tanzania.’ It was the first net off their assembly line. They had invested a quarter of a million dollars of their own money, bought some new equipment, and made these beautiful nets, polyester nets. […] And the whole crowd went over and AMREF was there, AMREF-Nairobi was there, and they ordered one hundred thousand on the spot. 

By 2004, two other textile companies in Tanzania had entered the bed net market as well, banking on support from the country’s voucher scheme.

Very quickly NATNETS and the program’s key expatriate stakeholders, including Christian Lengeler, Don de Savigny, and Jo Lines, found themselves the opponents of free ITN distribution advocates. “The public sector in Africa,” free-distribution advocates published in a 2003 *Lancet Infectious Diseases* article, “has shown its capacity to deliver vaccines efficiently and sustainably; this infrastructure and complementary additional approaches should be developed to deliver ITNs. Rather than assume that the public sector is inadequate for this task,” the authors suggested of Tanzania’s ITN distribution system, “funds should be provided so that it can effectively fulfill its role in the protection of public health.”

182 Don de Savigny, interview with author.
183 Curtis, et al., “Scaling-up coverage with insecticide-treated nets against malaria in Africa.”
and his allies excoriated the idea of selling nets to those at risk for malaria. “We strongly suggest that malaria-endemic countries and donor agencies should abandon the idea of social marketing,” they wrote and “commit to a policy that regards antimalarial commodities […] as public goods to be available free of charge for mass distribution to affected communities.”\(^{184}\) Lengeler and those supporting Tanzania’s voucher scheme argued that the fluctuation and uncertainty of global funding for fully subsidized LLINs—an expensive undertaking—meant African countries should work towards an ITN distribution model that did not depend as much on continual donor funding.\(^{185}\)

Sachs presented his message at the 2005 World Economic Forum, sitting on a panel alongside Tanzanian President Benjamin Mkapa, Bill Gates, and others. One member of the audience, actress Sharon Stone, was so moved by the idea that ITNs could save thousands of children’s lives that she agreed to donate $10,000 to Tanzania for ITNs. Rallying other members of the audience to add to her donation, she cried, “Just stand up. Just stand up. People are dying in his country today, and that is not okay with me!”\(^{186}\) By the end of the Forum, audience members pledged to give Tanzania $1 million for free ITNs. However, not all those who pledged came through on their spur-of-the-moment commitment of funds. UNICEF agreed to make up the difference, giving about $860,000 of the $1 million to Tanzania’s National Malaria Control Programme so program officials could complete the purchase order they had already made.\(^{187}\)

\(^{184}\) Teklehaimanot, Sachs, and Curtis, “Malaria control needs mass distribution of insecticidal bednets,” 2146.

\(^{185}\) Heierli and Lengeler, “Should bednets be sold, or given free?,” 14.


Many of those invested in Tanzania’s National Net Programme, including the architects of Tanzania’s voucher scheme and domestic manufacturers of ITN products, were greatly dismayed by the prospect of this influx of free nets and its threat to Tanzania’s ITN supply chain. In fact, Managing Director of Textile Manufacturers of Tanzania Ltd., Anthony Haji, wrote to WHO Director-General, Jong-Wook Lee, pleading for him to discourage this course of action. “It is [...] disheartening to learn that the Government of Tanzania together with some of its guiding partners are considering handing out more than 400,000 free nets to the Lindi and Mtwara regions to children under 5 years of age.” Invoking Sharon Stone’s outcry at the World Economic Forum, Haji continued,

The argument cited for the free nets is that these children need to be protected from malaria today. TNML [Tanzania Manufacturers Ltd] fully understands the plight of these children and as a long-term investor in this country we are interested in the well-being of these children not only today, but yesterday, tomorrow and for many years to come (assuming we will still be around to produce and distribute ITNs).188

He felt this ITN windfall might be more easily tailored to Tanzania’s current approach where donors provided full-value vouchers rather than flood the market with free products. “In the long-run this is of course the only true and sustainable market from a private sector as well as public sector perspective.”189

Haji’s letter also shows that the label of ‘public-private partnership’ did not suggest a uniform relationship; such partnerships could be configured and operate in different ways. In one configuration, development agencies and wealthy individuals could purchase ITNs from foreign manufacturers for Tanzania’s Ministry of Health to

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189 Ibid.
give away free; in another configuration, the Ministry could use external funds to buy nets directly from Tanzania’s ITN manufacturers for inclusion in the voucher scheme. Interpreting the idea of public-private partnership in the latter sense, Haji complained, “Considering all the focus on our partnership as the way forward in public health in general, I find it exasperating that free distribution of nets is even considered as an option.”\textsuperscript{190} This predicament highlighted for all involved that partners did not “s[i]ng off the same hymn sheet.”\textsuperscript{191}

In practice, Tanzania’s National Voucher Scheme increased ITN coverage in the country only very gradually. According to one survey, the percentage of households in the country owning at least one ITN increased to just 29% by 2007, though just as many households owned at least one untreated bed net.\textsuperscript{192} Furthermore, only 25.7% of children under 5 and 23.2% of pregnant women used ITNs—rates well below the 60% Abuja Declaration target.\textsuperscript{193} Those living in urban areas and wealthy households were more likely to own and use both treated and untreated nets. As in many previous cost-recovery bed net projects, the cost of nets and insecticide proved a barrier to ITN ownership and use, especially among the poorest populations. Researchers also linked low usage rates to some people’s lack of knowledge about the links between malaria and mosquitoes and low levels of ITN promotion in certain districts. They identified these latter two barriers mainly in the western part of the country, far from former ITN research and project sites as well as Tanzania’s major urban centers.\textsuperscript{194} While the voucher scheme did help increase

\textsuperscript{190} Ibid.
\textsuperscript{191} Ibid.
\textsuperscript{193} Ibid., 4.
\textsuperscript{194} Ibid., 32.
ITN access in outlying, rural areas of the country, it by no means solved the problems of ITN delivery in Tanzania.

Tanzania’s National Malaria Control Programme continued to operate the national voucher scheme even after newly available resources from the Global Fund allowed African countries to conduct free mass ITN distribution campaigns. RBM officials and partners referred to free mass ITN distribution activities as ‘catch-up campaigns,’ intended to increase coverage rapidly either as a stimulant in areas where communities had not adopted ITNs widely, or as an effort to replace people’s old, worn-out nets. Defenders of Tanzania’s voucher scheme tried to emphasize the importance of ‘keep-up,’ or continuous ITN distribution, alongside ‘catch-up’ campaigns. Taking “a clear stance in favour of the commercial distribution chain” in Tanzania, they both acknowledged the need for a catch-up strategy while also recognizing that such a strategy was inadequate for accommodating new pregnancies and births.195 However, as more donors, NGOs, and humanitarian organizations joined the RBM movement, latching on to ‘life-saving’ ITNs in particular, more and more African countries switched to only doing free mass distribution campaigns. Tanzania’s slow and steady coverage growth suddenly paled in comparison to the very high coverage rates of neighbors who blanketed regions with free ITNs. The country even organized a free distribution, ‘catch-up’ ITN campaign in 2008 in response to findings of low ITN coverage. Tanzania no longer represented an ideal model for ITN distribution or malaria control development in Africa.

Tanzania’s voucher scheme finally ended in 2014 under pressure to meet pay-for-performance criteria of donors. Tanzanian health officials adopted the free mass

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195 Heierli and Lengeler, “Should bednets be sold, or given free?,” 11.
campaign model in its wake. On top of that, in 2015 the Tanzanian government changed the classification of ITNs from ‘zero-rated’ goods—or goods for which ITN producers received state credits for the value-added tax on inputs used to make ITNs—to ‘exempt supply’ goods—goods for which producers did not receive these credits.\textsuperscript{196} The government did so as part of a broader effort to significantly reduce domestic, tax-exempt items and increase state revenue.\textsuperscript{197} Eliminating credits on the value-added tax for domestic ITN manufacturers meant these companies had to raise the price of their ITN products to continue making a profit.\textsuperscript{198} This change has put A to Z Limited and Sunflag at a severe disadvantage in competing for Global Fund tenders. Moreover, these companies have laid off thousands of workers due to stagnant bed net sales and the influx of cheap bed nets from Asia.\textsuperscript{199} In many ways, partners’ early dreams of developing a sustainable ITN supply chain in Tanzania seem to be dissolving.

\textit{Zambia}

Zambia emerged as a demonstration ground for rapidly scaling up malaria control during the era of RBM. Like Tanzania, the country enjoyed good standing among RBM partners for its political stability and political commitment to RBM. Unlike Tanzania, however, Zambia and its National Malaria Control Programme (NMCP) demonstrated the viability of a ‘quick impact’ strategy that relied heavily on outside donor assistance

\textsuperscript{196} Value-added tax is a tax on the amount by which the value of a good has been increased at each stage of its production or distribution. It is a tax, in other words, on the surplus value of product.
\textsuperscript{199} \textit{Ibid.}
rather than a private sector-based delivery system that increased ITN coverage gradually. Members of Zambia’s National Malaria Control Centre (NMCC) and their partners provided proof-of-concept that achieving high coverage of RBM interventions, including ITNs, could reduce malaria rates to levels reaching elimination.²⁰⁰ However, recent fluctuations of donor inputs have exposed the vulnerabilities of both the strategy and the health of populations at-risk for malaria.

During the first years of Roll Back Malaria, Zambia’s NMCP adopted ITN distribution strategies and policies advocated by RBM partners at the time, namely socially marketing ITNs at a subsidized price to “create a net culture.” This entailed stimulating consumer demand through behavior change communication and encouraging the private sector to reduce its prices.²⁰¹ Such a strategy represented a continuation of earlier ITN activities from the 1990s, where NGOs and development agencies supported small-scale, cost-recovery ITN projects at the district or community level. While recognizing that entomologists working with the WHO recommended “targeted vector control” for malaria control programs, NMCP leadership also “recognize[d] that in the current resource-poor environment in Zambia,” measures like indoor residual spraying, larvaciding, and eliminating breeding sites were “not cost-effective […] for the public sector.”²⁰² Thus, the systematic introduction of insecticide treated materials remained a cornerstone of the Program’s malaria (disease) prevention and vector control goals. As

²⁰⁰ Malaria elimination—the new, if intermediate, goal for African countries—consists of interrupting the local transmission of parasites in a particular region and bringing the incidence of indigenous cases of malaria in that area down to zero (as opposed to eradication, in which one acts to permanently reduce malaria incidence down to zero).
²⁰² Ibid., 10. For more on the relationship between Zambia’s declining economic conditions following structural adjustment, malaria control, and malaria rates, see Packard, The Making of a Tropical Disease, 206-216.
occurred in other RBM-supporting countries during the 2000s, Zambia’s malaria control program embraced ITNs and, due to donors’ support and preferences, ITN social marketing.

Zambia also benefited, however, from private sector involvement in malaria control. In 2000, the Ministry of Health, NMCC, and other partners initiated a malaria control program funded by Konkola Copper Mines in the country’s Copperbelt region. Using indoor residual DDT spraying—the vector control method of choice in Zambia’s mining regions during the 1970s and early 1980s—this effort proved successful in reducing malaria cases among the population of roughly 360,000. Malaria control officials cited this as a good example of “how collaboration between the private and public sector can benefit the community and business,” an example followed most notably by ExxonMobil in West and Central Africa.203 Outside analysts recognized that Zambia “was fortunate” in that it “benefited from private interest in its mining sector” while most other African donors had to rely on international public donors to support their malaria control programs.204 Not every country could support even targeted insecticide spraying activities. Nevertheless, as the national malaria control program expanded this malaria control effort beyond Chingola and Chililabombwe, the country demonstrated the viability of a multi-pronged approach that included indoor residual

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203 Brian Sharp, et al., “Malaria control by residual spraying in Chingola and Chililabombwe, Copperbelt Province, Zambia,” *Tropical Medicine and International Health* 7, no. 9 (2002): 732-736. For more on ExxonMobil’s malaria initiative, see, ExxonMobil, “ExxonMobil Malaria Initiative,” updated 2017, http://corporate.exxonmobil.com/en/community/malaria-initiative/malaria-program/overview, accessed April 18, 2015: “As a major employer and investor in Africa, ExxonMobil has witnessed the devastation of malaria. We’ve seen its impact on the lives of employees, their families and their communities. That’s why we are part of an international effort to prevent, treat and cure this deadly disease.”

spraying—an approach stigmatized though not completely abandoned in the post-malaria eradication era.  

Success and investment in malaria control in Zambia continued to increase, nearly in parallel. In 2003 the RBM Secretariat selected the country for a consultative exercise called ‘REAPING’ (RBM Essential Action, Progress and Investment Gaps), where WHO/RBM experts would assist Zambia’s Ministry of Health negotiate a malaria control support package from global RBM partners and donors. “Zambia is recognized as one of the countries in Africa with the greatest potential, and readiness to achieve the targets set […] during the Summit on 25 April 2000,” RBM Director Fatoumata Nafo-Traoré wrote to Hon. Rosemary Chipampe, Zambia’s Deputy Minister of Health. RBM leaders based this judgment on the fact that Zambia had adopted and carried out many of the steps RBM partners encouraged, such as reducing taxes and tariffs on ITN commodities, mobilizing additional resources for malaria control, creating “effective partnership mechanisms,” and completing a situation analysis and strategic plan. In addition, Zambia had proven its success in obtaining funding for malaria control from the newly created Global Fund—one of only seven African countries to do so in Round 1 of the organization’s grant cycle. In an era of performance-based-funding, Zambia emerged as a frontrunner in the scramble for malaria control resources.

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205 Although WHO officials encouraged African countries to move away from spraying during the 1990s and early 2000s, by 2006 the WHO and other partners of RBM included IRS on their list of tools that African countries could use in pursuit of malaria elimination. American stakeholders, such as PMI, had a substantial influence on this change in policy. WHO Global Malaria Programme, “Indoor residual spraying: Use of indoor residual spraying for scaling up global malaria control and elimination,” (Geneva: WHO, 2006); Christian Lengeler, interview with author, online (skype), November 5, 2015.


207 Briefing notes for regional director for video conference on malaria (GFATM), 2003, WHO Archives, File M50-370-13, Jacket 1. Zambian officials, however, ultimately did not sign the agreement necessary to receive the grant.
Zambia continued to enjoy attention from donors in the mid-2000s, when RBM partners intensified their investments in malaria control in Africa. The World Bank provided roughly $20 million to Zambia through its Malaria Booster Program to help the country implement its 2006-2010 National Malaria Control Strategy. The World Bank linked the grant to its broader aims in the country, claiming the project [Booster Program] “would contribute towards achieving the MDG goals of reducing infant and child mortality, maternal mortality and control of communicable diseases,” and directly support the World Bank’s Zambia Country Assistance Strategy of 2004.\(^{208}\) Citing Zambia’s efforts to reform and decentralize the health sector during the late 1990s, and the commitment of Zambia’s government to RBM and malaria control, Bank officials felt Zambia would be a worthy recipient of malaria aid.

Additionally, in 2004 the Gates Foundation funded a program within the non-profit, Seattle-based organization PATH: the Malaria Control and Elimination Partnership in Africa (MACEPA). According to Rick Steketee, longtime member and now Science Director of MACEPA, the new program emerged to keep the pursuit of malaria control afloat at a time when endemic countries in Africa struggled to scale up ITNs and other interventions. “Roll Back Malaria was risking not having a success to build on, that no country was actually demonstrating the successful scale up of all of the recommended interventions,” he told me. “And the donors were sitting on the sidelines, not necessarily diving in […] our notion was that the world needed some successes, and that success at a national level would be required, not at a sub-national level.”\(^{209}\)


\(^{209}\) Rick Steketee, interview with author.
on help from RBM and, in particular, James Banda—a member of the RBM Secretariat and contact person for Zambia’s malaria control program—MACEPA’s leaders chose Zambia as the testing ground for a new strategy that would be the vehicle for success: ‘Scale Up For Impact’ (SUFI).

Intended to provide an alternative to the fractured, slow-working ITN social marketing projects, the main purpose of SUFI was to achieve high coverage of interventions black-boxed as ‘evidence-based.’ ITNs, IRS, case management “were proven effective interventions, they had a lot of science and clinical trials behind them, but nobody was taking them to high coverage in populations,” Steketee continued. “But the idea was if you look at bed nets as a vaccine that saves lives, vaccines save lives on the basis of coverage. So it was all about coverage.” MACEPA worked to “coordinate support” around SUFI among the donor community, focusing on tapping into patrons’—namely the World Bank’s, Global Fund’s, and PMI’s—interest in achieving high coverage of interventions and being able to track the impact of their investments. MACEPA, in other words, provided a competing model for the scale up of ITNs that drew from the substantial increase in financing available for malaria control.

Zambia turned out to be a place well-suited the MACEPA’s demonstration project due in part to the country’s political stability, along with the Ministry of Health’s commitment to and history of collaborating with outside partners on malaria control. MACEPA consultants helped plan the National Malaria Control Strategy for 2006-2010, as well as mobilize resources and logistical support to carry out the scale-up of

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210 Ibid.
interventions. The “progress to date [2005] in malaria programming in Zambia,” including the reduction of taxes and tariffs on ITNs and the introduction of revised drug policies, “built the confidence of many donors to commit to supporting malaria programme scale up.” Of course, a portion of this money went towards strengthening routine health management information systems needed to track and illustrate the success of the SUFI approach. A group of representatives from MACEPA, Zambia’s NMCC, and the country’s Ministry of Health summarized Zambia’s malaria control efforts pithily as “Sound policies attracting partners and growing resources.” This statement reinforced the idea that a main purpose of national and global malaria control policies was to secure the means necessary to finance further control activities.

Beginning with Luapula and Western provinces, NMCC officials and their partners began scaling up ITNs around the country in earnest around 2006. Zambia’s malaria control officials tapped into and expanded existing networks of district health workers, NGOs, and community-based organizations to distribute commodities. They even used infrastructure originally dedicated to HIV/AIDS activities. Piggybacking off of other health services as well, Zambia’s NMCC and its partners subsidized ITN distribution through antenatal clinics and routine child health services, including childhood vaccination campaigns. They also ran ITN-specific mass distribution campaigns in rural, hard-to-reach areas, distributing over 3.5 million ITNs in 2006 and 2007, and reaching over 60% ITN coverage in the northeastern and western parts of the

212 External funding for malaria control in Zambia grew from about $9 million in 2003 (mostly via WHO/UNICEF and USAID) to a high of nearly $40 million in 2007, provided through USAID, MACEPA, the World Bank Malaria Booster Program, the Global Fund, and, to a much lesser degree, WHO/UNICEF.


country by 2008. The NMCC maintained commercial ITN distribution in urban areas, where they focused instead on scaling up indoor residual spraying activities.

At the same time health officials carried out these control activities, health and demographic surveys showed a 29% decline in child mortality from 2001 to 2007. The surveys also showed a 69% reduction in severe anemia prevalence among under-fives from 2006-2008, and a 54% reduction in declining malaria disease incidence among under-fives over the same two year period. These statistics, of course, represent an aggregation of national data, obscuring the heterogeneity of health impact in such places as the marshlands of Nchelenge district, bordering Lake Mweru and eastern DRC. And although reductions in child mortality are difficult to attribute to malaria control alone, much less to ITNs, MACEPA representatives mobilized such data to argue, “Zambia is demonstrating that it can be done!”

Bill Gates lauded efforts in Zambia to scale up malaria control tools at the 2007 Malaria Forum meeting in Seattle, saying, “Zambia is an inspiring example of a nationally-coordinated effort. Three million long-lasting insecticide-treated bednets are being distributed there this year, and the country is close to reaching its national target of 80 percent of households with at least one net—up from 20 percent two years ago.”

Even more amazing, Gates claimed, representatives from other African countries were now discussing with malaria funders how they could follow Zambia’s model of national coordination.

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215 Ibid.
216 Ibid., 483.
intervention scale-up. “It is a breakthrough that these countries [Ethiopia, Tanzania, Mozambique] are considering national programs today” since only “a few short years ago there was only enough funding for district efforts.”220 In convincing potential donors of Zambia’s success as a model, Gates and MACEPA officials made little of the fact that Zambia is not representative of numerous other endemic countries in Africa, where political and economic circumstances continually limit, threaten, and undermine malaria control activities. However, by portraying malaria control as a technical problem that can be solved by getting commodities and interventions into people’s hands and homes, they also collapsed the variability that separates one place from another.

Increasing coverage of ITNs through rapid distribution, of course, is not a full proof solution to malaria prevention. For one, as researchers and program managers found in Zambia, not everyone who owned an ITN actually used it. “The intervention was assumed to be a known and popular one,” they reported. This in turn generated assumptions that “fast and near universal uptake would arise because (1) the intervention is known to work (protect from malaria); […] ITNs are relatively cheap/free; […] [and] ITNs are easy to use.”221 Survey data showed that of those families in Luangwa District who received ITNs in a 2008 mass distribution campaign, however, just over half of recipient children slept under ITNs during the period of data collection.222 Even with substantial communication campaigns in the district and mothers’ high awareness of the benefits of ITNs for malaria control, a number of people did not hang up nets they received, making the net ineffective as a health intervention. “Policies based on the

220 Ibid.
222 Ibid., 321.
evidence that for every two ITNs distributed only one is used,” researchers concluded, “may not attract support and subsidies in the long term.”

Indeed, external support for malaria control and ITNs in Zambia slowed dramatically in 2009 following the mismanagement, or disappearance, of a 7 million Swedish Krona (about $700,000) grant to Zambia’s Ministry of Health. Other donors followed Sweden’s lead in pulling funding for Zambia’s Ministry of Health shortly thereafter. The European Union and Global Fund began funnelling funds through UN agencies rather than through the Ministry, making it more difficult for Zambian health officials to direct funds to its priority areas. Because Zambia was highly dependent on external donors to support the country’s health sector, health service delivery—including antenatal services which incorporated ITN distribution—suffered. Malaria illness and mortality rates increased with the disruption in funding and service provision in the eastern half of the country. Rates of insecticide resistance increased as well, as they have across Africa markedly following the introduction of mass ITN distribution campaigns and universal ITN coverage goals. In its 2011-2015 Strategic Plan, Zambia’s NMCC recognized the need to build up human resource capacity and health infrastructure in Zambia to help prevent shocks caused by fluctuating funding conditions. At the same time, it recommitted the country to addressing these gaps in the health system by pursuing universal coverage of malaria control interventions such as ITNs. Just as Zambia demonstrated the viability of SUFI as a twenty-first-century approach to malaria

223 Ibid., 324.
control in Africa, so too has the country demonstrated the precariousness of malaria control on the continent.

**Conclusion**

As ITNs became increasingly central to global malaria control, these objects, these biomedical commodities, connected a rapidly growing set of people and groups involved in antimalaria activities in Africa. This identity of biomedical commodity was not an inherent property of ITNs; it developed, as this dissertation suggests, over the 1980s and 1990s in a particular political, social, and intellectual milieu. Those who participated in rolling back malaria bolstered, modified, and operationalized this identity of biomedical commodity in pursuit of their own interests—which often included reducing malaria, but often, and almost always, included securing financial resources as well. This pursuit of funding contributed to the transformation of ITNs from a malaria control measure into a tool for saving lives and advancing economic development in Africa. The idea that ITNs could save children’s lives regardless of social or ecological context bolstered marketing models based on ‘demand creation’ along with assumptions that consumers would invest in ITNs for the technology’s biomedical value. Such market determinist conceptions led policy makers, program managers, patrons, and manufacturers to tinker with ITN technology and markets to address the problems with ITN programming, sometimes overlooking alternative pathways to malaria control in Africa.

In addition, prevailing beliefs among the development community that the poor were autonomous, rational economic actors seeking to optimize utility and value
reinforced this community’s support of ITN demand creation strategies. For the
development community, providing African populations the means to access a tool of
survival, whether through commercial markets, highly subsidized channels, or charitable
donations, meant giving the poor the means to pull themselves out of poverty and
suffering. Such conceptions of ITN technology as a fix for development—an endeavor
focused these days on “eradicating poverty”—has reinforced decentralization and
diverted attention away from the politics of dependence and economic inequality in
global health.\textsuperscript{227} To revivify James Ferguson argument in \textit{The Anti-Politics Machine}, “by
uncompromisingly reducing poverty \textbf{and malaria} to a technical problem, and by
promising technical solutions to the sufferings of powerless and oppressed people, the
hegemonic problematic of “development,” \textbf{and global health} is the principal means
through which the question of poverty \textbf{and malaria are} de-politicized in the world
today.”\textsuperscript{228}

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\textsuperscript{227} Ferguson, \textit{The Anti-Politics Machine}.
\textsuperscript{228} \textit{Ibid.}, 256.
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Chapter 6
Stitching a Patchwork: Experiences with Insecticide-Treated Net Distribution in Kenya

Ong’ielo clinic sits atop a small hill not too far from the village of Asembo Bay. Located across from a matatu (minibus) stop, it is no doubt a common destination for many in this lakeside region of Siaya. This includes research teams and expatriate NGOs aiming to better understand and help curb HIV/AIDS, malaria, and other health problems prevalent in the area. When I arrived there with my research assistant, Molly, in late July 2015, however, the clinic was fairly quiet. A couple of women—very likely new mothers—stopped by, signed in, picked up what they needed, and left. No other researchers or expatriate NGOs in sight. Lillian, a staff member at western Kenya’s branch of the Nairobi-based NGO, Halo-Kenya, who occasionally worked out of Ong’ielo clinic, showed me around the facility. If the clinic did not seem overflowing with people and things, there was one thing it had in spades—on the floor of a back storage room sat multiple bales of insecticide-treated bed nets.

These days, expectant mothers who come to Ong’ielo are issued one of these nets when they come in for antenatal care. Along with this, they receive a small booklet with health information, including a place to mark down that they received a net. When they deliver their children, they receive another net and another check mark in the booklet. Theoretically, bed nets constitute just one arm of Kenya’s multipronged malaria control strategy. The Ministry of Health and Division of Malaria Control (DOMC) also promote rapid diagnostic testing—which health workers can now do with cheap, mobile kits about half the size a cell phone—prompt treatment with artemisinin combination therapy, and
improved health system surveillance.¹ Malaria control at Ong’ielo, however, does not live up to these best laid plans. In the summer of 2015, I learned that community health workers working for Halo-Kenya often walked around villages in the area, providing rapid diagnostic tests for malaria. Following to the decentralization of drug procurement to county level earlier in the year, though, Ong’ielo and many other clinics in Asembo lacked drug stocks to clear up malaria parasites detected through the tests. As a result, many people stopped bothering to come to Ong’ielo for malaria treatment. For reasons I describe in this chapter, though, Siaya’s population, like Ong’ielo clinic, has plenty of bed nets.

The previous chapter described the scale up of ITNs in Africa largely through the activities of health and development organizations based overwhelmingly in the ‘global North.’ While understanding those activities is essential to understanding how and why ITNs became so central to malaria control in Africa, such a perspective obscures the ways in which African health officials, researchers, and populations informed the scale-up of ITNs in practice. Therefore, this chapter examines the experience of scaling up ITNs in Kenya, an experience in many ways representative of ITN uptake across the continent, sketched out a bit in chapter 5. Focusing on Kenya specifically, though, the chapter also elucidates the influence of Kenyan officials, researchers, and populations not simply on ITN distribution and programming in the country—a fractured activity carried out by multiple agencies in multiple ways—but also on global ITN distribution strategies.² Kenyans were not simply passive recipients of a foreign technology; rather,

² For more studies on how local responses and circumstances challenged and/or shaped Western colonial or international health institutions’ attempts to implement disease control strategies, see Sunil Amrith,
they actively incorporated (sometimes in alternative material forms or epistemic frameworks) ITNs into their daily lives and national plans in pursuit of their own development.\(^3\)

Although operating with circumscribed power in this period, Kenyan Ministry of Health and DOMC officials did various things to try to steer malaria control and ITN programming in the country. For instance, Kenyan health officials shared knowledge across national borders about running an ITN program within the Roll Back Malaria (RBM) framework and with limited resources. In some cases, officials were able to negotiate new strategies and solutions within existing funding structures and relationships, albeit with support from external partners. Some officials also collaborated on research projects and publications aimed at illustrating the need for free or highly subsidized ITN products for the country’s poor. Therefore, while it is true that African states have taken a back seat to NGOs and other foreign agencies in public health service provision following structural adjustment reforms, it is worth recognizing the ways in which state actors have used the apparatuses of global health—including regional networks within global public-private partnerships and relationships to partner research

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institutions—to try to influence provision practices on a national scale.\(^4\) Doing so recognizes the uneven power relations of public health provision in Africa today while also expanding conversations about the ways African populations have mobilized social relationships as tools to pursue their goals under political, legal, and economic constraints.\(^5\)

Similarly, while populations at-risk for malaria did not get much choice in which malaria control interventions were available and accessible to them, they did not simply take up ITNs as health agencies and donors intended. Drawing on various forms of knowledge, including sensory and tacit knowledge, Kenya’s residents used or declined to use ITNs in various ways to meet their own priorities, beliefs, and needs.\(^6\) Sometimes this included deploying ITNs as malaria control devices, sometimes it did not. ITN programmers, malaria control patrons, and other ‘global’ partners modified strategies in response to African populations’ patterns and practices of ITN consumption and use. In this way, Kenyan users and intended users of ITNs shaped the roll out of ITNs as biomedical, malaria control tools in the country, even if they did not consider ITNs as such. Doing so under the watchful gaze of researchers and health officials, who produced


and disseminated knowledge about ITN consumption and use among Kenya’s poor, these intended users also influenced international debates and policies about ITN provision and poverty in Africa.

Finally, it is important to remember that twenty-first-century debates over ITN provision did not mark the first time Kenyan communities, researchers, or health officials influenced international knowledge and discussions about ITNs. These groups also shaped biomedical knowledge produced about ITNs in scientific trials of the late twentieth century, endeavors in which their material practices with nets and insecticide mattered heavily. By ending with a chapter on ITN implementation and use, I do not wish to merely draw out this parallel between ITN research trials and health programs. Rather, I want to trace ‘evidence-based’ public health to its denouement—from scientific knowledge production, to evidence-based policy making, to the implementation of evidence-based policies—and understand how and why certain types of knowledge get translated in this process. The fact that Kenyan communities continued to shape international discussions about effective ways to disseminate ITNs in Africa over the twentieth and twenty-first centuries—often through the same general responses to ITNs—speaks to the limitations and politics of knowledge translation within evidence-based public health.

Bed nets in Kenya in the mid-twentieth century

Just as bed net technology itself was not new in the late twentieth century, neither was the technology new to Kenya in this period. Prior to the late 1980s, however, (untreated) bed nets in Kenya were luxury items that people associated with towns, civil
servants, *wazungu* (white people, foreigners), the educated, and the wealthy. For that reason, many residents I interviewed in rural Nyanza Province, though certainly not all, had not encountered or learned about bed nets until relatively recently. Those who were familiar with bed nets—which, as one might expect based on colonial labor patterns, were predominantly men—recalled that these luxury goods were neither common nor used explicitly for health purposes. John Obonga, now residing in Gem, recalled buying a bed net as early as 1958 in Nairobi for 120 shillings, “a very expensive price in those days.” Even living in Nairobi from 1952 to 1999, he noted, bed nets “were not common in the past. They were only common among soldiers who came back from the war in 1945 and among police people.” Tom Ochangwa, on the other hand, said he first encountered bed nets in his school during the early 1970s. “You know I went to a boarding school. These other schools had no such [mosquito nets] because they were not boarding schools. […] even the homes here [Gucha], we had no mosquito nets.” Asked why school staff told the students to sleep under a net, he replied, “at that time they were purposely to hold [back] mosquitoes.” Sometimes bed nets were not connected to education or positions of wealth at all. One *mzee* (elder) in the Nyanza highlands, for instance, described how he first used a bed net working on a tea plantation in Kericho. Harvesting one of the colony’s largest, most important exports, he got to use a bed net.

Women who accessed bed nets in this earlier period often did so through fathers, husbands, or other male kin. Anastasia Akinyi grew up with bed nets as a child before

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7 John Obonga,* interview with author, Nyawara (Gem), August 26, 1989. As in previous chapters, I use pseudonyms, marked with an *, for all Siaya residents I interviewed as part of the study.
8 Ibid.
9 Tom Ochangwa,* interview with author, Masisi (Nyamache), November 21, 2015.
10 Ibid.
11 Milo Nguge,* interview with author, Masisi, November 27, 2015.
Kenyan independence. Her father had procured the nets when he was stationed in Bombo, in Uganda, as part of the British colonial army. “We used to have the nets, right from the time we were children,” she told me. “And even if you’re sleeping on the mat, the net’s there. Even though we were lucky, we had beds. We never slept on mats. […]”

During the time when we came back to Kenya,” she continued,

the authority was in the hands of the white men. So all those working, and more especially those working with the government, all those who had big jobs and had money would buy the nets. In the government, they were being given to the employees. But others who had extra money would buy nets. But as much as it was some small amount, it was hard for every commoner to buy it. They didn’t have that money.\textsuperscript{12}

These connections were not always kin-based. Victoria Okech, a long-time Catholic living in Asembo’s Rarieda division, described how she first obtained a net in the mid-1970s through a missionary from Holland named Father John. He worked at the Pandpier Catholic Centre in Kisumu town, where Victoria and her grandmother lived at the time, selling and training people to mend mosquito nets. Happy to no longer burn cow dung and mieny (Lantana-Camara plant)—common ways people in Nyanza repelled mosquitoes in the past—she embraced mosquito nets.\textsuperscript{13}

During the colonial period and first decades after independence, my informants made clear, bed nets were not goods for the “common wananchi,” the common man.\textsuperscript{14} As much as Nyanza residents associated the introduction of bed nets with wazungu, who

\textsuperscript{12} Anastasia Akinyi,* interview with author, Nyawita (Bondo), September 14, 2015.
\textsuperscript{14} Wananchi means “citizens” in Swahili (or, people of the country (nchi)). My research assistant frequently translated the concept of ‘ordinary people’ to common wananchi, so I will use that term here.
according to one woman loved their skin so much they brought over the tool to prevent the swellings of mosquito bites, many also linked the recent dissemination of insecticide-treated nets with the Kenyan government. “Before the government came in,” one man elaborated, bed nets were being brought in and assimilated to the communities by those people who had been in towns who have known [malaria] mostly in the lake region, where they understand that the mosquito is very, very great. So they brought these things. They had even been buying them themselves. […] A majority in the community cannot afford to buy, so they went through the ministry of health. That is how it [bed nets] was given.\textsuperscript{15}

In the remainder of the chapter, I will explore the role of the Kenyan state and various other entities involved in ITN activities in Kenya to see how an expensive, luxury good transformed into a free health technology of the poor. Efforts to effect such a transformation in Kenya had broader implications for global health and malaria control in Africa, even if the transformation did not solve all the problems of using ITNs for malaria control in Kenya. In addition, I will examine the different ways residents responded to ITNs based on their priorities, interests, knowledge, and resources. I focus on the experiences of people living in Nyanza Province, the region with the highest malaria rates in the country and thus the site of many ITN-related projects and activities. Their responses not only shed light on how ITN dissemination operated in practice, and on people’s experiences with the new tool; they also reveal how “ordinary people,” the common wananchi, informed the trajectory of a biomedical, global health technology.\textsuperscript{16}

\textbf{The Kenya Model: Population Services International and Social Marketing ITNs}

\textsuperscript{15} Paul Mbati,\textsuperscript{*} interview with author, Masisi, November 27, 2015.
\textsuperscript{16} Mavhunga, \textit{Transient Workspaces}, 7.
“With the Abuja Declaration [on Roll Back Malaria], all member states committed themselves to achieve some targets. And one target in bed nets was to achieve sixty percent of net coverage among under-fives and pregnant women. With that, the government and the Ministry now could lobby international organizations—WHO, UNICEF, whoever is willing—to give donations in terms of nets, in terms of funding, in terms of whatever it takes because now we have a target as a country.”

For Kiambo Njagi, the current Project Coordinator for Kenya’s National Malaria Control Program (NMCP), the Abuja Declaration on Roll Back Malaria marked an important milestone in the country’s fight against an intractable disease. After years of trying to consolidate international support for malaria control in Kenya through bureaucratic reform, policy adoption, and other displays of political commitment, Ministry of Health leaders now had a mechanism through which to attract and facilitate external malaria aid. During the first years of RBM, Population Services International (PSI) and its main sponsor, the U.K. Department for International Development (DFID), provided a majority of this aid in Kenya. As such, Kenya provided a model for how to scale up ITNs in Africa through ITN social marketing schemes. This contrasted with the voucher-based, private sector delivery scheme implemented in neighboring Tanzania, or free ITN distribution implemented in at-risk areas of Eritrea, though the Kenyan government did consider and try out these systems as well. In becoming a major participant in the

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country’s ITN programming, PSI and its behavior change messaging had a tremendous impact on the landscape of ITNs and ITN-related knowledge in Kenya.

In 2001 DFID gave PSI $25.4 million to run a five-year, national social marketing scheme in partnership with Kenya’s Ministry of Health and Division of Malaria Control, which PSI launched in 2002. Tasked with “stimulat[ing] the emergence of a net culture,” PSI aimed to create demand for and distribute 2.4 million subsidized nets to vulnerable groups in Kenya through such commercial channels as supermarkets and independent retail shops.\(^{20}\) The marketing agency pursued this goal by ‘selling the value’—specifically the biomedical use value—of ITN products to Kenyan populations, enticing them to invest in a personal malaria management tool that the government had adopted for the purposes of public health.\(^{21}\) This, the Kenyan government hoped, could help the country achieve that 60% ITN coverage goal by 2006.

PSI focused much of its work on behavior change communication, the crux of social marketing. The organization designed both ‘unbranded’ and ‘branded’ campaigns for ITNs as part of this work. In both types of campaigns PSI disseminated messages through conventional mass media channels such as print, radio, and television. They also used mobile cinema units in rural areas where large percentages of the population are illiterate and do not own televisions. In addition, PSI representatives sought to raise awareness about ITNs through community drama performances, educational rallies at


\(^{21}\) Members of the international health and development community recognized that the private sector provided certain advantages on which the public sector could capitalize, including the ability of the private sector to “deliver” or sell value. Travel Report for Awa Coll-Seck, C. Capuano, and B. Killen, June 2005, WHO Archives, M50-370-13, Jacket 1.
large market centers, and other ‘culturally appropriate’ venues.22 Indeed, much of PSI early activities focused on simply creating awareness about ITNs as tools for malaria control, with the belief that this activity could do significant work in inciting people to purchase and use the technology.

PSI’s unbranded campaign, or generic ITN advertising, portrayed malaria as a silent killer that took the lives of young and unborn children, which people could prevent by sleeping under a treated net (see Figure 6.1). Meant to be generalizable, this generic advertising for ITNs appeared in many other African countries during the early years of RBM. As in those other countries, generic messaging in Kenya seemed to have little impact on people’s uptake of or desire for ITNs (see chapter 5). According to one of PSI’s surveys, intended consumers in Kenya found this kind of ‘shock and fear campaign’ too negative and disjointed.23 Considering many people, especially in rural areas, did not understand mosquitoes as the cause or sole cause of malaria, and thus would not find the connection between a treated bed net and malaria illness obvious, it is not surprising generic campaign ads did not work. The fact that residents unfamiliar with bed net technology did not immediately understand the tool’s medical importance was not a new revelation, of course; researchers in Kenya and across Africa encountered this obstacle in scientific ITN trials during the 1980s and 1990s, an obstacle PSI did not sufficiently address.

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23 Ibid.
PSI was more successful in raising awareness through its branded campaign. This campaign centered around two PSI-branded products: the ‘Supanet’ bed net and ‘Power Tab,’ a pyrethroid insecticide sachet. The agency sought to create demand for ‘Supanet’ and ‘Power Tab’ though advertisements and informative rallies, thereby inducing intended consumers to change their behavior (see Figures 6.2 and 6.3). Doing so, they drew from a common idea in the field of marketing that one could sell a product brand to sell a product-based behavior, such as sleeping under a treated bed net.\textsuperscript{25} PSI had used this behavior change marketing strategy in an earlier pilot project on the Kenyan coast, branding the practice of insecticide dipping, \textit{Fufua Neti Yako} (“Revive Your Net”) to get people to bring their nets to dipping agents during mass re-treatment campaigns.\textsuperscript{26} 

\textsuperscript{24} \textit{Ibid.} The Swahili message translates to, “Malaria kills 36,000 children under five years every year. Make sure you are sleeping under a treated net every night.”

\textsuperscript{25} NetMark and other organizations involved in marketing nets also latched onto the idea that creating demand for a particular branded product was the most efficient way to get people to adopt a new behavior. Dr. Pierre Carnevale, working paper for Study Group on Malaria Vector Control and Personal Protection in context of African Savannah, 2004, 31, WHO Archives, File M50-87-1, Jacket 3.

though *Fufua Neti Yako* failed to convince most people to pay for insecticide dipping (see chapter 4), PSI modified and continued to use branded ITN advertising. Drawing on financial support from DFID, PSI re-launched ‘Supanet’ (first developed for the Kilifi pilot project in 2000) with their new product, ‘Power Tab,’ in 2001. Introducing pyrethroid insecticide as an individually packaged commodity, complete with its own superhero champion, Mr. Power Tab, members of PSI sought to cultivate ‘net (and net re-treatment) culture’ in Kenya.\(^\text{27}\)

\[\text{Figure 6.2. Storefront in Kisumu town (Swahili: “Treat your net with Power Tab today”), photo taken by author}\]

PSI did not just market ITNs, though; the organization also procured and supplied ITN products as part of its social marketing scheme. In urban areas, PSI sold the products through a network of distributors, who then sold them to wholesalers and retailers (e.g. supermarkets). In rural areas lacking such commercial outlets, PSI sold their products through kiosks or small shops. PSI representatives agreed to paint shop exteriors with social marketing messages free-of-charge if shop owners agreed to sell ‘Supanet’ and ‘Power Tab’ products alongside their other goods. Some of these faded exteriors remain today, literally paling in comparison to the brightly colored shops promoting new ITN marketing messages, the pain reliever Panadol, and other medical preparations (See Figures 6.4 and 6.5). “In that kiosk,” Njagi described to me, “you can sell anything which you want. [The shop] will be branded, and once it is branded, you must sell nets and insecticide. You can put bread, milk, and whatever you want, but bed nets must be there, and it must be branded, and PSI will be monitoring.” ITNs slowly became integrated.

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28 Ibid.
29 Kiambo Njagi, interview with author.
30 Ibid.
into Kenya’s built environment, not only inside homes and shops, but also onto the structures peppering cities, townships, and the countryside.

Figure 6.4. Old PSI-Ministry of Health ITN marketing in Luanda (Vihiga county), photo taken by author

Figure 6.5. Current PSI-Ministry of Health ITN marketing in Nyawara (Siaya county), photo taken by author

PSI also bundled ‘Supanet’ with a ‘Power Tab’ sachet to encourage and make it easier for consumers to re-treat nets with insecticide—a perennial problem since researchers introduced ITNs in Africa. “The instruction was,” one Nyawita resident recalled, “that if you are given the net they had the ‘Power Tab’ inside so after 6 months you are supposed to wash the net.”31 Some residents remembered buying insecticide re-

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31 Ruth Okech,* interview with author, Nyawita, September 18, 2015.
treatment from the local chemist after using up that first sachet, though this came up rarely in my interviews. For a variety of reasons, people frequently did not treat or re-treat their nets with insecticide. Many cited lack of funds and confusion about where to buy more insecticides. Although the ITN package contained paper instructions, many people did not feel they had sufficient information. “I got an extra insecticide in the net; it was a tablet for washing the net,” one woman told me. “I thought, I cannot use the tablet to wash my net. I do not know how long it will take to dry, so I decided to use the net like that and left that insecticide. It got lost.”32 The trouble of preparing the insecticide with water, washing the net, and hanging it to dry—or as one woman summed up, “laziness,”—proved a barrier as well.33

Probably most frequently, however, people simply had strong, negative reactions to the insecticide which, if not dried properly, could produce rashes, made your skin itch, and provoke coughing fits. “Whenever you would use the nets after washing from the insecticide,” one man remembered, “it had some pungent smell that would choke someone. You will feel like the chest is locking, and one would be forced to open the window. […] It even prevented many people from going to buy the insecticide because it was bringing problems.”34 The fact that people often felt hot sleeping under a bed net—which most cited as detrimental, but which some felt was beneficial when it was cold—could exacerbate these effects. “The first day after I received the net, I did not have any thoughts or feelings about it,” Elizabeth, a Nyawita resident, explained.

However, […] the net has got some heat, as opposed to a person who sleeps without a net. And it is very sad that at times, the insecticide on the net is so powerful that if it comes into contact with your skin or even your face, it itches.

33 Ruth Okech,* interview with author.
34 Tom Nyariki,* interview with author, Masisi, November 20, 2015.
So in my opinion, I knew that it is this insecticide that is itching, because maybe I did not follow the right instructions before I used my net. But at times when you are suffering from fever, and heat is being produced by the net, you end up removing the net so you get some air.\textsuperscript{35}

Physical discomfort deterred many from buying or using ITNs and insecticide treatment as public health officials intended. In Kenya’s 2003 Demographic and Health survey, in fact, rates of any bed net use (treated and untreated) greatly exceeded those of treated net use, regardless of socioeconomic status.\textsuperscript{36} The price of insecticide, in other words, did not present the only barrier.

Generally speaking, though, household income and wealth played a significant role in shaping the geography of ITNs in Kenya. PSI priced their products differently in different parts of the country, recognizing that people living in urban centers like Nairobi tended to be wealthier and better able to purchase ITNs compared to populations in rural areas. In the first couple years of the program, PSI sold subsidized nets for 350 Ksh (roughly US $5) in urban areas and for 140 Ksh (roughly US $2) in rural areas.\textsuperscript{37} The agency did so as part of a cross-subsidization strategy, which entailed selling ITNs at a higher price in urban areas and using money made from those sales to subsidize ITNs sold in rural areas, where people had less disposable income. To prevent what is called “leakage,” where people buy highly subsidized nets in rural areas and sell them in urban areas for a profit, PSI introduced different colored and shaped nets for each region: green,

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\textsuperscript{35} Elizabeth Onyango, * interview with author, Nyawita, September 16, 2015.
\textsuperscript{36} Central Bureau of Statistics [Kenya], Kenya Ministry of Health, and ORC Macro “Kenya Demographic and Health Survey 2003,” (Calverton, MD: CBS, MOH, and ORC Macro, 2004), 172. ITN use hovered below 5% for the entire country.
\textsuperscript{37} Eastern Africa RBM Network (EARN), Report of Eastern Africa Roll Back Malaria Annual Review and Planning Meeting, 2003, WHO Archives, File M50-370-37, Jacket 1. It seems the price for nets in rural areas may have fluctuated over the first five years of PSI’s project, as I also saw sources quoting the price at 120 Ksh and 100 Ksh.
rectangular nets in rural areas and white or blue conical nets in urban areas.\textsuperscript{38} PSI tinkered with both market mechanisms and bed net technology to try to scale up ITNs in Kenya.

In setting up an ITN social marketing scheme in Kenya, PSI also aided the Kenyan government by tracking such ITN coverage indicators as net ownership and net use (defined as sleeping under a net the previous night). Tracking these numbers was important since the Kenyan government needed to show progress towards reaching ITN coverage targets (see chapter 5). Ministry of Health officials aiming to reach coverage targets quickly had neither the time nor the resources to set up new ITN surveillance infrastructure and, like health officials in other African countries, often grafted this surveillance onto existing, NGO-run health and demographic survey instruments. In essence, pressure to meet somewhat arbitrary RBM goals forced governments with limited resources to scramble to find ways of demonstrating bed net usage. PSI conducted its surveys—including Knowledge, Attitudes, and Practices (KAP) surveys and Tracking Results Continuously (TRaC) surveys—every two years to monitor, evaluate, and adjust their social marketing activities. Through its 2003 TRaC survey, for example, PSI found that 1.2 million ITNs and 1.4 million retreatment kits had been sold through commercial channels since 2001.\textsuperscript{39} The agency also found that people knew a lot more about ‘Supanet,’ ‘Power Tab,’ and ITNs more generally as malaria control tools by 2003, but were not buying or using them in the regions where malaria risk was highest. Through such surveys, PSI produced considerable knowledge about ITN ownership, people’s

\textsuperscript{38}\textit{Ibid.}
opinions about ITNs, and people’s knowledge about malaria in Kenya during the early years of RBM. However, as a marketing agency, it produced little if any knowledge about the health impact either of its activities or of increasing ITN coverage—which is fairly difficult and resource-intensive to measure.40

Despite all this work, Kenyan malaria control officials and their partners at PSI ran into several problems during these early years. For one, PSI focused much of its resources and energy on selling nets in urban areas such as Nairobi, where malaria transmission was extremely low.41 The agency did this in part because more robust communication and marketing infrastructure already existed in these areas, as well as because consumers had greater capacity to purchase these products. In time, PSI representatives felt, these purchases could prop up higher subsidies in the fledgling rural ITN sector, thereby justifying such an investment in the urban market.42 Major retail outlets were also already selling untreated bed nets when PSI introduced its ITN products onto the scene; consumers had likely seen bed nets in stores if not in hotels and neighbors’ houses. Increasing coverage in urban areas required much less work and investment.

40 Kenyan health officials did track maternal and child health statistics and, sometimes, malaria prevalence rates alongside indicators such as ITN ownership and use for health and demographic surveys. However, they only conducted these surveys on five year intervals. Moreover, they did not track malaria-specific mortality and more generally struggled to make a direct link between changes in ITN coverage indicators and changing malaria disease indicators. Central Bureau of Statistics [Kenya], Kenya Ministry of Health, and ORC Macro “Kenya Demographic and Health Survey 2003,” (Calverton, MD: CBS, MOH, and ORC Macro, 2004); [Kenya] Division of Malaria Control [Ministry of Public Health and Sanitation], Kenya National Bureau of Statistics, and ICF Macro, “2010 Kenya Malaria Indicator Survey,” (Nairobi: DOMC, KNBS, and ICF Macro, 2011).
41 Bob Snow, interview with author, Nairobi, August 6, 2015; Abdisalan Noor, interview with author, Nairobi January 8, 2016.
Furthermore, the price of ITNs presented a major, though not unexpected, obstacle to scaling up ITNs nationally. PSI’s social marketing program “has created considerable demand for ITNs,” Kenyan officials reported at an East Africa RBM Network meeting. “Unfortunately even at subsidised prices they remain unaffordable to certain sectors of society,” particularly for people in rural areas and the urban poor, who are most at-risk for malaria.43 The program “continued for about three, four years, but it did not pick up properly,” Njagi remembered. “I think perhaps the subsidy was not high enough.”44 This disparity appeared in Kenya’s 2003 Demographic and Health Survey, which showed bed net ownership among populations in urban areas and in the highest wealth quintiles (37.6% and 39.3%, respectively, with at least one net) dwarfed that among populations in rural areas and the lowest wealth quintiles, respectively (16.6% and 11.2% with at least one net).45

Additionally, Kenyan consumers did not always do what PSI marketers wanted or thought they would do. One long-time member of PSI-Kenya remembered that some people thought the white nets looked like a ghost or burial shroud, associating them with death.46 They complained that sleeping under such a thing was equivalent to sleeping in a coffin.47 PSI therefore had some difficulty selling white nets. Behavior change activities in rural areas, which were much less intensive than those in urban areas, did not lead to automatic uptake of ITNs. Again, the fact that many people did not see the connection between ITNs and malaria prevention, or malaria and mosquitoes, proved problematic.

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44 Kiambo Njagi, interview with author.
46 PS-Kenya members James and Dennis Mwambi, interview with author, Nairobi, August 6, 2015.
47 Kenya Division of Malaria Control, Malaria Control Notice Board, Issue 2, January-March 2007, 6.
“Those kiosks, although they were strategically placed,” Njagi remembered, “communities did not see them as for any health benefits.” Finally, PSI did not have enough boots on the ground to fully monitor leakage. As a result, a number of people resold bed nets or insecticide sachets informally for a profit. One woman I interviewed in Asembo even speculated that the nets currently being distributed in Kenya, which are long lasting, insecticide-embedded nets, lacked insecticide packets because program officials discovered that women were selling the “insecticide soaps.” While that is not the reason nets no longer come with insecticide packets, her speculation suggests a more dynamic circulation of ITN products in Kenya than quantitative surveys reveal.

Under intense pressure to reach the 60% coverage goal by 2006, Kenya’s Ministry of Health found in 2003 that only about 5% of children under five and 5% of pregnant women were sleeping under ITNs, and mostly those concentrated among the wealthy. PSI and Kenyan health officials did various things to correct their course. On its part, PSI revamped behavior change messaging, combining images of their ITN products with calls to protect family members from malaria using treated bed nets. Around 2004 the organization developed the new campaign slogan for Kenyan markets, ‘Malaria Ishindwe!’ (“Down with Malaria!”). According to PSI surveys, preachers in Kenya often used the term ishindwe in calls to combat the devil or other evil forces. PSI representatives thought this made the slogan an effective marketing tool. The continued
lethargy of ITN uptake in Kenya, however, did not validate the message’s effectiveness 
outright.

Finding that social norms heavily shaped bed net use, PSI launched yet another 
marketing campaign in 2009 that coupled ‘Malaria Ishindwe!’ with the slogan, ‘Mbu nje! 
Sisi ndani!’ (“Mosquitoes outside! Us underneath!”) on posters and other media.⁵² 
Wanting potential consumers to believe that everyone else was using ITNs, they included 
images of people tying up, tucking in, or sleeping under bed nets on posters for the 
campaign. PSI also included icons that paired mosquitoes in a red ‘no’ symbol with the 
phrases, ‘Komesha Malaria, Okoa Maisha’ (“Banish malaria, Save lives”) to emphasize 
the connection between mosquitoes, malaria, and survival (see Figure 6.6). These icons 
appeared next to the Kenya Ministry of Health logo, just as DOMC reports and materials 
also contained the ‘Komesha Malaria, Okoa Maisha’ symbol. These and subsequent 
marketing campaigns, which persist in Kenya to this day, emphasized the Kenyan 
government’s ownership of malaria control activities even though PSI based the 
campaign largely on its own marketing research.

⁵² The Communication Initiative, “PSI/Kenya Malaria Communication Campaigns,” May 4, 2012, 
http://www.comminit.com/early-child/content/psikenya-malaria-communication-campaigns, accessed 
August 16, 2015.
The RBM Secretariat also organized meetings and facilitated communication among African health officials from different regions, countries, and sub-national contexts to share information about obstacles and potential solutions to scaling up ITNs. Such conversations seemed especially important given the lack of information on what strategies actually worked. Information sharing of this sort, Njagi recalled, was useful in negotiating with external partners. “One time we went for a bed net meeting with my boss in Zambia,” he told me,

and we shared experience with a number of countries within the region and we realized our idea of selling bed nets through kiosks is not working. And therefore, when we came back, we decided to sit with PSI, modify their policy [...]. And we told them, ‘look...you can continue with the kiosks, but besides these kiosks, let’s involve health workers more. [...] because we’re targeting under-[five] and pregnant women—let’s put these nets at maternal-child health [centres], so that as these women come for their antenatal clinics, as these people bring their children

for immunization, the nurse who is a health worker can also promote nets. And those who want to buy can buy. Okay? 54

This strategy gained traction as the WHO and UNICEF continued to push integrated maternal and child health services alongside efforts to deliver ITNs through existing delivery channels in African health systems. WHO and UNICEF added support to Kenyan officials’ request, even though these organizations did not constitute the final word on health programs run by private voluntary organizations such as PSI.

In partnership with Kenya’s Ministry of Health and DOMC, PSI did begin to distribute their ITN products through government antenatal clinics, targeting pregnant women and children under five. Drawing on additional funding from DFID, they began by testing this method of ITN delivery on the coast in 2004. By 2005 they expanded, aiming to deliver 2.5 million ITNs through antenatal clinics in all 51 malaria prone districts.55 This system continued to operate on user fees, as clinic staff were supposed to buy bundled ITN products from PSI at a cost of 30 Ksh and then sell them to pregnant women at a cost of 50 Ksh. The 20 Ksh profit, PSI felt, could be put towards infrastructural improvements, ITN stocks, and recurrent facility costs.56 This method of distribution (reminiscent of Bamako Initiative community pharmacies), along with lower prices, stimulated increased ITN coverage of children under five, from roughly 4% coverage in 2001 to about 24% in 2005.57 “The uptake really picked up,” after they

54 Kiambo Njagi, interview with author.
57 Kenya Division of Malaria Control, “Free mass distribution of 3.4 million long lasting insecticide treated nets to children under five years age, in Kenya,” Malaria Control Notice Board, Issue 1, October-December 2006, 8.
introduced ITNs into health facilities around 2004, Njagi remembered, “because now it is
the health worker, not a villager talking to another villager, […] trained to convince a
villager the health benefits of this commodity.” Nevertheless, Kenyan officials noted,
“there [wa]s still a proportion of populations that cannot access these nets,” and felt “a
need for more subsidized nets is required.” This issue of ITN price, as the rest of the
chapter shows, constituted a main theme of Kenya’s ITN programming through most of
the first decade of Roll Back Malaria.

**Intervention, research, or both?: NGOs, research institutes, and free ITN
distribution**

PSI provided a substantial amount of Kenya’s ITN programming in the first five
years of RBM, but it was not the only game in town. A variety of organizations
participated in scaling up ITNs around the country in a variety of ways. Though often
working with or through Kenya’s Ministry of Health, these mainly non-governmental or
foreign organizations typically operated as independent, time-limited projects. As a
result, ITNs covered the country unevenly, not simply concentrated among the wealthy,
but also among very poor populations enrolled in public health, development, and
economic research and activities. In turn, Kenya emerged as an important terrain on
which academic researchers, health practitioners, and development agency
representatives produced knowledge about African poverty and the relationship between
poverty, ITNs, and the health.

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58 Kiambo Njagi, interview with author.
M50-370-37, Jacket 1.
Several NGOs got involved in ITN pilot programs in Kenya to help improve maternal and child health among the rural poor, a key aim of the Millennium Development Goals (see chapter 5). For example, in 2003 economists Jessica Cohen and Pascaline Dupas created the NGO, TAMTAM Africa, Inc., or “Together Against Malaria! Tuafue Afya Na Maisha!” Together they worked with Kenya’s Ministry of Health and the Dutch NGO International Child Support Africa to provide fully subsidized ITNs and HIV/AIDS counseling in government prenatal clinics in Busia, a district of Western Province. Their efforts to intervene in maternal and child health services, Dupas recalled, bred economic research about the effects of price on bed net usage among the poor. “I was trying to get money for the NGO,” she told me.

And I was at a meeting in Silicon Valley [...] people were like, ‘What? You give bed nets for free? That’s crazy. People aren’t going to use them. Don’t you know that people don’t use things that they get for free?’ [...] I realized that there was such a very strong sense that free stuff was bad because it was not used. And somehow it didn’t click with me because, you know, with marketing in the U.S. or Europe, you get free samples all the time for stuff. So I was like, ‘Why are people saying it’s okay to get free stuff if you’re rich, but if you’re poor, it’s not?’

These “Silicon Valley types” argued that consumers would not value something they did not pay for (and thus not use it), low prices indicated low product quality in consumers’ minds, and that consumers who spent a lot of money on a product would feel bad not putting it to use (a “sunk cost“ effect). Pursuing their curiosity in pricing as a tool for targeting products those who were resource- and credit-poor, Dupas and her colleagues

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60 *Tuafue Afya Na Maisha* is Swahili for “Let’s protect health and life!”
62 Pascaline Dupas, interview with author, online (skype), August 4, 2015.
set up a research study to track how many women who received a free bed net as part of prenatal clinic enrollment actually used and ‘valued’ the tool.\textsuperscript{63}

At the time they initiated this research, PSI social marketing schemes still dominated bed net distribution in Kenya. In contrast to TAMTAM, Dupas told me, PSI “refused to make [ITNs] free.”\textsuperscript{64} Yet, she admitted, she did not know whether TAMTAM had adopted the best allocation mechanism, especially since many economists in the U.S. and western Europe seemed to frown upon free ITN provision. She and Cohen conducted a survey for their initial research project, showing roughly 85% of those women who received free nets from prenatal clinics were sleeping under the nets one year later.\textsuperscript{65} And some of those who did not use the ITN, Dupas remembered, were waiting to give the net to their child going off to boarding school, finish building a separate cooking hut so the net would be not get dirty hanging in a smoky room, and so forth.\textsuperscript{66} In other words, women still seemed to value the object. Dupas also recognized in published results that only women who felt ITNs had value may have enrolled in prenatal clinics, thereby enrolling themselves in the study (a process of self-selection). Yet, she ultimately concluded, since prenatal clinic enrollment increased dramatically during the study period—which correlated with the introduction of bed nets—“it seems like a large fraction of women do value ITNs as a health commodity.”\textsuperscript{67} This initial work spawned numerous other research studies—including randomized controlled trials—on ITN use,

\textsuperscript{63} Dupas, “The impact of conditional in-kind subsidies on preventive health behaviors.”
\textsuperscript{64} Pascaline Dupas, interview with author.
\textsuperscript{65} Pascaline Dupas, interview with author. Dupas, “The impact of conditional in-kind subsidies on preventive health behaviors.”
\textsuperscript{66} Pascaline Dupas, interview with author. In rural areas of western Kenya, many families live in two-room huts where children and sometimes mothers as well will sleep in the main living room. Women often also use that room to cook if they are not cooking outside or in a separate hut.
\textsuperscript{67} Dupas, “The impact of conditional in-kind subsidies on preventive health behaviors,” 15.
pricing, and possible leakage in Kenya and elsewhere in Africa. Carried out with aid from the non-profit organization, Innovations for Poverty Action, the subsequent research studies contributed to development knowledge about ITNs and the poor. In providing free and highly subsidized ITNs in western Kenya, moreover, TAMTAM and its research team helped stitch up the patchwork of ITN provision in the country during the first decade of RBM.

It is worth pausing here to highlight the possibilities and limitations of the circulation of scientific knowledge in the arena of ITN programming. Using her position in the Brookings Institution, Jessica Cohen disseminated results at the Institute and other policy think tanks in the global North. The two economists also published their results in economics journals. Dupas remembered that after publishing the study results, people got in touch to say they had tried to convince colleagues for years to distribute ITNs for free. “I got emails like that from staff within PSI, for example. I got emails like that from people at DFID,” though the two agencies continued to throw their weight behind social marketing approaches at that time. “It seemed like there were always people on both sides of the debate within any organization. And [the study] just created some evidence base the pro-distribution camp could use” and “tip the debate in some cases.” Yet for the most part, neither public health practitioners nor journalists actually cited her and her colleagues’ work in discussions about free ITN distribution and pricing. “It’s a problem


69 Pascaline Dupas, interview with author.

70 Ibid.
that, essentially, economists write in a way that is totally unappealing to anyone else,” Dupas laughed, “No one reads an economics journal.”71 Indeed, based on first-hand experience, I can say the technical jargon and mathematical formulas of the publications can be overwhelming and, in some cases, impenetrable for the non-specialist. Much like ITN distribution activities, the production of knowledge about ITNs in Kenya and Africa more broadly was fractured.

Residents in Asembo and Gem received free ITNs as part of research projects as well, albeit research of a different nature. While scientists had confirmed that ITNs could reduce child mortality in different epidemiological situations through randomized controlled trials, no one had monitored the long term effects of ITNs on populations living in areas of intense transmission—a setting in which, some feared, ITN use might simply shift the age profile of malaria disease (see chapter 2).72 For this reason, scientists at the Kenya Medical Research Institute and U.S. Centers for Disease Control (KEMRI-CDC) extended their Siaya-based bed net study to 2001-2002. This meant that the research partnership continued to supply free ITNs to the study community through the initial years of Roll Back Malaria in an effort to produce scientific knowledge. *Nyamrerwas* (community health workers) who worked with the CDC, residents remembered, walked around to “create awareness” about nets, teach people how to tie up and tuck in nets around sleeping spaces, and ensure people were using nets properly.73

73 Residents of Rarieda-Omiyomano, interviews with author, July-August 2015.
During the extended study, CDC representatives also organized mass dipping campaigns in schools and market centers. KEMRI-CDC’s research-cum-public health intervention is one reason health and demographic statistics show higher ITN ownership and use in Nyanza Province in 2003 than in some regions with similar or greater wealth indicators.\(^\text{74}\)

In monitoring adherence to the intervention alongside child mortality and malaria morbidity, KEMRI-CDC researchers also generated data supporting the argument that ITNs should be given to at-risk populations for free. Acknowledging that intensive education on ITN use in the region might reduce generalizability of their findings, Kim Lindblade and colleagues reported that the study “results demonstrate that populations who are given bednets for free and who do not have a history of bednet use can learn to appreciate the benefits of bednets and improve adherence after initial acceptance.”\(^\text{75}\) This echoed sentiments KEMRI-CDC staff expressed in their earlier publications on the randomized controlled ITN trial in Siaya, as well as those sentiments of researchers and health officials working in other parts of Kenya.\(^\text{76}\)

While the U.S. Agency for International Development (USAID) supported commercial and ITN social marketing approaches through entities such as NetMark during the early 2000s (see chapter 5), they also funded research promoting free and highly subsidized ITNs in Africa.


Again, though, receiving free ITNs and educational messages did not lead all residents in the study area to use the intervention as scientists and health officials had intended. A number of people still did not re-treat their bed nets. “It appeared clearly that bednet as an obvious “thing” is well perceived,” one analyst noted of KEMRI-CDC’s experiences in Siaya, “but not the “plus” conferred by the insecticide itself, and this could explain the low rate of retreatment often observed everywhere.”

This observation aligns with the fact that a number of current residents I interviewed touted protection from mosquitoes, falling debris, caterpillars, cockroaches, and other pests as a benefit of using ITNs while downplaying the tool’s effects on malaria and disease. Nevertheless, while not all residents I interviewed in Asembo used ITNs for the purpose malaria disease control, or linked malaria to mosquitoes, a larger proportion did compared to residents of neighboring Bondo district, for example. Some people even knew specific technical details, such as that female mosquitoes cause malaria, which makes sense given that KEMRI-CDC researchers continue to carry out numerous vector control research projects in the area. Based on experiences from 2015, it is clear that the long and overwhelming presence of malaria researchers in Siaya over the past couple of decades has had a great impact on people’s ITN use and knowledge in this area.

Although KEMRI-CDC also incorporated Nyawara, a sub-location in Gem Central, into its bed net trial during the late 1990s, people’s experiences with bed nets there differed from those of people in Asembo, where KEMRI-CDC had set up more intensive research infrastructure. KEMRI and the “white men from Asembo,” Nyawara

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78 Residents of Rarieda-Omiyomano, Nyawara, and Nyawita, interviews with author, July-September 2015.
79 Drasilia Anyang Atieno,* interview with author.
residents recalled, did come into the region to conduct malaria research and later provide public health interventions, including bed nets, worm pills, and clean water tablets.\footnote{Residents of Nyawara, interviews with author.} Many also remembered that KEMRI-CDC staff taught them how to hang up nets.\footnote{Ann Adhiambo,* interview with author, Nyawara, August 26, 2015.} Around 2004, however, KEMRI-CDC researchers stopped coming to Nyawara as often, focusing more of their malaria work in Asembo and Siaya township, where the district hospital and KEMRI’s outpost were located. Before too long, the “Millennium people” or “maendeleo (development) people,” as residents referred to them, came into Nyawara as replacements of sorts to distribute, wash, and teach people about ITNs.

The “Millennium people” were representatives of the Millennium Villages Project (MVP). This project was the brain child of Jeffrey Sachs, who moved on from the Commission on Macroeconomics and Health to become Director of both the UN Millennium Project and Columbia University’s Earth Institute in 2002. Sachs intended the MVP to function as a kind of laboratory for development in Africa. In 2004 Jeffrey Sachs and colleagues from the UN Millennium Project and the Earth Institute established the first Millennium Development Village in Bar Sauri, Kenya, a sub-location about 5 km away from Nyawara. They quickly expanded the project to cover ten other sub-locations in the “Sauri cluster,” including Nyawara, where residents seemed eager to participate.\footnote{Scholars have noted how communities actively attract development resources by fashioning themselves as willing participants. The logic of development assistance, in other words, is not necessarily driven by a desire to help the very neediest communities. I encountered this phenomenon of chiefs fashioning their region as welcoming and particularly well-suited for development assistance when I went to conduct interviews in Nyawara. The assistant chief who gave me and Molly his blessing to conduct research in the area and linked us with a community health worker from the region “welcomed any assistance I might bring.” Alice Wiemers, “Help Them Help Us: Development, Authority, and Family in a Northern Ghanaian Town, 1942-1992,” Ph.D. Thesis, Johns Hopkins University, 2012.} As Sachs described in his book, The End of Poverty, after an initial site visit, project

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80 Residents of Nyawara, interviews with author.
81 Ann Adhiambo,* interview with author, Nyawara, August 26, 2015.
82 Scholars have noted how communities actively attract development resources by fashioning themselves as willing participants. The logic of development assistance, in other words, is not necessarily driven by a desire to help the very neediest communities. I encountered this phenomenon of chiefs fashioning their region as welcoming and particularly well-suited for development assistance when I went to conduct interviews in Nyawara. The assistant chief who gave me and Molly his blessing to conduct research in the area and linked us with a community health worker from the region “welcomed any assistance I might bring.” Alice Wiemers, “Help Them Help Us: Development, Authority, and Family in a Northern Ghanaian Town, 1942-1992,” Ph.D. Thesis, Johns Hopkins University, 2012.
representatives felt they “would be able to put some of the ideas to work in Sauri and help the international community learn from the experience in Sauri for the benefit of villages in other parts of Africa and beyond.” Along with his colleagues, Sachs, an outspoken advocate for malaria control as a stimulant for economic development as well as free ITN distribution, included free ITNs in the MVP for Sauri cluster.

In partnership with Sumitomo Chemical Company, Ltd., which manufactured Olyset long lasting insecticidal nets (LLINs), members of the Millennium Villages Project NGO began distributing free LLINs on a two-year cycle in Sauri cluster around 2005. At this time, malaria prevalence totaled about 55.8% among children under five and 49% among the cluster’s entire population. Unsurprisingly, the poorest residents had the highest malaria prevalence rates. The MVP team trained nyamrerwas to teach residents how and when to use the nets. These nyamrerwas helped MVP members survey the region for proper ITN use as well. “After getting proper education and information on how to use the nets from the Millennium people,” one woman remembered, about three-fourths of people used the tools. She also told me that the nets distributed “were being washed for five years,” a reference to Sumitomo Chemical Company’s Olyset LLINs, which have an expiration date of five years. A team of researchers, in fact, capitalized on the widespread distribution of Sumitomo’s nets in the region to measure how many nets “survived” (i.e. were still being used) at the factory-promised five year mark.

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85 Frida Akinyi Onano,* interview with author, Nyawara, August 27, 2015.
86 Ibid.
87 Mejia, et al., “Physical condition of Olyset® nets after five years of utilization in rural western Kenya.”
many bed net-related projects in Kenya and Africa more broadly in this period, the Millennium Development Villages Project in Sauri cluster blended intervention and knowledge production.

It is difficult to tell how successful free ITNs specifically were in generating economic development, as Sachs intended with the MVP’s interventions. Nonetheless, the introduction of ITNs through the project correlated with declining malaria prevalence in Sauri, a greater decline than measured among those living outside of the cluster. Residents I spoke with certainly also expressed appreciation for the nets and the malaria protection nets provided, though I realize people’s perceptions of me as a possible member of an NGO or American government agency may have shaped their responses. One of the most striking things about the interviews I conducted in Nyawara, however, was how much information people had absorbed about malaria and development, very likely from the MVP. Frida Akinyi Onano related to me, for instance, about how appropriate use of nets has prevented malaria attacks and disease, so many people are able to carry out their business and work on their farms. When you are sick, you just want to sit down and it is hard to go to your business or farm. It is hard to send the child to school when you are sick. Because of nets, and because of reduced malaria, people can go to their businesses and work on their farms.

Onano’s observation matches up extremely well with arguments perpetuated by champions of malaria control for economic development in Africa, such as Jeff Sachs. That is not to say her comments are disingenuous, only that the development enterprise has become a pervasive presence in Nyawara embodied in, among other things, ITNs.

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89 Frida Akinyi Onano,* interview with author.
This small selection of twenty-first-century, ITN-related projects in Kenya emphasizes the patchwork fashion in which ITNs were scaled up in the country. The roll out of ITNs, much like the roll out of antiretroviral therapy in Africa, was extremely fractured.\(^90\) Such projects facilitated malaria control aid, including malaria health education, to populations in regions of high malaria risk. At the same time, the projects put antimalaria service provision on a somewhat precarious basis since all research projects eventually end. Soon we will find out just how precarious ITN services in former research sites are, and how easy it is for Kenyan officials to replace long-standing ITN distribution channels with new, routine delivery channels, as members of the MVP withdraw from Sauri cluster following the end of the Millennium Development Goals (MDG) era in 2015.

*ITNs and Malaria Emergencies*

“In this region the mosquitoes were far away. We didn’t experience much of mosquitoes. It is in this era that tea plantations and sewages have come is when mosquitoes have become rampant. But we just slept; you scratch yourself and you sleep. There was no way we used to deal with that.”\(^91\)

“I first heard about mosquito nets … when the Marine people sprayed due to the very serious highland malaria that attacked the region. When the strength of the insecticide was worn out, then the nets were introduced. The news about the nets was all over; when you go to hospitals they would tell you that if you do not want the mosquitoes to bite you, look for a net.”\(^92\)


\(^91\) Esther Nyaboke,* interview with author.

In 1999, following an unusually devastating El Niño in 1997-1998, the densely populated highland districts of Kisii and Gucha experienced a major malaria epidemic.93 Heavy rains combined with warmer temperatures fostered an influx of malaria-carrying mosquitoes into the normally temperate region, whose residents had very little immunity to the disease. Weather and residents’ lack of immunity were not the sole culprits for the epidemic, however; the lack of effective, accessible malaria drugs and slow mobilization of indoor residual insecticide spraying—the main method of curbing malaria epidemics in Kenya at the time—exacerbated epidemic conditions. Surveys conducted in June 1999 revealed that roughly 45% of the population in these two districts had malaria infections, afflicting adults and children alike. Hospitals in Kisii and Gucha saw a 300% increase in admissions during 1999, overwhelmed with malaria patients. By the end of the epidemic, in September of that year, approximately 400 people had died with malarial infection.94 Bed nets were almost nowhere to be found.

Health officials and researchers recognized early epidemic detection and warning systems as an integral part of malaria control efforts in Africa by the late 1990s.95 However, few Health Ministries, including Kenya’s Ministry of Health, had such systems in place at this time. Ongoing efforts in Kenya to decentralize and reform health services,

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93 These areas are so densely populated in part because the Gusii, a group of Bantu language speakers that live in a small region abutting Luo-dominated regions around Lake Victoria and Masaii-dominated Narok county to the south, tend to marry among themselves, thereby further concentrating in this highland region of Nyanza. For more on the history of marriage, land, and settlement among the Gusii, see N. Thomas Hakansson, “The detachability of women: Gender and kinship in processes of socioeconomic change among the Gusii of Kenya,” *American Ethnologist* 21, no. 3 (1994): 516-538.


moreover, hindered the government’s epidemic relief activities. “Health services in Kisii and Gucha are far from adequate,” analysts assessing the epidemic noted.

Resources are scarce and what is available is neither prioritised nor organised according to health needs. The non-systematic introduction of a decentralized health system has not helped as the District Health Management Teams (DHMTs) have been given little budgetary control, no management training, have limited transport (so cannot adequately supervise staff in rural health facilities), and have minimal resources for continuing education.96

Even though the Kenyan government had changed national malaria control guidelines to recommend sulphadoxine-pyramethamine (SP) over chloroquine in malaria treatment two years earlier, clinics in Kisii and Gucha continued to stock the latter, contraindicated drug. Thus, while in some ways the 1999 epidemic was a time-limited crisis connected to fluctuating environmental conditions, in other ways, it was a crisis generated by underlying, systemic problems with the public health system in Kenya following structural adjustment.

Treating the very serious, time-limited crisis, Kenya’s Ministry of Health worked with various NGOs and relief organizations to mitigate the epidemic, including Médecins Sans Frontières (MSF), World Vision, and Medical Emergency Relief International (Merlin). For the most part, these organizations focused on providing effective antimalaria therapy, temporarily expanding hospital staff and bed capacity, collecting health surveillance data, and training community groups in malaria control best practices. Eventually members of the Ministry of Health, with the staff training and logistical support of NGOs, began insecticide spraying in the region as well. “We heard through the radios that malaria is killing people in Kisii,” one man recalled. “At that time the

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president was Daniel Moi, and he came for the campaign of that malaria. […] They were using the vehicle [a lorry] to spray around the field, and we realized that a mosquito can kill.”\(^\text{97}\) Although too late for the 1999 epidemic, NGOs continued to support mobile spray teams in the region in preparation for the end of the long rains in 2000.

Merlin, a British NGO and health charity referred to by many residents as the “Marine people,” played a significant role in epidemic relief in the highland region. Among other things, Merlin organized 32 ‘community self-help’ groups to disseminate knowledge and resources to residents of Kisii and Gucha, including ITNs. The preventive technology of ITNs, of course, is of limited utility during the throes of a malaria epidemic and therefore did not figure prominently in Merlin and other NGOs’ activities from June to September. Indeed, as one resident recalled, “before the coming of the mosquito nets, the Marine people came and sprayed an insecticide within homes, and for between roughly six to twelve months there were no mosquitoes.”\(^\text{98}\) After the epidemic subsided, however, Merlin used the opportunity and the community groups to set up an ITN distribution scheme in the area. Run through a revolving fund mechanism and stimulated by Merlin-procured nets and KO (deltamethrin) tablets, members of these community groups sold ITNs to Kisii and Gucha residents at either a highly subsidized cost of 50 Ksh (about US$ 0.64 at the time) for pregnant women and children or at 350 Ksh for everyone else.\(^\text{99}\) Acknowledging the need for more community groups and continued intervention, Merlin representatives felt that by 2003, “groups could legitimately expect

\(^{97}\) James Ototo*, interview with author, Masisi, November 28, 2015.
\(^{98}\) Peter Mogwasi*, interview with author, Masisi, November 18, 2015.
to have achieved market saturation of ITNs.” ¹⁰⁰ In other words, Merlin planned to help strengthen ITN markets in the highland region as a means of epidemic-preparedness.

When I interviewed residents of Masisi sub-location in Gucha, many linked ‘the coming of the nets’ to this epidemic. “People were really getting ill with malaria,” one woman explained. “When you suffer from malaria you would go to hospital, come back, get attacked again. You go to hospital and the drugs would be missing. It is when the government saw that this area has dangerous mosquitoes [that] it brought the nets […] because people were full in the hospital with common malaria and no drugs.”¹⁰¹ And unlike in many other parts of the country, where malaria was endemic, men also benefited from NGO-led ITN distribution. One older man, Dominic, for example, told me how he got his first bed net in 2000 “from the Marine people who were distributing the nets.”¹⁰² Mysterious, ephemeral figures, the ‘Marine people’ did not come up in many people’s recollection of their introduction to ITNs, particularly those who described first seeing nets in the mid- or late 2000s.

Merlin’s post-epidemic ITN scheme in Kisii and Gucha mixed humanitarian aid with a community-based, cost-recovery project approach common in other parts of Kenya during the days of the Bamako Initiative. Although it was difficult to align exact dates, ITN prices, and buying practices in my interviews with residents from Masisi sub-location, it is evident that ITNs proliferated in the region as commodities associated with the epidemic and Merlin’s distribution scheme. “The mosquitoes were so many and people really suffered from malaria. Each time the hospital grew, as many people were

¹⁰¹ Esther Mora,* interview with author, Masisi, November 26, 2015.
¹⁰² Dominic Ongaki,* interview with author, Masisi, November 19, 2015.
sent there,” Dominic’s friend recounted. “So I opted to buy a mosquito net. Even though I couldn’t afford getting 500 shillings to purchase the net, I talked to one of the people around who had the net, who had bought at a cost of 500, and agreed to sell it at 250 shillings.”103 Before bed nets were distributed for free in Kiobegi hospital, around 2005-2006, one woman remembered, “we found them in shops and bought them. I bought a net at 50 shillings.”104 Ruth, another Masisi resident, also said she bought a net for 50 shillings, but did not feel she was representative. “Not many had the nets” back when she first got the net around 2004. “It was a new thing in the area and the 50 shillings was hard to get. Only those who had the money would buy.”105 New epidemic conditions and responses helped raise awareness about the need for malaria control in Kisii and Gucha, but the dissemination of knowledge and commodities did not always translate into ITN uptake.

Researchers and health officials at KEMRI-Wellcome Trust and Kenya’s Division of Malaria Control used Kisii and Gucha as a technical and operational testing ground immediately following the epidemic. Specifically, they examined the cost-effectiveness of indoor residual spraying (IRS) verses ITNs and the effectiveness of ITN programming in the highland region as a whole.106 Their studies challenged popular approaches to and ideas about malaria control in Africa at the dawn of RBM, a time when ITNs emerged as the default primary intervention for vector control that organizations sold to at-risk populations as a public health commodity. In one study, the research team surveyed

103 Ibid.
104 Jennifer Kemonto,* interview with author, Masisi, November 18, 2015.
residents in Nyamache division of Gucha district—which Merlin had targeted in its bed net scheme—to compare their willingness to pay for ITNs with actual household expenditure and allocations. Finding that the price of one Merlin ITN (350 Ksh) represented over 10% of the average household expenditure in the region (3250 Ksh), most of which went toward food and children’s school fees, researchers “argue[d] that the simplest approach would be to provide ITNs free of charge” to “maintain equity and guarantee a marked and immediate increase in access to ITN services across Africa.”

The research team, including Bob Snow, Sam Ochola, and Helen Guyatt, would reprise their call for free, donor-supported ITNs in public debates over marketed and free ITNs over the decade (see chapter 5).

While KEMRI-Wellcome Trust researchers used willingness to pay research in Gucha to support a general approach to ITN programming in Africa, they also conducted a comparative, cost-effectiveness study of vector control intervention to make claims about regions with particular epidemiological situations. The WHO and many donor partners did not support IRS activities in Africa during the 1980s and 1990s, even though Health Ministries of countries such as Zimbabwe and Ethiopia considered IRS critical to national vector control. In addition, no research team had conducted ITN efficacy trials in epidemic prone areas of Africa since malaria rates are extremely low there most of the time, and many Health Ministries on the continent had little in the way of an epidemic warning system prior to the twenty-first century. Withholding a potentially life-saving intervention from people in an acute, fatal epidemic would also be ethically fraught, to say the least. The little evidence that existed on the cost-effectiveness of IRS and ITNs in

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107 Guyatt, Ochola, and Snow, “Too poor to pay.”

Africa supported opposing conclusions. Researchers in Kenya, therefore, looked at this comparison in the highlands of western Kenya in the context of Merlin’s efforts to control the 1999 epidemic through IRS and ITN distribution. NGO activities, in other words, provided the possibility for the production of scientific knowledge. “IRS may be both more effective and cheaper in communities subjected to low, seasonal risks of infection,” researchers found, and “should be considered as part of the control armamentarium for malaria prevention.” Researchers supported IRS over ITNs in the epidemic-prone highlands of Kisii and Gucha while at the same time using evidence from the region to argue for free ITN services.

The convergence of Kenya’s malaria epidemics, which devastated districts in the Rift Valley highlands into 2002, with the intensification of malaria control activities in Africa meant Kenya came to function as an important proxy for epidemic-prone areas as a whole. Kenya hosted a malaria epidemic preparedness workshop in 2001 to discuss the problems country officials and partners faced in dealing with this epidemic and what African malaria control programs could do to combat epidemics going forward. Moi University’s Dr. Augustine Ngindu and other Kenyan health officials recognized that Kenya’s Division of Malaria Control and Ministry of Health “can only respond” to such an outbreak “by case management at facility level,” since they had “neither the ability to

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They aspired, of course, to a more robust and preventive response. “It was recommended that IRS should be the method to control Vectors before epidemics,” workshop participants agreed. “Other activities should follow to minimise breeding sites.” The use of ITNs on the other hand was “not generally recommended as a strategy during an epidemic.” Due to the high cost of IRS as a strategy, including the cost of hiring ‘community spray volunteers,’ however, malaria prevention via ITNs remained integral to Kenya’s epidemic response during the early years of RBM.

Fluctuating weather patterns did not constitute the only risk for sparking malaria epidemic conditions in Kenya. The migration of those with little to no immunity into malarious regions, combined with a lack of access to effective chemoprophylaxis and therapy, also put these migrants at risk. Such a situation arose following the 2007 presidential election, a contested election that sparked a wave of targeted ethnic violence across the country. The oppositions’ campaign hinged on the message that all non-Kikuyu groups had to oppose the Kikuyu, who had enjoyed considerable political power and control of desirable land since independence.

After the “abrupt proclamation” of Kikuyu incumbent, Mwai Kibaki, as the winner of the presidency on December 30, 2007, opposition candidate for the Orange Democratic Movement (ODM) party, Raila Odinga, disputed the election results and called for mass protests. Some of Odinga’s supporters took this outrage to another level, targeting and killing many Kikuyu. The violence

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113 Ibid., 3.
quickly escalated, turning into a full blown conflict between ethno-political groups that left over 1,300—including DOMC official Beth Rapuoda—dead and roughly 600,000 displaced.\footnote{Peter Kagwanja and Roger Southall, “Preface,” Journal of Contemporary African Studies 27, no. 3 (2009): 257-258.} Much of this violence occurred in the Rift Valley and Nairobi, regions where malaria transmission is highly unstable (i.e. uncommon) or, in the case of Nairobi, almost nil. Many of those displaced from these regions had little malaria immunity at the time of the 2007 presidential election.

A number of Luo and other non-Kikuyu from Nairobi and the Rift Valley fled west to Nyanza and Western Provinces, inhabited mainly by Luo and Luhya groups. Malaria is highly endemic in these provinces, where residents receive upwards of 80 infectious mosquito bites per year and where 200 infectious bites per year is not an uncommon extreme. Beginning April 15, 2008 members of KEMRI-CDC gave ITNs to many internally displaced people who ended up in KEMRI-CDC’s Health and Demographic Surveillance Site in Siaya.\footnote{For more on KEMRI-CDC’s Health and Demographic Surveillance Site in Siaya, see chapter 2.} For those displaced, the lakeside district presented fatal epidemic conditions.\footnote{Frank Odhiambo, et al., “Profile: The KEMRI/CDC Health and Demographic Surveillance System—Western Kenya,” International Journal of Epidemiology 41, no. 4 (2012): 977-987.} Displaced children and adults alike died from severe malaria in high numbers. While the CDC’s distribution of ITNs mitigated suffering among migrants somewhat, many migrants lacked access to other essential, life-saving resources such as HIV/AIDS drugs.\footnote{Daniel Feikin, et al., “Mortality and health among internally displaced persons in western Kenya following post-election violence, 2008: novel use of demographic surveillance,” Bulletin of the World Health Organization 88, no. 8 (2010): 601-608.} As relatively cheap, portable commodities and a donor-darling among health interventions, ITNs have operated as a technology of emergency relief in Kenya over the twenty-first century.
The Kenyan state and the push for free nets

In parallel with PSI and NGO activities described so far, members of Kenya’s DOMC and Ministry of Health also worked much more directly to provide ITNs to the population, albeit with the aid of various outside organizations. Doing so, they added to the patchwork of ITN-related projects in Kenya, which up until 2006-2007 had not increased ITN coverage levels among at-risk populations to anywhere near the 60% RBM goal. Working project-by-project, rather than through a single, top-down policy decision, the Kenyan government along with researchers and members of health and development NGOs helped make free ITN distribution the norm in Kenya. This section explores the DOMC’s efforts to provide ITNs in order to illuminate the complexities of operating a public health campaign based around a tool of personal disease management distributed in a decentralized fashion. Looking also at the ways Kenyans did or did not take up ITNs, I show how reducing or eliminating prices of ITN commodities for consumers did not solve all of the problems health official faced in trying to increase ITN coverage in Kenya.

Sam Ochola, Head of Kenya’s DOMC, worked with researchers at the University of Oxford to support claims that free ITN distribution was a feasible and effective way to scale up the intervention in Kenya. They did so in a 12-week pilot study of free ITN distribution beginning April 25, 2001, the first annual Africa Malaria Day. Within this study, health workers at antenatal clinics in 35 of Kenya’s districts gave free, UNICEF-

procured bed nets and KO (deltamethrin) Tabs to pregnant women. According to surveys conducted in Makueni and Kwale, a majority of recipients were using the UNICEF nets after one year.\textsuperscript{121} “This operation clearly showed that large scale distribution of [mosquito nets] and insecticide is feasible \textit{with currently existing systems},” analysts stressed, making ITN cost-recovery projects unnecessary.\textsuperscript{122} Furthermore, researchers claimed, “these findings show that free bednets are valued and used by recipients. This important information needs to be included in the debate on how to scale-up bednet delivery to vulnerable groups.”\textsuperscript{123}

Distributing ITNs for free in such a project, however, did not automatically solve all the problems that hindered the uptake of ITNs in the country. Miscommunication about the proper, intended use of ITNs remained an issue. Some pregnant women did not use ITNs while pregnant, for instance, under the impression from health facility staff that the net was only for the baby. Sometimes staff did not provide information to recipients about how to treat the net with the KO Tab, an activity which is critical to the public health function of the technology but is definitely not intuitive.\textsuperscript{124} Ensuring that only ‘vulnerable groups’ used these free ITNs also proved difficult. While many women kept and used the ITNs, at least one person in the survey area had sold their free net to someone else.\textsuperscript{125} Overall, in fact, about 20% of the 70,000 bed nets UNICEF procured ended up with non-target groups, including men who, as the main income generators in

\textsuperscript{121} Guyatt and Ochola, “Use of bednets given free to pregnant women in Kenya.”
\textsuperscript{123} Guyatt and Ochola, “Use of bednets given free to pregnant women in Kenya,” 1550.
\textsuperscript{125} Guyatt and Ochola, “Use of bednets given free to pregnant women in Kenya.”
their families, used bed nets to protect themselves and keep healthy enough to work.126 In some ways this was a rational health decision, since the loss of household income brought in by male breadwinners could pose a substantial, if not the greatest, threat to a family’s health.127 In a situation where coverage of ITNs is very low, as it was in Kenya during the early 2000s, ITNs in-use have a limited effect on the mosquito population and therefore provide limited protection for those not actually sleeping under the nets. Problems with miscommunication and the ‘leakage’ of nets to non-target groups, in other words, reduced the effectiveness of ITNs as a malaria control intervention.

Kenyan malaria control officials and their partners did not have the resources to continue distributing ITNs for free through antenatal clinics, though they did continue to use antenatal clinics as an outlet for ITN delivery. They did so in an effort to better target ITN subsidies to pregnant women and children under five. It seems ITNs also functioned as an incentive for many women in Kenya to attend antenatal care and maternal and child health centers.128 Again, using financial support from DFID, PSI sold ITNs to health facilities in malaria risk areas; health facility staff then sold ITNs to pregnant women for 50 Ksh, accumulating roughly 20 Ksh to increase ITN stocks or address some of the facility’s other needs.129 Not all health facility staff in at-risk areas invested in and stocked ITNs. However, those that did so “report[ed] that people [we]re travelling further

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127 Giulia Calvi identified a similar phenomenon in her study of plague in 17th century Florence, in which members of the lower classes continued to engage in income-generating activities against the will of public health authorities seeking to stop the spread of plagues through measures such as quarantine. Giulia Calvi, *Histories of a Plague Year: The Social and the Imaginary in Baroque Florence*, trans. Dario Biocca and Bryant T. Ragan, Jr. (Berkeley: University of California Press, 1989).
to attend these facilities rather than attending those that are closer, but without subsidised ITNs.”130

Antenatal clinics and hospitals served as an entry point for many women to obtain bed nets as well as knowledge about bed nets and malaria. “At the clinic,” one woman from Nyawita recalled, the population was “being told that at that time, there was a lot of malaria in the region. And more especially it was very risky for an expectant woman, or mother. Therefore, we were told that every expectant mother had to pay 50 shillings to get the net.”131 A number of women remembered learning about how to use and hang nets from nurses and ‘malaria people’ when they went in for antenatal and child health services, as well as about the relationship between mosquito bites and malaria more generally. Still, women had to assimilate this knowledge into existing routines and sleeping habits, a process which was not intuitive, especially in situations where new mothers and children did not sleep together. “In the past,” one woman described,

when I […] went to clinic and was given only one net for the first born, I would at times place the baby on the seat to sleep, and didn’t put a net because I was using the net in the bedroom. So the child ends up being sick. Now I wonder. When I go to hospital, I tell them ‘the child is now again sick and suffering from malaria.’ Then they told me ‘it’s because you placed the child on the seat. The mosquito doesn’t know that the child normally sleeps under a mosquito net. So any time your child is sleeping, you need to put the child under the net.’ So when I did that, my third born has never gotten sick or suffered malaria.132

And, of course, getting to a clinic in the first place was difficult at times and not, as one woman recounted, simply due to issues of geographic access: “During those times, there was a problem with HIV tests. As long as you’re an expectant mother you had to go

130 Ibid., 28.
131 Pascalina Dyambada,* interview with author, Nyawita, September 15, 2015.
through it. There was a lot of stigma, so many women did not go to hospital. They preferred to give birth with the midwives [...] But I was lucky. I went to hospital and got a net.” ITNs may have served as an incentive for women to go to an antenatal clinic, but strong disincentives certainly existed as well.

Kenya’s NMCP later benefited from the tremendous uptick in external funding for malaria control and ITNs in Africa, mainly through the Global Fund. Drawing on technical assistance from WHO members and funding from DFID, Kenyan health officials successfully applied for a Global Fund malaria control grant in 2004. Kenya’s Country Coordinating Mechanism (CCM), the group which put together the application, proposed to use the $17 million grant to procure and distribute roughly 3.4 million Olyset and Permanet LLINs for children under five. This was the second Global Fund proposal Kenyan officials put together to try to procure ITNs for free distribution in the country, the first one being turned down during the first round of Global Fund grants in 2002. At the time, Kenya’s 2004 Global Fund grant represented the largest successful award for the free distribution of LLINs in Africa. In 2005, international malaria control advisors even praised Kenya for being a model fundraiser. “It was suggested that other countries could learn from the example of Kenya,” one RBM regional meeting report stated, as the country “has a strategic plan, a business plan and an operational plan, 

133 Ibid. Samuel Wangowe, the Community Relations contact at Walter Reed Army Research Institute’s center in Kombewa, suggested that women avoiding health facilities for fear of being tested for HIV was a more general phenomenon, at least in Nyanza. Samuel Wangowe, personal communication, September 25, 2015.
134 For more on the details of the Global Fund and its involvement in malaria control funding, see chapter 5.
135 Kenya Division of Malaria Control, “Free mass distribution of 3.4 million long lasting insecticide treated nets to children under five years age, in Kenya,” Malaria Control Notice Board, Issue 1, October-December 2006, 8.
making gap analysis and negotiation with partners much easier.”" Although relying heavily on PSI to scale up ITNs in the country, members of Kenya’s DOMC negotiated a sea of various stakeholders to secure malaria control resources.

Kenyan DOMC officials planned to distribute LLINs in malaria endemic areas of western Kenya through an integrated measles vaccination campaign in July 2006. Like antenatal clinics, such vaccination campaigns were mechanisms through which to target ITNs to intended groups, in this case, children under five. Health officials in other African countries had already tried integrating ITN distribution into child immunization campaigns, and Kenyan officials looked to them for guidance. “It all started in Zambia, and we saw that it could be done,” Kiambo Njagi recalled. “When Togo was distributing bed nets, their first mass nets [campaign] in 2004, we sent a delegate from Kenya to go and observe how the logistics of such massive nets is conducted. Luckily, I was among the delegates.”" Health officials from Kenya, Zambia, and other African countries also shared their experiences at RBM regional or ITN-specific meetings, building up a base of programming knowledge for colleagues also under intense pressure to scale up ITN on a national level. ITN-based malaria control in Africa, in other words, depended on experts based in the global North as well as African experts and health officials.

Kenya’s DOMC also had the opportunity to learn from in-country experiences for its integrated ITN campaign due to unusual circumstances. Health officials detected the beginning of a measles outbreak in September 2005, initially among Somali immigrants in Nairobi. Soon, a number of places in the central part of the country reported increased

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138 Kiambo Njagi, interview with author.
measles rates, well before the government’s planned measles campaign in July. As a result, district health officials initiated vaccination activities early in 16 districts, taking the opportunity to do a test run of integrated measles vaccination and ITN distribution in Isiolo before the main distribution campaign. During this test they found, for example, that many distribution centers ran out of ITN stocks by the second day, in part because mothers had figured out a way to receive extra nets. When district health teams carried out the main integrated measles vaccination campaign in July, officials marked children’s fingers with a pen to indicate who had already received interventions—a practice still in use today. Officials adjusted distribution techniques further, giving away the rest of the Global Fund-financed nets in September through a free mass ITN campaign in endemic areas outside Nyanza and Western provinces. For the most part, district officials and their partners were successful using this ITN distribution method, increasing ITN ownership among Kenyan households with children under five to about 67%. Indeed, as woman told me, “it is now that the distribution has made people like me, the common wananchi, to get a net through the hospital.”

Free LLIN distribution helped address the problem of financial access to the public health intervention, but it did not always lead directly to use of the tool. The DOMC, for example, found that even though 67% of households received a free net, only about 42% had an ITN hanging in their house and only about 52% of children were

140 Kenya Division of Malaria Control, “Free mass distribution of 3.4 million long lasting insecticide treated nets to children under five years age, in Kenya,” 8.
141 As I saw in Asembo during Kenya’s 2015 polio vaccination campaign.
143 Mary Odera Ochielo,* interview with author, Nyawita, September 15, 2015.
reported to have slept under an ITN the previous night. In more extreme cases, recipients rejected the free net altogether. In Kilifi district, the DOMC reported, a rumor spread that the nets were ‘talking’ to their users, causing fever among children, and inducing hallucinations. Associating the white nets with death, some claimed the nets wanted the family to sacrifice the first and last-born children as an exchange for the net helping their other children. According to focus group interviews in the district, some believed nets given for free must have had something wrong with them. Similar suspicions arose during bed net efficacy trials as well, as Siaya residents, for example, were very apprehensive about accepting something supposedly free from authority figures with little on hand to exchange for it (see chapter 2). This suspicion, in other words, differed from western economists’ suspicions that people would consider free nets to be of poorer physical quality than those nets with a price. Those in Kilifi who feared the free nets returned the products to the district chiefs’ distribution centers. Health workers, chiefs, DOMC officials, and their partners tried to assuage people’s fears and explain the benefits of sleeping under ITNs—information which, it seems, had not reached all recipients during the free LLIN distribution campaign.

Indeed, a more common scenario health officials encountered was that people simply did not understand the purpose of the object. “Some people who were given those [nets] who do not know were given, they tore the nets to cover their gardens,” one woman explained. “It is that person who does not know the benefit of the net.” Others

144 Kenya Division of Malaria Control, “Progress made after the mass distribution of ITNs,” Malaria Control Notice Board, Issue 2, January-March 2007, 9.
145 Ibid.
146 Ibid.
147 Esther Mora, interview with author.
used ITNs to cover their gardens (see Figure 6.7) because they found the nets suffocating, a complaint often associated with the very pungent insecticide smell.\textsuperscript{148} Even if people did use the nets as intended, this did not always mean they understood why they were suddenly receiving nets. “Did you ever get a free net?” I asked one mzee in Nyawita. “Yes,” he responded, claiming he did not remember the exact year. “A majority of people,” he continued,

don’t have these memories of when the nets were distributed for free because, one, if you’re in class, you know you are learning for a given goal. The nets are being given, but they [recipients] do not know the next motive or the next goal, or the future goal for why the nets are being distributed. So that is why a majority of people do not keep track of what year they received the nets.\textsuperscript{149}

All of this is not to say that those distributing ITNs in Kenya’s first mass campaign completely neglected to provide information; only that the provision and reception of information was uneven. Since 2006, community health workers, members of research organizations and NGOs, or local administrators (depending on the region) have made greater efforts to walk around villages to monitor and promote proper ITN use. In a sense, they act as maintainers in Kenya’s public health system, helping ITNs function as a malaria control measure through their educational and monitoring activities.\textsuperscript{150}

\textsuperscript{148} Jessica Anyango Ching,* interview with author, Nyawita, September 22, 2015.
\textsuperscript{149} Daniel Okal,* interview with author, Nyawita, September 14, 2015. Interestingly, many women could identify a year they received an ITN as, for women of a certain generation, this often coincided with the birth of a child.
\textsuperscript{150} Scholars have recently drawn attention to the importance of maintenance, repair, and upkeep, rather than simply innovation or invention, in the history of technology. For more on this movement within the history of technology, see Blog, “The Maintainers,” 2017, http://themaintainers.org/blog/.
Making Global Health Practice in Kenya: Evidence for Free Mass Campaigns

Kenya’s Ministry of Health, DOMC, and their partners tried out a variety of approaches for distributing ITNs in the country, in large part because most everyone was implementing national bed net programs for the first time. International health officials and policy makers debated for a number of years about whether to subsidize ITNs, how to target subsidies for ITNs, and other fundamental questions. A large contingent of researchers and health officials, of which Kenya-based experts comprised a significant proportion, clamored to get backing for fully subsidized ITN distribution through the public sector. The money and resources, however, did not exist to support such activities on a large scale until the mid-2000s. In this context of uncertainty, Kenyan researchers from the KEMRI-Wellcome Trust research partnership in Nairobi monitored and compared results of ITN uptake across four sentinel sites in the country. Through this study, which overlapped with PSI’s and the government’s adoption of different ITN distribution methods and subsidy levels, the researchers generated scientific knowledge showing fully subsidized ITN distribution was the most equitable distribution method, and thus had the greatest public health impact. While the idea that free ITN distribution
could have a greater public health impact than unsubsidized or partially subsidized
distribution was not new, Kenyan and expatriate scientists provided statistical evidence—an
important advocacy tool during this period—with which the WHO could pressure
donors to increase support for free distribution. Thus, Kenyan researchers, along with
intended ITN users who took up and used ITNs according to their own interests,
priorities, and beliefs, shaped global ITN policy.

Even though it took many years for RBM officials and partners to figure out an
effective way to scale up ITNs in Africa quickly, researchers sought to answer this
question fairly early on in the life of the Roll Back Malaria program. This included
researchers in Kenya who, under the direction of Bob Snow and KEMRI-Wellcome Trust
partnership, used mapping, database, and survey technology to assess access to malaria
interventions and health facilities in the country. One such researcher, Dr. Abdisalan
Noor, came to KEMRI in 2000 specifically to work on this project. Drawing from his
background in engineering, GIS, and geospatial analysis, he developed databases of
epidemiological, geographic, and health intervention data to address the many
“unanswered questions on the operational side” of antimalaria activities in Kenya.151

“Bed nets were working. We knew that from the clinical trials,” he recounted.

There were a number of suggested approaches to scaling up, […] But nobody
knew what was really the best way to scale up and the best way to sustain, and
whether they were equitable, [and] cost-effective. And the second thing that was
unknown is, how did communities, when they got the intervention, how did they
actually accept it? How did they use it? How often did they use it? What was the
impact on parasitemia? What was the impact on mortality in an operational
setting?152

151 Abdi Noor, interview with author.
152 Ibid.
Working in conjunction with Ministry of Health officials, Snow, Noor, and the rest of the team set out to generate knowledge about these and other question regarding the effectiveness of ITNs in Kenya.

KEMRI-Wellcome Trust’s nationally-oriented research project—albeit one targeted at answering questions of continent-wide import—was very much shaped by the circumstances of past and concurrent ITN distribution in Kenya, as well as prevailing epidemiological views of malaria. “We decided with Bob [Snow] we were going to set up seventy-two villages across four different ecologies: […] eighteen in Bondo, eighteen in Kwale, eighteen in Makueni, and eighteen in Kisii/Gucha,” Noor recalled.

And we followed them up, I think, once after every high transmission season over a period of five years. And did lots of household type surveys, including birth histories, to document deaths, and all that. And the beauty of that study—and this was largely coincidental—was we started when the main intervention for scaling up bed nets was through social marketing, largely conducted by PSI. Then, subsequent to that bed nets [were introduced] through clinics to under-fives and pregnant women. Then free mass campaign. […] And we were able to look at how access to bed nets varied in terms of just general coverage but also in terms of equity and impact—how this varied with varying types of intervention.¹⁵³

The team’s scientific inquiries, as with much of the operational research on ITNs in Kenya and Africa more broadly during the early years of RBM, emerged out of ongoing efforts to implement ITNs in health projects and programs.

Researchers’ selection of study sites reflected prevailing approaches to and observations about malaria in twenty-first-century Africa. For one, the four districts selected for the study mapped onto the varying epidemiological situations in Kenya: from intense perennial transmission in the lakeside region of Bondo to the acutely seasonal, low transmission of Makueni in the semi-arid south. The multi-sited investigation

¹⁵³ Ibid.
mirrored what research teams did in the ITN efficacy trials of the 1990s (see chapter 1). Furthermore, researchers noted between 63% and 71% or households in the rural areas of these districts lived on less than $1 per day, well below the poverty line.154 For this reason, populations in the districts served as important proxies, not only for populations most at-risk for malaria disease in Kenya, but for at-risk populations in sub-Saharan Africa more generally. Additionally, populations in each of the sentinel sites had been exposed to roughly the same amount and types of access to ITNs, including through NGO and emergency-relief projects. Randomly choosing approximately 2,687 homesteads from across the four districts, researchers created a longitudinal cohort of children under five that they surveyed from 2004-2005 to 2006-2007.155

Researchers tracked both ITN and malaria disease indicators over the two-year study, stratifying study populations in the four sentinel sites by wealth quintile (from most poor to least poor). Doing so, they accumulated further evidence that fee-based distribution discouraged or disadvantaged those of low socioeconomic status. For example, they recorded that in the 2004-2005 period, when social marketing campaigns dominated, only 2.9% of those children in the “most poor” category used ITNs. By contrast, 66.3% of children in the same category used ITNs in 2006-2007, following the free mass distribution campaigns.156 Although researchers reported that 15.6% of children in the “least poor” category used ITNs in 2004-2005—many more children, in other words, than in the “most poor” category—still, only around 66% used ITNs in 2006-2007. “In recent years, there has been a consensus among national ministries of health,

155 Ibid.
156 Ibid., 1344.
development partners, and other stakeholders that access to health interventions should be made pro-poor,” Noor and colleagues wrote. “To the best of our knowledge this is the first time in Africa that a large-scale public health intervention, covering millions of people, has preferentially reached the most-poor quintiles of a community when compared to the least poor.”\textsuperscript{157}

Snow and his colleagues also tracked child mortality among the cohort, a cohort which morphed along with in-migrations, out-migrations, and age-out (when a child reached six years of age). Looking at their data, researchers associated ITN use among children under five with a 44% reduction in mortality over the entire period of the study.\textsuperscript{158} Mortality rates declined much more in high transmission areas of Bondo, where, researchers calculated, ITN coverage could avert 22 deaths for every 1000 ITNs used, than in low transmission areas of Makueni, where only one death could be averted for every 1000 ITNs used.\textsuperscript{159} Of course, multiple variables confounded any straightforward attribution of reduced child mortality to high ITN coverage. Even though mortality rates among those children using ITNs—a group that expanded over time as Kenya undertook free distribution activities in 2006—appeared to drop, overall levels of child morality in the cohort remained about the same over the two-year study period. Roughly the same amount of children in the four districts died, in other words, whether or not more of them used ITNs. Researchers thought ecological conditions helped explain these, somewhat contradictory findings: Kenya experienced a drought in the first year of the study, which usually dampens malaria transmission, and excessive rainfall in the second year, which

\textsuperscript{157} Ibid., 1345.
\textsuperscript{159} Ibid., 1037.
would exacerbate transmission. The effect of more children in poorer groups using ITNs during the period of high transmission, they felt, probably evened out with the effects of fewer, mostly wealthy children using nets in a period of low transmission. Government clinics also began dispensing new antimalarial drugs in 2006, a development that could also potentially influence results. Researchers, however, felt these variables had little impact on their findings. “We are nevertheless confident that a substantial effect on child survival was achieved during the expansion phase of the ITN strategy,” they concluded. “Donor agencies should regard this as money well spent and recognise that the challenge is now to maintain and increase funding to expand coverage further.”

The general conclusions of KEMRI-Wellcome Trust’s study did not seem all that shocking. After all, researchers working in Kenya and other African countries had already generated evidence, if on a small scale, that African populations were more likely to use ITNs if they could access the tool. Some national malaria control programs had already experimented with free ITN distribution in some fashion, producing anecdotal knowledge about the method at the very least. In addition, randomized controlled trials had shown that high coverage of ITNs could curb child mortality and malaria morbidity. Reach high-level coverage, logic suggests, and you reduce malaria disease indicators. Yet in 2007, the WHO singled out the KEMRI-Wellcome Trust study as justification for adopting the official position that LLINs should be distributed free or highly subsidized to all people living in areas at risk for malaria. The WHO’s new Director-General, Margaret Chan, touted Kenya’s experience more generally, saying “The collaboration

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160 Ibid., 1038.
161 Ibid.
between the Government of Kenya, WHO, and donors serves as a model that should be replicated throughout malarious countries in Africa.” Why, given the years of experience African health officials had with free ITN distribution, did the WHO highlight the Kenyan study in particular?

It is difficult to know with certainty why the WHO mobilized results from the Kenya study to officially endorse free ITN distribution in Africa, but the organization’s initial press release provides some hints. First of all, the release’s author noted, the WHO had supported efforts in Kenya to distribute nets for free by providing technical assistance on Global Fund proposals and providing a “full-time logistician” to help implement free ITN distribution activities. In other words, the WHO was already primed for recommending free distribution. Furthermore, the study provided concrete, measurable evidence that linked free ITN distribution, increased ITN coverage and use, and reductions in child mortality. “In Kenya, from 2004 to 2006,” the release stated, “a near ten-fold increase in the number of young children sleeping under insecticide-treated mosquito nets was observed in targeted districts, resulting in 44% fewer deaths than among children not protected by nets.” This appeared to be “the first demonstration of the impact of large-scale distribution of insecticide treated mosquito nets under programme conditions, rather than in research settings.” Since many donors financed ITNs with the, at least intermediate, objective of saving lives, making explicit connections between distribution practices and mortality rates would be key to securing their investment. “This data from Kenya ends the debate about how to deliver long-

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163 Ibid.
164 Ibid.
165 Ibid.
166 Ibid.
lasting insecticidal nets,” Arata Kochi, head of the WHO’s Global Malaria Control Programme, proclaimed. “No longer should the safety and well-being of your family be based upon whether you are rich or poor.”\textsuperscript{167} ITNs, rather, should be universally available tools and in particular, health tools for Africa’s poor.

**Scaling Up in the Era of Free, Universal ITNs**

Following the WHO’s recommendation for African countries to adopt free, mass ITN distribution campaigns to increase ITN coverage, both donors and the Kenyan government embraced this approach. The U.S. President’s Malaria Initiative (PMI) has stepped in to inject considerable new funding into the country’s National Malaria Control Program.\textsuperscript{168} Drawing on money mainly from the Global Fund and PMI, the Kenyan Ministry of Health initiated free mass ITN distribution campaigns beginning in 2008-2009, which run every three years—the low-range estimate for the life span of an LLIN. PSI, now PSKenya, has remained active as well, continuing to market ITN use and helping coordinate routine ITN distribution for pregnant women and infants in between mass campaign years. As of 2014, roughly 59% of households in the country owned an ITN.\textsuperscript{169} Within that group of households, Kenyan health officials recorded 77% of children under five and 77% of pregnant women as sleeping under an ITN the night before they conducted their survey.\textsuperscript{170} The Ministry of Health and PSKenya are

\textsuperscript{167} *Ibid.*  
\textsuperscript{168} PMI began giving funding to Kenya in 2007, which totaled $6.1 million. Funding levels spiked in 2010, with PMI giving $40 million. Since then, the Initiative has given between $34 and $36.5 million to Kenya each year.  
\textsuperscript{169} This figure included regions of low risk for malaria or seasonal transmission, where the government does not target ITNs. Kenya National Bureau of Statistics, et al., “Kenya Demographic and Health Survey 2014” (Rockville, MD: ICF International, December 2015), 183.  
\textsuperscript{170} *Ibid.*
promoting their newest advertising campaign, based around the slogan, ‘Msimu Wowote’ (“All seasons”), which emphasizes that people should sleep under nets in both the rainy and dry seasons (see Figure 6.5). The fact that authorities adopted the ‘Msimu Wowote’ campaign suggests that many people continue to use ITNs according to climatic conditions, observed mosquito levels, and, relatedly, perceptions of malaria risk.

Free mass campaigns have certainly helped even out the coverage of ITNs among populations at-risk for malaria. In line with the country’s decentralized health governance structures, community health workers—or, if lacking those personnel, village elders and local administrators—walk around to homesteads to count how many ITNs each house should receive (the ideal being one net for every two people). These local authorities also tell people where to pick up the nets—usually at a health facility, school, or local administrator’s office. This system has facilitated ITN distribution in rural, outlying areas with scattered populations and populations that do not frequent hospitals and clinics. Many residents I spoke with have attributed the positive change to the Kenyan government, albeit for reasons which may or may not be entirely transparent to me.

Expressing a common sentiment I heard in my interviews, one Nyamache resident told me, “At times I did not have money and I have ten children. I cannot manage to buy the nets for all these children; maybe I will buy for two and leave the rest. So the government has done well to distribute the nets [for free].”

Mobilizing the language of economic disparities, another said, “The system they [the government] have started using of distributing the nets to the rich and poor has brought us far. […] Now whether rich or poor, all have got the nets.”

171 Pacifica Ogedha,* interview, Nyoera (Nyamache), November 22, 2015.
172 Janet Kimtu,* interview, Nyoera, November 7, 2015.
Yet free mass campaigns have not solved all problems with achieving high ITN coverage and (intended) use in the country. For one, distribution within campaigns is still a bit uneven. I did my field work in Nyamache during a free mass campaign. A few people complained to me that they did not receive enough nets during this distribution—some expecting one net for each person, some claiming to have received less than one net for every two people. I met an old widow who had not even heard the distribution was going on, having stayed in her home, sick, for a number of weeks. Based on her experience, Mary Odera, a Nyawita resident, said she preferred to put ITN distribution in the hands of village elders rather than community health workers and hospital staff to correct such problems. “There is a lot of mischief, or let me call it a gap, on the distribution of the nets. You realize that whenever they record your names that you have six members in your households, but later on you’re only given two nets. Sometimes you’ll find that your name was not even on that list.” Asked if she knew why these hitches existed, Mary responded, “It is hard to tell where that mistake is coming from because the people who record the names, the community health worker, when you ask them they say, ‘I recorded your name.’ The hospital says ‘your name is not on the list.’”

ITN mass campaigns have worked to close some gaps, but certainly not all. Problems with use and efficacy—some new, some old—exist as well. The introduction of universal ITN distribution, not just distribution to pregnant women and children, in 2009 through mass campaigns has hastened the development of pyrethroid resistance among *Anopheles* mosquitoes. Entomologists I spoke with guessed that, barring the introduction of a new class of insecticides suitable for bed net treatment, ITNs

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173 Mary Odera Ochielo,* interview with author.
would be an effective malaria control tool for only one to two more decades. Manufacturers have incorporated binding agents into chemical treatments to increase the bioavailability of pyrethroids (typically deltamethrin) on nets and slow resistance rates, but this is only a temporary solution. The physical integrity of bed nets, moreover, does not always endure over the three-year period between distribution campaigns. “At times they get torn,” one woman from Nyawita told me, “and more especially with the kinds of houses we’re living in, the rats tend to destroy the nets. So even if you try to mend the nets, then another part gets torn. There is nothing you’re doing about that.”

Additionally, some people continue to use ITNs for things like fencing their gardens, drying maize, and catching or drying fish. They use ITNs to earn income, feed their families, and maintain healthy homes, though not in ways policy makers and malaria control advocates intended (i.e. by reducing malaria illness, hospital visits, and mortality, thereby opening up opportunities for wealth accumulation). At least some of the time, people are using old nets, which they have either replaced or which are simply too worn to act as a barrier for mosquitoes. While Ministry of Health officials and NGO partners do try to police alternative ITN use, as one community health worker told me, people can just take down bed net-garden fences when they know authorities are coming around and put them up again later. Finally, the proliferation of non-biodegradable ITNs and ITN packaging has also had a noticeable impact on the environment. This includes fish populations that are caught in small-holed bed nets before reaching maturity and

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174 Steve Lindsay, interview with author, Durham, UK, May 27, 2015; Jo Lines, interview with author, May 28, 2015; Clive Shiff, interview with author.
175 Monica Atieno Odhiambo, interview with author.
reproducing.\textsuperscript{176} As one of the few financially accessible, effective, and donor-friendly malaria control interventions on the market, however, it seems ITNs will only become further integrated into the Kenyan landscape.

\textbf{Conclusion}

During the course of my field work in western Kenya, I met people with a variety of experiences using insecticide-treated nets. My research assistant, Molly, who grew up in Gem, told me about how she and her siblings used to play and pretend their bed nets were small houses or forts. She admitted to me that, initially, she had no idea why would anyone investigate the history of an object that seemed to be, and have always been, such a commonplace piece of household furniture. I met another young college student in Kisumu Town, Mina, who insisted he could no longer sleep without a bed net. Some responses, however, really surprised me. In particular, Kenyan entomologist and former Director of KEMRI’s Centre for Global Health Research, John Vulule, told me he did not sleep under a bed net at all. Yes, he is an adult who has lived in a malaria endemic area of Kenya for decades; an attack of malaria for him is not as serious as for someone with little immunity. Still, I thought that someone so close to the world of malaria control, someone who even investigated ITNs for malaria control, would use this widely-touted tool. Malaria, Vulule explained, is a result of poverty. If he or his family members are afflicted with malaria, he can afford diagnostic and treatment services. He can afford to

buy additional bed nets for his children if they need them. Those less fortunate do not have money for medical services or tools; they do not have the resources to build houses that can be ventilated without permanent, wide, open eaves—an ample pathway for hungry mosquitoes. Due to particular developments in Kenya and beyond, Kenya’s poor do have access to ITNs. More than pulling people out of poverty, though, ITNs have become a technology of the poor.

By exploring the history of ITN implementation in Kenya, this chapter has shed light on the role Kenyan health officials, researchers, and publics played in shaping ITN distribution strategies and re-defining ITNs as public health tools for the poor, both in the country and on the continent. At the same time, it has illuminated some key characteristics of infectious disease control and public health in twenty-first-century Kenya. Although they are not a universal mode of health service provision in the country, mass ITN distribution campaigns encapsulate multiple of these characteristics. For one, the campaigns run largely on external funding. They depend heavily on decentralized governance structures, including assistance from non-governmental or bilateral organizations, such as PMI. Finally, the exercise of free mass campaigns hinges on the distribution of individualized, biomedical technologies. Community health workers, NGOs, and other health-related agencies have informed people about malaria control strategies such as clearing bushes, eliminating standing water, and the like, as some of my interviews with Nyanza residents suggest. However, in Kenya and Africa more broadly, health and development authorities primarily approach the control of malaria and other infectious diseases as a problem for personal management of the body against illness, whether that be through a drug, vaccine, home water filter, or insecticide-treated
bed net. Such an approach to malaria is not simply the result of some natural progression of public health—increasingly accountable to the needs of the poor by democratizing biomedical gadgets; rather, it is the product of various political, economic, and social circumstances in Kenya, Africa, and the world. It is also the approach with which Kenyan health officials and populations will have to combat a complex disease in an age of increasingly irregular and unpredictable ecological and health funding conditions.
**Conclusion**

Insecticide-treated bed nets have had ambivalent effects in Kenya. Since 2006, when the Kenyan government initiated its first mass ITN distribution campaign, malaria rates have largely declined in the country. Malaria prevalence around the Lake Victoria region, for example, has declined from 38% in 2010 to 27% in 2015. While it is difficult to tell how much widespread ITN use has played in such reductions, it is true that the intervention has had some beneficial effects in the fight against malaria disease, especially in places where effective antimalarial drugs are scarce or expensive.

However, there are signs this trend may not continue, certainly not without substantial effort. It is well-known that mosquitoes are becoming increasingly resistant to pyrethroid insecticides across the continent. Unless chemists find a new class of insecticide to use for bed nets, this tool will not remain effective after the next decade or two. Pyrethroid-treated nets have also have reshaped the landscape of mosquito vectors in important ways. While pyrethrroids have led to significant declines in western Kenya’s *Anopheles gambiae* population, the population of *Anopheles funestus*—which feed on humans and animals—has increased. The consequences of such changes are still uncertain but pose legitimate concerns. Changes in the climate and environment also present threats, as lake and ocean levels rise—expanding mosquito habitats—and as fluctuating rainfall levels promote malaria transmission and contribute to poor harvests.

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drought conditions, and increased food insecurity. Neither ITNs nor a new malaria vaccine, one candidate of which is currently being tested in Kenya, will be able to mitigate such interrelated threats.

Additionally, donors who have financed, and largely propped up, malaria control in Africa during the twenty-first century are starting to cut back. The Global Fund, the largest funder of Kenya’s malaria control program, is reducing its aid for malaria control in the country by more than half for 2018-2020. The U.S. President’s Malaria Initiative (PMI) still contributes substantial funding to Kenya’s National Malaria Control Programme (NMCP) but has also reduced its aid in recent years. “If current trends continue, then PMI will be the only major donor after the end of the cost extension of the Global Fund grants in December 2017,” PMI’s report for the 2017 Fiscal Year stated. “The projected available funding to support NMCP’s annual malaria prevention and control plan of $34 million falls significantly short of the expected need, which is estimated to be approximately $300 million based on the revised KMS [Kenya Malaria Strategy] costing.” Since 2014 PMI has been trying to rationalize, or triage, ITN distribution in the country, testing out and evaluating ‘community-based,’ continuous ITN distribution channels where people are supposed to request new nets from community health volunteers on an as-needed basis. Given the general increase in donor availability, the need to ensure high coverage and sustained use of ITNs in the community is critical. Since many people in rural areas may not be able to afford the nets, it is essential to ensure that the nets are accessible to all. However, the donors are cutting back, leading to uncertainty about the future of malaria control in Kenya.

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fatigue, however, it is yet unclear as to how well such a system will support sustained ITN programming. Due to the structure of malaria control financing that developed over the twenty-first century, donor fatigue and the disappearance of malaria control resources also poses a serious concern for communities in malaria-endemic areas of Kenya and around the continent.

Even if ITNs are not a perfect or long-term solution to malaria in Kenya, it is one of the few solutions to which at-risk communities in the country have, at least somewhat reliable access. As such, Abdisalan Noor and colleagues at the Kenya Medical Research Institute-Wellcome Trust partnership are also preparing to rationalize ITN delivery in the country. If people in malaria-endemic areas stop using ITNs due to lack of resources, complacency with reductions in malaria, or both, Noor explained, “We have no clear way of knowing whether you will get a rebound. If you get a rebound, you have a risk of a massive epidemic.”

To try to predict and mitigate against major malaria outbreaks, Noor and colleagues are using maps of malaria transmission from the period before widespread ITN use to identify the areas most vulnerable to a future epidemic. “Even though [people] are not exposed to any significant levels of transmission,” at the moment, still they must be able to protect themselves. Because you haven’t had as much impact on the mosquito as you’ve had on the parasite [with ITNs]. The mosquito population can blossom. What you have done is interrupt the contact between the mosquito and the human, which means you’ve had an impact on the parasite level. […] And you still have adults who are carrying infections, parasites. They are immune. They carry parasites in their body. You remove that contact, the mosquito bites, people get infected—not sick. Then [the mosquito] bites you and me—we are not immune. So there’s this whole thing.”

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8 Abdisalan Noor, interview with author, Nairobi, January 8, 2016.
9 Ibid.
Population migration and mobility, which may increase given the country’s current drought, will facilitate the spread of malaria parasites to people with little immunity. While Kenya’s Ministry of Health and their partners have made notable strides in reducing malaria prevalence in the country over the past decade, then, the malaria situation is becoming increasingly volatile—volatility attributable in part, at least, to the overwhelming reliance on ITNs for malaria control.

Kenya’s situation is not unique. Health officials in many African countries heavily reliant on donor funding for malaria control activities are now looking for ways to move forward with reduced resources. They, too, face a complex, multidimensional problem, which ITNs and other individualized biomedical technologies alone cannot fully address. Given the particular history of global malaria control in the late twentieth and twenty-first centuries, however, they may have limited room to pursue alternative solutions to mitigate a potential disease crisis.

This dissertation has traced the life history of insecticide-treated bed nets in Africa to examine how and why this technology became a cornerstone of global malaria control in the twenty-first century. Contrary to traditional narratives about the adoption of evidence-based tools in public health, biomedical evidence showing ITNs reduced child mortality by itself did not lead to the widespread adoption of ITNs. Rather, the political climate and economic constraints of structural adjustment, along with health officials’ need to sell malaria control to donors as a worthy investment of scarce resources, significantly informed the development and uptake of the intervention. This broader political-economic context of the 1980s and 1990s, in fact, shaped the production of
scientific knowledge about ITNs in Africa—an endeavor that transformed ITNs into biomedical commodities commutable in a growing economy of global health goods. The intensified decentralization, privatization, and corporatization of global malaria control during the twenty-first century further encouraged health officials to embrace ITNs, a ‘cost-effective’ tool attractive to a range of patrons looking to fight poverty and disease in Africa without changing entrenched power structures. In this case, the individualistic orientation of biomedicine worked synergistically with the individualistic orientation of neoliberal, economic development models prevalent in the 2000s to construct malaria control in Africa as a problem of personal and individual management—a problem amenable to ITNs.

This dissertation also uses a novel approach by historicizing the construction of a quintessential, ‘evidence-based’ technology to understand the development of global health science, bureaucracy, and practice since the 1980s. ITNs were not merely products of major trends in global health—such as the increasing centrality of randomized controlled trials, econometrics, market-based health care delivery systems, and biomedical commodities; their development as a malaria control intervention in Africa was entwined with the growth of these trends, as well as the global malaria control apparatus that exists today. Furthermore, by focusing on the history of a technology—its materials, its users, and its uses—I have been able to trace how a range of different people and groups participated in constructing the tool as a biomedical global health intervention. Knowledge produced about ITNs in the course of scientific trials did not always translate into evidence-based policy, just as top-down policies did not translate directly into evidence-based practice. Scientists, health officials, donors, and NGOs
mobilized certain types of politically salient knowledge to access and distribute health resources in the name of evidence-based global public health.

African populations were not marginal to this history of ITNs as an evidence-based intervention, or the development of evidence-based global health. African scientists, health workers, state officials, and communities all played key roles in defining ITNs as a major biomedical, global health technology. Randomized controlled trials with ITNs depended heavily on the intellectual, technical, administrative, and social labor of these groups. Scientific publications did not always acknowledge the importance of their labor, or the influence of local social and cultural circumstances of African research sites, in the production statistically significant, biomedical knowledge about ITNs. As a result, some of the lessons scientists learned about the difficulty of introducing ITNs into communities unfamiliar with the intervention, and about the complexity of deploying ITNs for malaria control in Africa, got lost when it came time to initiate national distribution programs. Exigencies to draw on marketing experts from the United States and Europe to deliver ITNs in Africa, and to meet disease control targets quickly to access additional, necessary resources, also contributed to such mistranslations. By tracking ITNs from initial scientific experiments to implementation in African health programs, this project has not only elucidated the complicated, multidirectional relationship between the specific, ‘local’ contingencies of technology use and supposedly universal, ‘global’ knowledge; it has also presented an alternative narrative of the development of biomedical, global health interventions, one in which professional and non-professional African communities played a central role.
The histories of ITNs and post-Cold War global health and development have reshaped Africans’ lives and livelihoods in important ways as well. In interrogating the history of ITNs in Kenya specifically, this study has explored how African populations and states have navigated and adapted to new governance structures, new economic opportunities (particularly in global health research), and new conditions of precarious living during and following structural adjustment. The Kenyan state mobilized ITNs in health care policy, attempting to attract resources for malaria control in the country while devolving responsibility for health care delivery and financing to sub-national and external groups. Scientists and residents of Nyanza Province have discovered new outlets for employment and health interventions through global health research studies and development projects, a trend very much tied to ITN research projects in the area. Despite the new opportunities in these, often time-limited projects, such projects have not addressed the need for permanent health infrastructure and resources in the politically marginalized, malaria-endemic region. More generally, Kenyans continue to use ITNs in various ways according to their own interests, priorities, and beliefs, to make healthy homes—sometimes by using ITNs as malaria control devices, sometimes by using them for agricultural activities in pursuit of subsistence or income, a pursuit at least equally if not more important to protecting their family’s health. By historicizing ITNs in Kenya and elsewhere in Africa, this dissertation seeks to understand the shifting nature of political and economic inequality on global and national scales—inequalities embedded in the global health enterprise to which African populations (especially those in popular research sites) have had to adapt.
Historians of malaria often emphasize the continuities between present and past approaches to malaria control, and particularly the continued use of narrowly technological solutions for a complex disease problem. For these scholars, those in charge of global malaria control either have not learned the lessons of history, or are so drawn to the quick-fix that they ignore the structural determinants of malaria, which continue to hinder control efforts. While I agree that such continuities exist, and that present malaria control efforts ignore certain lessons from past antimalaria endeavors in ways that are self-defeating, this dissertation stresses the very important differences between past and present malaria control.

By taking a detailed look at the history of malaria control after 1980, my study reveals how the politics of the late- and post-Cold War period profoundly shaped the introduction and widespread adoption of ITNs. Health officials, academics, and donor agencies gravitated toward ITNs—an individualized commodity well-suited to decentralized, infrastructure-scarce health systems—explicitly to avoid centralized, state-directed insecticide spraying campaigns. Prevailing conditions of resource scarcity, economic reforms under structural adjustment, and the legacies of these in both Africa and the arena of foreign aid over the twenty-first century have also promoted recourse to “cost-effective” ITNs as a solution for malaria on the continent. Finally, the field of malaria control looks very different today than it did in the early or mid-twentieth century.

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century. Doctors and clinical epidemiologists versed in the practices of RCTs dominate the field, including most leadership positions, and new generations of entomologists have traded field laboratories for genetics and genomics laboratories. Experts in marketing, business management, and microeconomics have come to play an unusually large role in malaria control efforts as the field, and global health more broadly, has become heavily corporatized. Such shifts in authority and represented expertise have important implications for the types of solutions members of the malaria control community pursue, as well as for the geography of knowledge production about malaria. The changing social, political, economic, and intellectual contexts in late twentieth and early twenty-first-century global public health not only help explain the centrality of ITNs in malaria control programming in Africa; they also provide the historically-specific ‘new bottle’ for current malaria control efforts, which continue to neglect the structural determinants of malaria and which we must work within to move forward.

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Biographical Sketch

Kirsten Jean Moore-Sheeley was born in 1989 in the United States of America. She did her undergraduate work at Chapman University in Orange, CA, where she completed a double major in History and Screenwriting. Her undergraduate thesis, “Medical Manipulation: Public Health as a Political Tool in the 1918-1919 Influenza Epidemic in San Francisco,” appeared in the online journal, Voces Novae: Chapman University Historical Review.

In 2011, Kirsten began her PhD in the History of Medicine at Johns Hopkins University. While there, she completed a Certificate in Global Health from the Johns Hopkins Bloomberg School of Public Health. She published some of her original historical research in an article for Social History of Medicine, entitled, “The products of experiment: Changing conceptions of difference in the history of tuberculosis in East Africa, 1920s-1970s.” She has also published book reviews in the Journal of the History of Medicine and Allied Science and Endeavour. Kirsten received a Hass Dissertation Writing Fellowship from the Beckman Center of the Chemical Heritage Foundation for the 2016-2017 school year. While a PhD student at Johns Hopkins, Kirsten has served as a teaching assistant in courses on the History of Medicine and African History. She also designed and taught her own undergraduate course, “From materia medica to mobile phones: The history of global health technologies, 16th century to the present,” in the fall of 2017 under a Dean’s Teaching Fellowship.