GENDERED SEXUAL HEALTH

AMONG MEN IN INDIA

By

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Abstract

Background:

The term "men who have sex with men" (MSM) provokes the illusion of sexual risk homogeneity among male sexual minorities. The term overemphasizes a single aspect of sex between men (behavior) and overlooks nuanced factors (such as gender/sexual identity) that affect the spread of sexually transmitted infections (STIs). Beyond STIs, the expression of gender/sexual identity has observable traits that predispose non-normative sexual minorities to profiling, discrimination and human rights abuses. In India, three subgroups of male sexual minorities differ in gender/sexual identity. *Kothis* have effeminate gender expressions and often practice receptive anal sex. *Panthis* have gender expression that reflect more traditional masculine roles and they tend to practice insertive anal intercourse with other men. The gender expression of *Double-Deckers* is mixed and situational and they practice both insertive and receptive anal sex depending on the specific situation or sexual partner.

Methods:

Respondent-Driven Sampling was used to recruit 12,022 men in 12 Indian cities from 9/2012 to 7/2013. In a questionnaire, participants were asked to select their gender/sexual identity from a list of locally recognized identities, including *Panthis*, *Kothis*, and *Double Deckers*. HIV and HSV-2 infection were ascertained using ELISA-based IgG assays. Syphilis was ascertained using standard Treponema (Treponema pallidum haemagglutination) and non-Treponema tests (Rapid Plasma Reagin) tests. Random-effects logistic regression was used for all aims. In ***aim 1***, we estimated the

associations between gender/sexual identity and serology-ascertained STIs (HIV, HSV-2, syphilis) as well as self-reported STIs (Hepatitis B, chlamydia, trichomonas, gonorrhea). We also estimated the association between gender/identity and concurrent infections (HIV and HSV-2, HSV-2 and syphilis, HIV and syphilis, HIV/HSV-2/syphilis concurrent infections). Associations were adjusted for age, intercourse type, sex work, number of partners, education, marital status, and circumcision. In ***aim 2***, we estimated the association between gender/sexual identity and outcomes related to human/sexual rights (healthcare refusal, healthcare mistreatment, physical and sexual violence). In ***aim 3***, we analyzed if 3 social stratifiers (age, family income and education) modified selected associations between gender/sexual identity and outcomes estimated in aim 1 and aim 2.

Results*:*

The parent trial recruited a total of 12,022 men who self-reported sexual encounters with other men. This analysis was restricted to 9,542 (79.37%) men who self-reported the 3 gender/sexual identities of interest: *Kothi*, *Panthi* and *Double-Deckers*. The mean age was 28.45 years, 33.08% were married, and median age at first intercourse with a man was 18 years. *Panthis* represented the largest subgroup (32.7%), followed by *Kothis* (23.5%), and *Double Deckers* (23.3%). In terms of sexually transmitted infections (***aim 1***), after adjustment for behavioral and social factors, compared to *Panthis*, *Kothis* had higher odds of HIV (OR=2.20; 95% CI=1.60, 3.03), HSV-2 (2.55; 2.04, 3.20), syphilis (2.35; 1.42, 3.90), and coinfections with HIV/HSV2 (2.56; 1.74, 3.75), HIV/syphilis (2.93, 1.17, 7.34), HSV2/syphilis (2.97, 1.58, 5.59) and HIV/HSV-2/syphilis (3.84; 1.40, 10.56). In terms of relative differences in human/sexual rights (***aim 2***), compared to

Panthis, *Kothis* had higher odds of reporting being frequently mistreated by hospital staff (4.59; 3.54, 5.94), of frequently being refused medical care or denied hospital services (5.08; 3.79, 6.80), of frequently being refused housing (5.49; 4.20, 7.16), history of serious physical violence growing up (6.69; 5.97, 7.49), and history of forced attempts at unwanted sexual activity by an intimate partner (4.11; 3.67, 4.61). In ***aim 3***, the differences in the associations between gender identity and HIV showed modification across strata of age, education and income. Men with high family incomes, high education (or both) had lower odds of HIV but these protective effects were largely limited to younger (not older) *Kothis* and *Panthis*.

Conclusions:

Men of different gender/sexual identities in India belong to heterogeneous subgroups. *Kothis* had elevated odds of HIV, HSV-2, and syphilis as well as higher odds of concurrent epidemics of these infections. *Kothis* were predisposed to human/sexual rights violations such as discrimination, physical and sexual violence. Education and income were associated with lower odds of HIV for younger but not older *Kothis* and *Panthis*. In contrast, sex work and the *Kothi* identity in India are associated with high risk of adverse sexual health outcomes independently of protective social variables. The role of education and income among younger men in their formative years warrants additional multi-disciplinary HIV research. Gender/sexual identity is an important biopsychosocial determinant of health that is associated with sexual behavior, epidemics of sexually transmitted infections, and the enjoyment of human rights.

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Many people supported me through my failures, which have been many…
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Motivation and specific aims

In 2000, a review by Delor and Hubert entitled "Revisiting the concept of vulnerability" [3] discussed the pervasive yet ambiguous use of the term "vulnerability" in the HIV/AIDS literature. Reports describing the current state of the HIV pandemic frequently disseminate claims about "vulnerable" (now commonly referred to as "key") populations. Seldom are these claims accompanied by a definition or a discussion of what researchers mean by 'vulnerability'. The review by Delor and Hubert tackles questions that are the cornerstone of this dissertation:

** What does it mean to be vulnerable to HIV infection? **

** What does it mean to be vulnerable to other sexually transmitted infections? **

** What does it mean to be vulnerable to violations of one' human/sexual rights? **

Much like the term vulnerability, other terms of importance in today's public health lexicon are similarly complex and not surprisingly suffer from imprecisions, ambiguities, and occasionally, from outright inaccuracies. Take the term "*men who have sex with men"* or MSM, for example. The coining of this term was an attempt to increase the specificity of the etiological discourse on HIV while simultaneously decreasing stigmatization of sexual minorities. However, several scholars, particularly in sociology and anthropology, have claimed that using a single behavioral label for such a diverse group of men can distract researchers and policy makers from other important but less straightforward terms. In other words, focusing simply on the *behavioral acts* of men

who have sex with other men can distract us from their sexual identities, the variability in their sexual roles, and many other highly nuanced aspects of sex between those men.

This dissertation intentionally explores the links between several complex constructs such as sexuality, stigma, and health to highlight how vulnerability in sexual health is embodied. We focus on the ***genderization of poor sexual health***. Importantly, we define sexual health using the WHO designation, which describes sexual health beyond the mere absence of sexually transmitted infections or other sexual pathology. This allowed us to explore other adverse outcomes such as human rights violations, discrimination and stigma since they are crucial in the promotion of sexual health. Even if HIV is brought under control, failing to protect the human rights of sexual minorities will preserve the causal pathways through which vulnerability acts to spread the physical and mental health problems of today and the future.

Our intention is neither to dispute nor to oppose the progress that we have seen in HIV/AIDS research within the past several decades. In fact, despite the historical lapses in mainstream research terminology, researchers across the globe have relentlessly sought to partner with communities that have historically been most affected by HIV and other STIs, reaching unmistakable accomplishments and thereby setting the strongest precedents for generations to come. We hope is to include additional perspectives from sociology, anthropology, and social epidemiology to elucidate crucial trends, which are evident only upon consideration of the social contextualization of human behavior.

Many of the perspectives we will discuss have been previously used to contextualize sex between men in India. Many of these ideas have been published

elsewhere in the literature in the form of qualitative descriptions and limited studies. We expand on these efforts thanks to the availability of data from a large cluster randomized controlled trial (cRCT) that recruited thousands of men who belong to an important population of Indian society – male sexual minorities. Our analyses investigate a specific set of diseases (sexually transmitted infections (STIs)) and our discussions on STI vulnerability occur in the context of gender roles, differences in sexuality, and human and sexual rights. We have chosen to focus only on three subgroups of Indian male sexual minorities with different gender identities: *Kothis* (described as effeminate, receptive partners), *Panthis* (described as masculine, and insertive partners), and *Double-Deckers* (described as having versatile and mixed sexual roles that shift depending on the specific partnership). In other words, the sexual health of specific subgroups may be different due to the genderization of the determinants of sexual health.

This dissertation compiled evidence from various sources including the previously mentioned cRCT of 12,022 men who self-reported sexual encounters with other men. Other sources of data include economic data publicly available in Indian government online sites and reports from media and newspapers covering material related to sexual health in India. Lastly, some books discussing global trends in sexuality were used to compare the treatment of sexual minorities as a global and historical perspective to emphasize generalizability. These various sources were combined to produce both quantitative and qualitative analyses and commentaries.

Specific aims

AIM 1

Aim 1a: Characterize the heterogeneity of STI risk between men of three different gender sexual identities in India

Aim 1b: Characterize the heterogeneity of STI risk determinants (social and behavioral) between men of three different gender sexual identities in India

This aim studies the association between gender/sexual identity and several outcomes:

Outcomes for aim 1a:

1. Seropositivity to sexually transmitted infections (HIV, HSV-2, syphilis)
2. Concurrent infections (HIV/HSV-2, HIV/syphilis, HSV-2/syphilis, HIV/HSV-2/syphilis)
3. Self-reported infections (Hepatitis B, trichomonas, chlamydia, gonorrhea)

Outcomes for aim 1b:

4. Descriptive differences in the social determinants of health
5. Descriptive differences in the behavioral risk factors
6. Descriptive differences in the HIV care continuum by gender identity

In aim 1, we hope to develop an understanding of the burden of several sexually transmitted infections based on three local gender identities among males in India. We also hope to understand if 1) the social and behavioral determinants of health and 2) engagement in the HIV care continuum are associated with gender/sexual identity.

AIM 2

Characterize the heterogeneity of human/sexual health rights violations between men of three different gender sexual identities in India

This aim studies the association between gender/sexual identity and several outcomes:

1. The right to equality and non-discrimination
    a. healthcare mistreatment
    b. healthcare refusal
    c. forced family evictions
    d. refusal of housing
2. The right to be free from torture or degrading treatment
    a. fear of psychological abuse
    b. fear of physical abuse
    c. physical violence
    d. unwanted sexual experiences
    e. attempts to forced sex with intimate partners
3. The right to privacy
    a. avoidance of HIV testing for fear of report to government
    b. avoidance of HIV testing due to fear of losing one's job
    c. avoidance of HIV testing due to friends or relatives noticing
    d. failure to obtain medical care due to not wanting to be seen in STI clinics
4. The right to determine decisions about one's children
    a. fear of being unable to be with children if gender/sexual identity is disclosed
    b. being told to stay away from children
    c. odds of not having children
    d. odds of having children but not living with them

In aim 2, we hope to extend the understanding of gender/sexual identity beyond sexually transmitted infections.

AIM 3

Evaluate for effect modification of the association between gender identity and 4 sexual health outcomes (HIV, HSV-2 from aim 1; healthcare refusal, forced sex with intimate partners from aim 2) by education and quartiles of family income.

The strata for aim 3 will be:

1) ***Gender/sexual identity*** (categorical variable with 2 strata)

- *Kothis* and *Panthis* (*Double-Deckers* are excluded for simplicity)

2) ***Age*** (categorical variable with 2 strata)

- Older men: top 2 quintiles of age
- Younger men: lowest 3 quintiles of age

3) ***Education/income combinations*** (categorical variable with 4 strata)

- Below high school education & collective income < median income for all families
- Below high school education & collective income > median income for all families
- Completed high school or above & collective income < median income for all families
- Completed high school or above & collective income > median income for all families

The 3rd aim of this dissertation will be completed in 2 steps. Step 1 is a descriptive analysis showing if the Odds Ratios between higher income/education and lower income/education with 4 sexual health outcomes differ after stratification for age and gender/identity. In other words, step 1 will be a subgroup analysis of the association between high family income/education vs. low family income/education stratified by age and gender/sexual identity. Step 2 will be completed using a formal regression model that will test for statistical significance of the three-way interaction between the strata of the 3 variables just described (age, gender/sexual identity and income/education combinations)

Table 1 Summary of specific aims and epidemiological associations under study

Aim	Overarching concept	Sample test statistic*
1	Heterogeneity of STI risk	$OR_{HIV} = \frac{Odds\ (HIV \mid Kothis)}{Odds\ (HIV \mid Panthis)}$
	Heterogeneity of risk determinants	$OR_{sex\ work} = \frac{Odds\ (sex\ work \mid Kothis)}{Odds\ (sex\ work \mid Panthis)}$
2	Heterogeneity of Sexual/Human rights	$OR_{SRV} = \frac{Odds\ (sexual\ rights\ violation \mid Kothis)}{Odds\ (sexual\ rights\ violation \mid Panthis)}$
3	Associations stratified by social stratifiers	$OR_{STI} = \frac{Odds\ (STI \mid Kothis)}{Odds\ (STI \mid Panthis)}$ for old/young/poor/wealthy/educated/uneducated
	Associations stratified by gender identity and age	$OR_{STI} = \frac{Odds\ (STI \mid high\ income,\ high\ school)}{Odds\ (STI \mid low\ income,\ low\ highschool)}$ for older younger/old/*Kothis*/*Panthis*

In Chapter 1, we review the epidemiological state of HIV and two additional common STIs in India: syphilis and HSV-2 infection. In Chapter 2, we review the background literature and offer definitions of important complex social constructs including gender and sexuality. We also discuss several frameworks and theories offering explanations for gendered vulnerabilities to STIs and other relevant aspects about Indian male sexual minorities. In Chapter 3, we turn to the description of the parent study and the sections within it that are relevant to this dissertation including the methodology for this work. In Chapter 4, we study the heterogeneity of STIs and STI determinants between sexual minority groups. In Chapter 5, we study violations of several sexual rights that are linked to human rights and other internationally recognized equality documents. In Chapter 6, we study whether there is significant stratification (or effect modification) of previous associations by several social determinants (age, income, education) and conclude with an analysis of income and education among younger and older *Kothis* and *Panthis*. Lastly, in Chapter 7, we synthesize key conclusions and suggest future directions

CHAPTER 1:

Sexually transmitted infections in India

State of knowledge

Human Immunodeficiency Virus (HIV)

Since the recognition of HIV as the cause of Acquired Immune Deficiency Syndrome (AIDS) in the early 1980's, outstanding accomplishments have been achieved in the treatment of people living with HIV as well as in the prevention of new infections.[4-6] In 2015, many of these prominent triumphs were summarized in a 500-page report in which the United Nations recognized the progress reached by nations worldwide with regards to the Millennium Development Goal 6A and B: Combat HIV/AIDS.[7]

The success of the HIV response is the result of the concerted effort of many scientific disciplines worldwide. Scientists now understand the cellular immune response to HIV with extraordinary detail[8] and this has led to numerous recent advancements in the development of a vaccine against the virus.[9,10] This global-scale synergy has also improved our understanding of major social, structural, and behavioral determinants of the HIV pandemic,[11-16] triggering interventions across the continuum of care, from prevention of infection to effective delivery of anti-retroviral therapy (ART).

Examples of success in the field of public health come from various parts of the world and include reduced HIV-free infant mortality[17] and mother-to-child

transmission[18], improvements in survival, treatment and patient monitoring[19], prevention of infection with pre-exposure prophylaxis[20], improved ART adherence in the perinatal period,[21] childhood,[22] adolescence[23] and older adults[24] and even the use of technology to enhance access to difficult to reach populations including imprisoned[25] and homeless[26] individuals.

The HIV/AIDS Response in India

Measurable Success:

Joining other global leaders, India has positioned itself as an important partner nation in the international HIV/AIDS movement. Numerous important benchmarks have been reached and even surpassed in India.[27] The UN report highlights the following examples: today, India is one of many countries that has seen more than 20% decline in new HIV infections since the start of the millennium.[7] Likewise, the availability of treatment has increased in India after the country amended its Patent Act to incorporate new flexibilities provided within the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement. Today, 85% of the antiretroviral medicines for HIV treatment come from India.[28]

Much of these positive changes are due to India's scaling up of its countrywide machinery involving most sectors of society. Ultimately, we have already witnessed quantifiable rewards resulting from India's synchronized efforts. Today, the HIV epidemic in India has slowed down and hundreds of thousands of lives have been saved as a result.[6] All of this progress is also the platform to conquer remaining challenges. Two studies estimated that, under ideal conditions, starting ART early in India could

reduce new infections by 18%, AIDS mortality by 9%, while better retention could reduce 38% of new cases over the next two decades.[29,30]

Remaining challenges:

Despite these encouraging trends, many challenges remain unmet in India, which have biological, logistical, political, historical, social, and economic underpinnings. [31,32] At the individual level, antiretroviral drugs are difficult to administer, require longstanding adherence and close medical monitoring.[33] Biologically, high treatment failure rates, particularly in resource-limited settings[34], could lead to substantial side effects[35] and to the emergence and perpetuation of drug resistant HIV strains throughout India.[36]

Besides individual challenges, social and economic difficulties in India regularly test the nation's public services and important parts of its healthcare infrastructure.[37] Sound financial strategies are needed to protect and promote the sustainability of HIV surveillance and prevention efforts[38], including the expansion of HIV testing for HIV-negative groups[39] as well as guidelines informing whether to expand the eligibility for free ART among people who are known to be infected with the virus.[40]

Unfortunately, simply achieving financial sustainability is not sufficient. However, with regards to sustainability of the HIV/AIDS response, Oberth and Whiteside differentiate between the fiscal sustainability and what actually needs to happen, on the ground, to continue making progress:

"*Current efforts focus heavily on fiscal imperatives such as increasing domestic funding. This is important (since) needs are increasing at a faster rate than donor funding… The problem is that measures of financial sustainability tell very little about the actual sustainability of specific programmes, disease trajectories or enabling environments.*"[41]

The HIV/AIDS response and the "Key Populations" of India

In line with achieving sustainability, financially and on the ground, the prioritization and allocation of limited resources continues to be of paramount importance. Classically, resource allocation strategies have sought to improve the engagement of groups that are disproportionately affected by the epidemic. Whether a group is affected disproportionately is decided based on measures of epidemic intensity, namely prevalence and incidence rates of HIV infection. Attempts to highlight the importance of these subgroups are reflected in the current scientific literature via the use of emphasis terms such as: "key populations", "priority populations", and "vulnerable populations." [42]

As in most other nations, India's engagement of subpopulations with reduced access to HIV care is critical to strengthen the national response to HIV and AIDS. On the one hand, each of these subpopulations confronts unique circumstances that impair access to HIV care through complex cycles and mechanisms. The abundant diversity of social circumstances in India might seem discouraging, since it has the potential to complicate India's ability to mount yet another concerted, targeted effort to engage these diverse subgroups simultaneously.

On the other hand, despite the complexity, all of these subgroups share a common tendency to confront poverty[43], marginalization[44-48] or disenfranchisement as compared to more favored sectors of society, particularly male[49] and female[50] sex workers, men who have sex with men and transgender individuals.[51] Besides sexual minorities, other groups in India remain either disproportionately exposed to HIV risk factors or distinctively unlinked from available HIV prevention and treatment resources. These include women[52-54] and neonates [55] from rural areas, in/external[56] and seasonal[57] migrants and the partners they leave behind[58], long distance truck drivers,[59,60] and people who use injection drugs[61].

Preliminary data about HIV

A recent publication by colleagues in our group characterized the prevalence of HIV among 12,022 male sexual minorities in 12 Indian cities. The average HIV prevalence in all cities was 7.0%, with a range from 1.7% to 13.1% between.[62] Among this same sample, the incidence based on cross-sectional assays was 0.87% (Range: 0% - 2.2%). The wide range in the estimated prevalence and incidence of HIV, beyond its literal interpretation of differential burden based on geography, suggests that 1) male sexual minorities face differential risk of acquiring HIV and 2) the areas of high incidence in the setting of low prevalence could be geographical hotspots of emerging epidemics among male sexual minorities.[62]

In addition, large differences in HIV prevalence have been observed by multiple studies across India. It is difficult to attribute the variability of these estimates to geographical variations alone. As previously stated, a significant portion of the current

challenges in India is related to the social and economic drivers of the epidemic. India, along with China and Indonesia, accounted for 78% of new HIV infections in Asia and the Pacific in 2014.[63] Furthermore, as with many other public health problems, India will face some consequences of its own success: many people living with HIV are growing older[64] and the medical, psychosocial and logistical aspects of their care will require attention and the same level of soundness in policy as the original achievements.[32] The sustainability of success will be key to India's HIV story.

Among the social causes of health, gender differences are some of the most important determinants of the HIV epidemic worldwide, and India is no exception. Among 2 million people living with HIV, approximately 61% are male. As stated before, the evidence to date suggests that the Indian HIV epidemic has declined since 2000. However, such estimates may largely reflect trajectories among the dominant heterosexual population. In contrast, the HIV epidemic among vulnerable Indian populations, including male sexual and gender minorities, remains uncontrolled.[65]

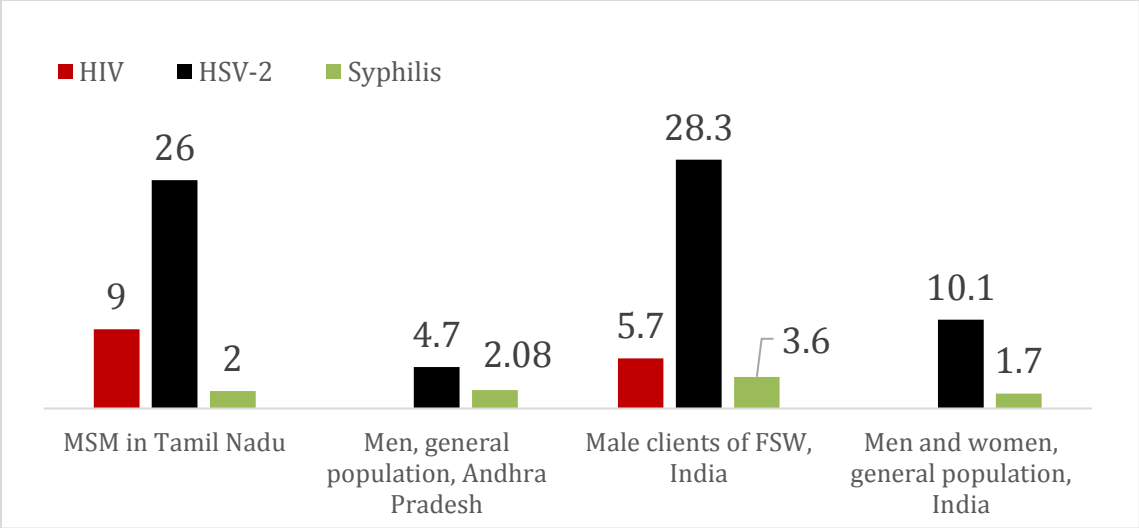


Figure 1 The prevalence of HIV, HSV-2 and syphilis among men using data from this dissertation (right) and from other published studies (left) varies by geography or subgroup. [63,66-68]

The prevalence of STIs in India including HIV (as well as the prevalence of HSV-2 and syphilis which are other outcomes of interest) varies by subgroup and geographical region in India. Some factors influencing these differences include discrimination based on differences in sexual practices, risk behaviors, sexual orientation, income instability, police harassment based on sexual practices, lack of healthcare access, occupational risks, sexual roles, inability to negotiate safe sex, and the flagrant stigmatization of sexual behavior. The list appears endless. However, for historical reasons discussed in future sections, much of today's important literature discussing the HIV epidemic in male sexual minorities is focused on the **behavioral act** of intercourse between two male partners. There are vast amounts of evidence to suggest that men of different sexual identities worldwide are not "exposed" to the same social determinants of health. In other words, no one would argue that gay men in the US are affected by the same social

determinants of health as their heterosexual counterparts. This is undoubtedly the case for India as well, despite the differences in the Western vs. the Indian gender systems (to be expanded upon below). One hypothesis that follows logically is that differences in exposure to the social causes of HIV could be crucial to explain the large amount of heterogeneity that we have seen throughout India in the geographic domain.

Herpes Simplex Virus type 2 (HSV-2)

Like the geographical differences in HIV prevalence, the prevalence of HSV-2 infection varies widely in India. In 2002, one study suggested an increasing prevalence of viral STIs relative to bacterial STIs, reporting an increase in the prevalence of HSV-2 from 11.4% in 1971 to 20.5% in 2002.[69] Another study suggests that HSV-2 infection in Andhra Pradesh was approximately 4.70% in 2010.[68] Later research showed that among STD clinic attendees, this prevalence could be as high as 85.2%.[70] Despite the variability in these estimates throughout time and between different sectors of the general community, HSV-2 infection has been highly prevalent in India as shown by data from the past four decades. Consequently, HSV-2 infection *alone* represents a significant burden in the sexual health among all Indian people.

Aside from the well-known risk factors associated with individual transmission of HSV-2 (i.e., unprotected sex, multiple sexual partners, etc.) research shows that multilevel systems of social factors in India modify the independent spread of HSV-2.[71] These factors include well know social stratifiers such as socioeconomic status, different age groups, gender, ethnicity, urbanization and geography. In fact, even conservative

estimates suggest that community level factors could account for a significant percentage of the observed epidemic variance.[72]

In the past decade, researchers also began to hypothesize a new role for HSV-2 in the widespread HIV epidemic. A 2003 study in Pune, India found that the hazard rate for HIV-1 acquisition after *recent* HSV-2 infections could be as high as 4 times the hazard rate for HIV-infection after *remote* HSV-2 infections.[73] Such high and widely ranging prevalence estimates, and the possible biological interaction of HSV-2 to facilitate HIV infection has prompted some researchers to call for a national household of Dried Blood Spot-based STI surveillance system in India, such that it would enable monitoring, especially in relation to the HIV epidemic.[63] While further research is needed to elucidate the biological interactions between HSV-2 and other STIs, the burden of disease by HSV-2 and concurrent infections with multiple STI culprits have been reported for HSV-2 as for most, if not all, bacterial, parasitic and viral STIs.

Syphilis

The trends for syphilis have changed in India due to improved laboratory diagnostic and treatment methods. A recent study noted an overall decline in the prevalence of syphilis in the last 5 years but a concurrent increase in latent syphilis during the same period[74]. Other studies also demonstrate a drop in prevalence in the period of 2004 to 2008 from 10.8% to 3.6%, respectively[75]. Like the case of HSV-2 infection, high rates of co-infection have been found, with one study citing a rate of syphilis/HIV co-infection of 22.7% compared to an HSV-2/HIV co-infection rate of 11.8%[68].

CHAPTER 2:

Gender and sexuality in scientific research

The biology of gender

In 2012, Dr. Anne Fausto-Sterling, published a book called "*Sex/Gender: Biology in a Social World*".[2] Fausto-Sterling's book is part of a series of discussions showing that biology and the social sciences have reached robust consensus on arguments about which both sides have historically disagreed. Her book begins with the story of Johns Hopkins psychologist, John Money, who pioneered the study of sexually ambiguous patients in the 1950's. In a series of manuscripts,[76-81] Money published numerous inconsistencies between the biological variables of sex assigned to children at birth and the role those children had depending on how they were raised. For instance, Money observed children and adults who had unusual combinations of sex markers[77], including children who had testes and a vagina, individuals with two X chromosomes and a scrotum, and women who had male chromosomes and no ovaries.

As Fausto-Sterling explains, throughout his career, Money advanced the argument that a strictly binary system of sex was inconsistent with the observed scientific evidence on gender and sexuality (**Figure 3**). While the observed biopsychosocial phenotype (a girl or a woman) often resulted from the expected biological genotype (XX), in some

cases, a genotype thought to be incompatible (XY) with a female phenotype resulted in a woman or a girl (as opposed to a boy or a man).

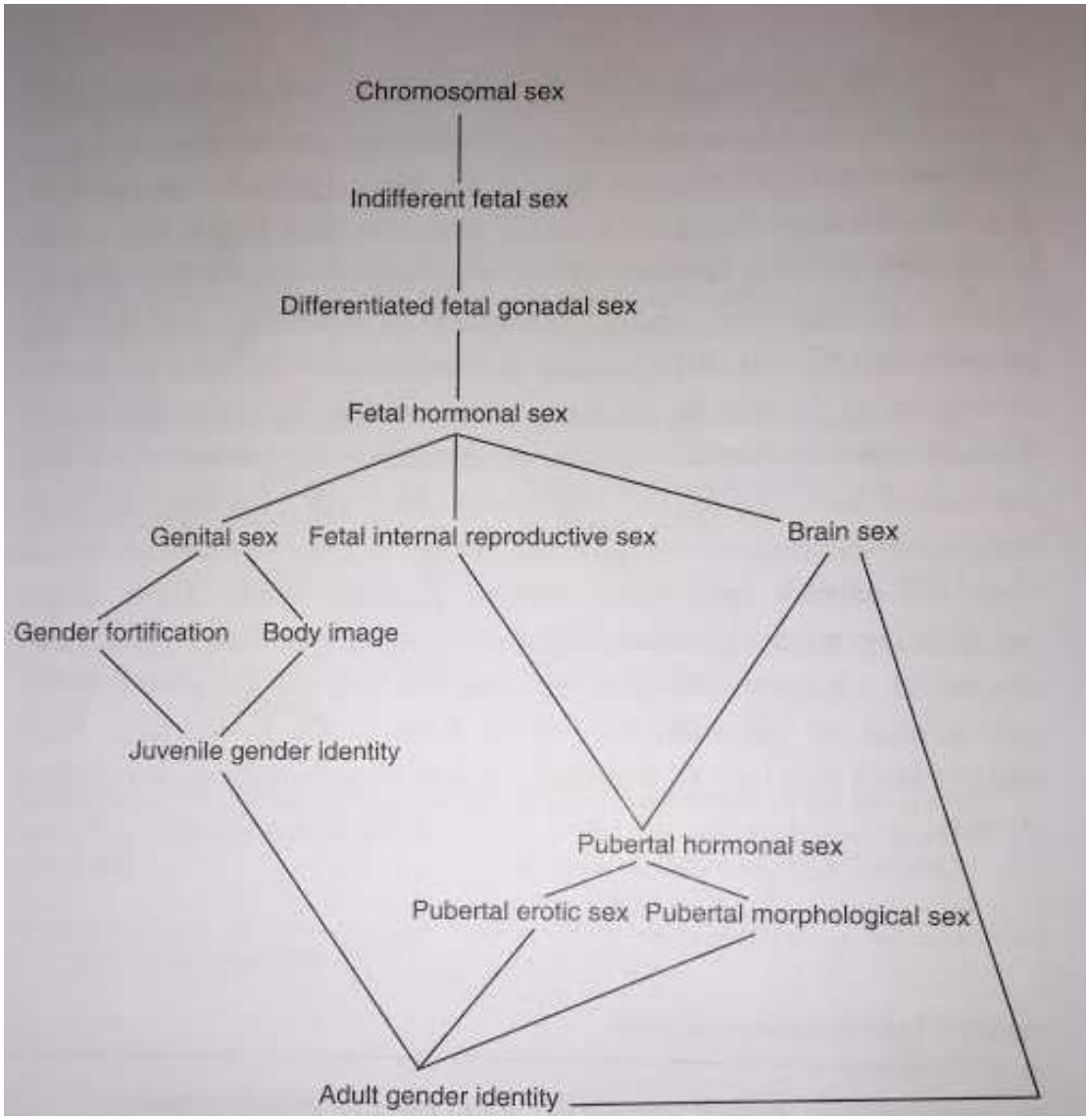
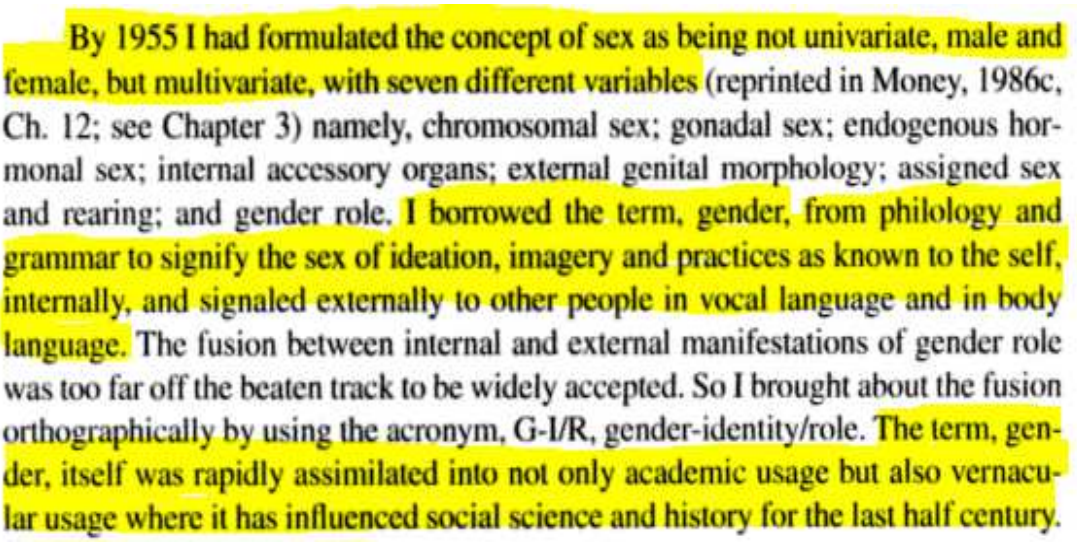


Figure 2 John Money's Layers of Sex Framework [2]

That key determinants of sexual development (i.e., chromosomes, external genitalia) were imperfect predictors of key developmental steps led Money to conclude that individuals are "*sex layered.*" These "*sex layers,*" he hypothesized, ensued based on imperfect processes. Layer after layer, probabilistic – not deterministic – causal processes generates diversity in the population as each person develop a multihued ***biopsychosocial identity***. Money call the inheritance of the XX vs. the XY genotype, the *chromosomal sex-layer* 1 in the multilayer process depicted in **Figure 3**. After layer 1 is formed, genetic and environmental influences, beyond the cellular level cause the imperfect presence of layer 2, increasing variability in the population. This is the variability that interferes with models relying on the strict dichotomization (or categorization) of traits. Money's *sex layer* 3 is the *gonadal sex layer*, which instead of referring to the combinations of XY, XX (and everything in between), refers to testicles vs. ovaries (and everything in between).



By 1955 I had formulated the concept of sex as being not univariate, male and female, but multivariate, with seven different variables (reprinted in Money, 1986c, Ch. 12; see Chapter 3) namely, chromosomal sex; gonadal sex; endogenous hormonal sex; internal accessory organs; external genital morphology; assigned sex and rearing; and gender role. I borrowed the term, gender, from philology and grammar to signify the sex of ideation, imagery and practices as known to the self, internally, and signaled externally to other people in vocal language and in body language. The fusion between internal and external manifestations of gender role was too far off the beaten track to be widely accepted. So I brought about the fusion orthographically by using the acronym, G-I/R, gender-identity/role. The term, gender, itself was rapidly assimilated into not only academic usage but also vernacular usage where it has influenced social science and history for the last half century.

Figure 3 John Money on the origins of today scientific discourse about sex and the most recent term, "gender" [1]

Beyond the implications for the biological causality of sex, Money's scientific observations argued against reductionist models of dichotomous sex. The possibility of diversity even in processes previously thought to be purely deterministic laid the foundation for discussions about ***gender identity***: the notion that people may look, feel, act, or behave differently than predicted based on their sex markers. **Figure 3** shows a manuscript by John Money discussing how the terms gender, gender identity and gender role became part of today's scientific and lay jargon[1]. As we argue in subsequent sections, academic language on issues of gender identity has enabled superior public health research with a focus beyond the absence of disease. It is now clear that human right abuses, homophobia, intolerance, and discrimination affect millions of men and women based solely on naturally occurring expressions of their sexuality.

Conceptualizations of sexuality in public health

In public health research, the conceptualization of ***sexuality*** and the operationalization in research of important components such as ***sexual orientation*** and ***sexual identity*** have historical underpinnings in the epidemiological study of HIV. Since gendered minorities have been at the epicenter of sexual health agendas, the mobilization of gender minorities in public health and policy has resulted in steadfast forms of activism that persistently demand answers to fundamental questions of equal citizenship and human rights for all expressions of gender globally.[82] We provide working definitions of the concepts that will emerge throughout this dissertation. These definitions were derived from recent scholarly agreements published in the field of sexuality and sexual health and include descriptions from the fields of sociology, psychology,

anthropology, and epidemiology, as well as from organizations involved in the promotion of sexual health in India and worldwide.

Definitions of sexuality by the World Health Organization (WHO)

Sexual Health

According to the WHO, "sexual health cannot be defined, understood or made operational without a broad consideration of sexuality, which underlies important behaviors and outcomes related to sexual health." [83] The Organization defines sexual health as:

> *"a state of physical, emotional, mental and social well-being in relation to sexuality; it is not merely the absence of disease, dysfunction or infirmity... (with) the possibility of having pleasurable and safe sexual experiences, free of coercion, discrimination and violence. For sexual health to be attained and maintained, the sexual rights of all persons must be respected, protected and fulfilled."*

The WHO definition will be instrumental to our analytical approach in subsequent chapters because of several important enhancements in the paradigmatic role of sex in public health research. First, defining sexual health *beyond* the absence of disease allow researchers and policy makers to differentiate whether subgroups in a given society might be emotionally, mentally, or socially oppressed, even if there is no sexual disease, challenging the double standard between the physical and the mental or between the biological and the social. Second, sexual health is described as *a state of well-being,* in which sex not only has a positive undertone, but where pleasure and fulfillment are promoted as behavior is contextualized. Third, the list of unacceptable outcomes is

expanded to declare coercion, violence and discrimination as detrimental to health as infections or mortality. Lastly, and probably most importantly, the definition declares sexual wellbeing as a right for all persons and not as a privilege for some.

Sexuality

Likewise, the WHO expands the conceptualization of sexuality *beyond* sexual orientation and sexual role. The Organization defines sexuality as

> *"a central aspect of being human throughout life that encompasses sex, gender identities and roles, sexual orientation, eroticism, pleasure, intimacy and reproduction. Sexuality is experienced and expressed in thoughts, fantasies, desires, beliefs, attitudes, values, behaviors, practices, roles and relationships. While sexuality can include all of these dimensions, not all of them are always experienced or expressed. Sexuality is influenced by the interaction of biological, psychological, social, economic, political, cultural, legal, historical, religious and spiritual factors."*

Sex

When the term "sex" is used in this dissertation, it refers mainly to the biological sexual elements of an organism, like genitals, hormones, and sex chromosomes. The colloquial use of the term "sex" also describes sexual intercourse or sexual practices. The WHO working definition is similar but introduces people who possess both female and male biological traits: "Sex refers to the biological characteristics that define humans as female or male. While these sets of biological characteristics are not mutually exclusive, as there are individuals who possess both, they tend to differentiate humans as males and females."

Gender

Gender refers to what societies make with the fact that humans are sexed.[2] That is, whether an individual has male, female, or ambiguous sexual components affects the roles, behaviors, and practices that society might consider appropriate. People with chromosomal alterations who have both male and female sexual structures might be placed into a given gender category based largely on their exterior physical appearance, their tone of voice, their mannerism or the presence (or absence) of secondary sexual traits.

Heteronormativity

Agreement on the number of gender categories is inconsistent across cultures and societies. In cultures where sexuality is thought to be fundamentally orientated to toward reproduction, a person's genitals might be correlated with their sexual preference and male babies will grow into men who desire women, while female babies will grow into women who desire men. This is called ***heteronormativity***.

Gendered homosexuality

A sex/gender ideology that is prevalent in many regions of the world (including India) in which males who take the receptive role in same-sex sexual relations are also expected to, and do, adopt feminine behaviors[84]. For example, gay men across a variety of countries label themselves by their preference for insertive anal intercourse (a "*top*") or receptive anal intercourse (a "*bottom*"). A "*versatile*" is defined as someone who has no preferences in anal sex or who participates in both insertive and receptive intercourse. Studies have shown that beyond role, *tops* show a masculine profile (resembling the

social role played by males in heterosexual relationships) while *bottoms* have a feminine profile in gendered personality traits.[85]

When other important social phenomena interact with expectations around masculinity, roles are even more categorical. Among Latinos, for example, homosexual encounters are conducted along highly gendered lines where men tend to be anally insertive or receptive for the lifecourse, but not both. This is thought to be the result of ***machismo*** or the quasi-institutionalization of homosexuality in Latin America compared to the United States.[86]

Gender, Human Right, and Sexual Rights

There is growing consensus that sexual health is intrinsically linked to specific human rights recognized in international and regional human rights documents. The WHO defines sexual rights as "*the application of existing human rights to sexuality and health*." Rights critical to the realization of sexual health include:

1. the right to equality and non-discrimination
2. the right to be free from torture or to cruel, inhumane or degrading treatment or punishment
3. the right to privacy
4. the right to the highest attainable standard of health (including sexual health) and social security
5. the right to marry and to found a family and enter into marriage with the free and full consent of the intending spouses, and to equality in and at the dissolution of marriage

6. the right to decide the number and spacing of one's children
7. the right to information, as well as education
8. the right to freedom of opinion and expression, and
9. the right to an effective remedy for violations of fundamental rights.

The individual expression vs. the social repression of sexuality

The volume of work on sexuality in all branches of scientific inquiry has increased exponentially in recent years,[87] and therefore a comprehensive review of sexuality is beyond the scope of this dissertation. Instead, we focus on specific problems that affect sexuality physically and psychologically, with a special focus on the interactions between individuals and society. We look at problems that affect sexual health and epidemiology. While the data used for analysis in subsequent chapters are from India, in this chapter, we use examples from different nations to emphasize the generalizability of these concepts. Most examples discuss sex between men as a key aspect of sexuality with two important caveats, namely that 1) sex is neither sufficient nor necessary for sexuality to affect sexual health and 2) women and people who do not consider themselves to be men are crucial actors in shaping their own sexuality and the sexuality of others in society (see the WHO definition of sexuality).

At the individual level, sexuality manifests itself through feelings, emotions, and thoughts (of which the individual may or may not be aware) which subsequently affect attitudes and behaviors. While feelings and emotions might be considered internal

experiences, attitudes and behaviors can be expressed, externalized and become "normalized" when the behavior is acceptable based on social consensus.

Beyond the individual, the expression of sexuality is affected by cultural norms, laws, religion and other ***tools of public consensus***. Through these tools of public consensus, societies decide what, when and why behavior is considered "normal". For example, the influence of Christianity among Khasi youth in Northern India has been associated with feelings of sin and guilt about masturbation, homosexuality, pre-marital sex, and abortion in the context of unrealistic sex education content that distorts what constitutes "normal sex".[88] At even more aggregate levels, sexuality affects deeply held values and beliefs, such as the religious practices of modern nations. Within a country, differences in opinions may lead to conflict between political subgroups. In one study, societal attitudes on sexuality affected social provisions such as the availability of sheltered housing for older gay, lesbian and bisexual persons in the UK.[89] Furthermore, particular occupations are dominated by male heterosexuals (e.g., military[90] and police[91] for example) while some occupations female-dominated regardless of gender identity (e.g., nursing). National heteronormative policies have historically created disparities that disproportionately affect non-normative subgroups through discrimination and unequal rights, eventually resulting in the marginalization of less accepted sexual expressions. Rigorous work continues to be needed to determine the complex relationships linking sexuality to politics, economics, culture and most other facets of societies worldwide. Gaps remain in the conceptualization of complex concepts around sexuality, particularly constructs that have implications in all aspects of daily life for persons with non-normative gender expressions.

Tools of public consensus:

Religion, law, and institutional policing of sexuality

Nations around the world have enacted and enforced laws that forbid various sexual behaviors and identities. While criminalization alone can promote stigma, enforcement has resulted in a range of consequences from small fines to death sentences. In general, regulation of sexuality is often much less conspicuous, though no less damaging to the social climate and to the individual. Besides laws and institutionalized forces, a society's norms on gender will protect certain behaviors in one gender and repress the behaviors of non-normative, less traditional sexual minorities. Therefore, norms, laws and institutional decisions can '*orientate'* sexual desire and preference toward the opposite sex, concomitantly marginalizing same-sex behavior.

Figure 4 New York Times articles covering the contradictory decisions on homosexuality in India

India's Section 377 of the Penal Code

For more than one and a half centuries, section 377 of the Indian Penal Code has criminalized homosexuality as an "unnatural offense" punishable on the basis of "carnal intercourse against the order of nature".[92] In 2009, in what was considered to be a landmark decision on equality, India overturned the outdated colonial law due to its impact on the underprivileged homosexual community.[93] Nevertheless, in 2013, Section 377 was reinstated, demonstrating the prevailing constructions of patriarchal gender relations and heteronormativity in India.[94] Despite these contradictory decisions by the courts in India, gender minorities continued to advocate against the retrograde premise

that re-criminalized sexual activity between two consenting adults (**Error! Reference source not found.**).[94]

The consequences of criminalization for public health and epidemiology

Criminalization results in clandestine behavior and obstructs frank and open discussions between sexual partners, doctors and patients, and between researchers and the community. Criminalized behavior is reported, if at all, with extraordinary caution and fear since divulging "criminal" activities results in violence, stigma, punishment, incarceration, coercion, extortion, intimidation, and harassment with impunity. A state of fear creates a menacing medium for human rights abuses.

With regards to research, clinical practice, and policy, criminalization may result in inaccurate ("biased") reporting in all stages of the HIV care continuum including HIV testing, diagnosis and awareness of serostatus, linkage to and retention in care, adherence to anti-retroviral therapy, as well as viral suppression.[95] In HIV research, scholars in medicine[96], epidemiology[97] and social science[98] are concerned that criminalization 1) affects the accurate collection of sexual health related statistics, 2) ultimately impairs the planning of interventions and the prioritization of resources and 3) is not driven by medical concerns or public health considerations. Despite these concerns, 61 countries have adopted laws that allow for HIV criminalization and prosecution for HIV non-disclosure.[99]

Criminalization is even more alarming when multiple important aspects of life and health are concurrently outlawed. In India, suicide attempts are criminalized resulting in biased statistics and further trauma for the victim.[100] In various parts the world,

homosexuality, drug use, sex work and HIV transmission and/or exposure are criminalized.[101] There is insufficient research on the intersection of criminalization and other punitive structural mandates on the individual, their partners, their families, their wellbeing, their health and their societies. Furthermore, the state of knowledge about the intersection between criminalized and legal-but-stigmatized aspects of sexuality is even less well understood.

Research as an authoritative tool of social consensus:

Like law and religion, medical and public health research are also tools of public consensus that have the ability to "normalize" or "pathologize" internal and external manifestations of sexuality with unprecedented authority. As a result of this authority, the extensive contributions of research to improve health worldwide stand against unfortunate examples where research hypotheses have resulted in further marginalization of vulnerable groups. Thus, when used incorrectly, research can serve as an effective tool for discrimination and stigmatization of sexual behavior. A well-known example in medicine is the official pathologization of homosexuality in the Diagnostic and Statistical Manual of Mental Disorders (DSM) of the American Psychiatric Association until 1973. Despite homosexuality being removed from the DSM, significant stigma and discrimination persist.[102] In 2016 India, almost half a century after the official depathologization of homosexuality from DSM, homosexual orientation continues to be conceptualized as a socially deviant mental disease that needs psychiatric intervention.[103]

Despite significant progress in theory about sexuality and the social structures that affect gender, key challenges hinder the adoption of these concepts in clinical and

epidemiological research. Some challenges are practical in nature. The vast range in which sexuality manifests, the myriad essential roles it plays in every person and in every society, and the innumerable expressions of sexual practices and beliefs across the world, are phenomena that logistically obstruct the operationalization of sexuality in public health research. This results in research where sexuality is often abridged to a manageable but incomplete set of important factors. For example, while this is not an exhaustive list, factors that have historically received special attention in male sexuality are types of sexual intercourse (anal vs. vaginal, receptive vs. insertive), condom use (consistent vs. inconsistent), sexual orientation (homosexual, heterosexual, bisexual), and the type and the number of sexual partnerships (casual vs. main vs. clients, few vs. many). On special occasions, studies delve into discussions of masculinity and femininity, mostly restricted to Western concepts of 'maleness' or 'femaleness.'

Moving beyond sexual orientation in epidemiological research

Gender is an overarching, multifaceted construct, located at the intersection of many dimensions of sexuality. In this work, based on abundant biological and sociological evidence, we assume that the man-woman dichotomy is insufficient to explain tendencies of critical trends in sexual health, between and within the biological sexes. In this section, we focus our attention on male sexuality. We give examples of current nomenclature in research and problematize the current operationalization of male sexuality in epidemiology. We also give examples of more complex ways to look at sexuality in men and show how gender theory can be incorporated into epidemiological

research to study and promote sexual health beyond the absence of sexual diseases, as recommended by the WHO and other international authorities on human rights.

It is important to emphasize the gaps between Western and non-Western understandings of gender. According to Shelly Errington, sexual differences between humans cannot be described outside the terms used within a given society. What different cultures make of these differences is what she refers to as '***gender***' or a culture's '***gender system***.' A cross-cultural perspective, therefore, makes it clear that societies organize their thinking about sex, gender, and sexuality differently.[84]

Serena Nanda, in her book ***Gender Diversity: Cross-cultural Variations,*** presents numerous inferences from ethnographic research in cross-cultural anthropology.[84] One example of differences in Western vs. non-Western understandings of sexuality comes from Brazil. In the United States, the current use of the terms heterosexual, homosexual and bisexual reflect a focus on the directionality of sexual preference, whether it is toward the same sex, the opposite sex, or both. In other cultures, sexual orientation is of less importance compared to other aspects of sexuality. In Brazil, for example, gender types are divided into those who penetrate (*ativade)* and those who are penetrated (*passividade*).[84] The focus is therefore less on the sexual traits (i.e., genitals and appearance) and more on the sexual behavior of penetration. As a result, sexual reconstruction is less popular among *travesties* in Brazil, who tend to believe that such surgical procedures 'do not produce women but castrated men.'[84] The difference lies in whether men exploring different sexual expressions "*feel like women"* but *"do not*

believe they are women". A sexual partner in this context, does not compromise his masculinity so long as he performs the penetrating role.

For Nanda these gender systems are dynamic. For example, sexual orientation, a previously important part of personal and social identity in contemporary Euro-American cultures, is no longer as associated with diverse gender roles as it was in the eighteenth, nineteenth, and early-twentieth centuries. In contrast, in Polynesia and among Native Americans, sexuality is less important than occupation in defining sex/gender diversity. In many parts of India, in medieval Europe, and the Balkans, it is the renunciation of sexuality that is culturally central in defining male and female gender variant roles. In Indonesia sex/gender diversity includes several alternative sex/gender roles, each of which occupies a different social status. Evidently, the nuances in these nations far outweigh generalizations but what is critical to epidemiology, and particular to social epidemiology, is that the conceptualization of gender is essential to understand why certain behavioral expectations, and therefore, why epidemiological interventions will be incongruent if they are solely based on Western models.

Another important aspect of sexuality, one that is also meaningful to public health, is globalization of the genders. As Nanda writes:

"In all the cultures described in this book, Euro-American sex/gender identities, such as "gay" and "lesbian," have become incorporated into traditional sex/gender ideologies, though often in ways that change their original meanings."

We can see the influences of globalization directly on the data used for this dissertation. Among all 12,019 respondents, 79.62% of participants self-selected non-Western Identities (e.g. *Panthi, Kothi, Double-Decker, Satla Kothi, Gupta Kothi,* and *Aqua Kothi*). However, among the 2,448 remaining participants with traditional Western identities: 8.01% self-identified as *gay* and 62% as *bisexual*. Interestingly, 29.74% of participants in this study identified as "*MSM*", a popular research acronym for the term "*men who have sex with men*" or "*males who have sex with males*". When colloquial or research terms globalize, they result in the Westernization of culture, in India and elsewhere.

In **Table 2** we have compiled several examples of gendered subgroups in North and South America, Europe, Asia, and several Pacific Islands from books and articles by Nanda.[84,104,105] While differences between regions are evident, what we hope to illustrate is the convergence of several ideas.

Table 2 Examples of terminology describing sexual roles and identities worldwide

WORLD REGION	TERM [84,104,105]	BRIEF DESCRIPTION [84,104,105]	SOME IMPLICIT ASPECTS
North America and Europe	*Nádleehs*	"Navaho male gender variant, adopts almost all aspects of a woman's dress, work, and behavior."	Expression and work
	Alyhas	"Mohave male gender variant, the extreme end of the cross-gender continuum in imitating female physiology as well as transvestism."	Physiology Femaleness Imitation
	Transsexual	"A person convinced he/she belongs to the gender opposite to that of his/her anatomy (a transsexual who undergoes sex-reassignment surgery)."	Anatomy Belonging Surgery
	Transgenderists (trans people).	"An inclusive sex/gender category in Euro-American societies that includes transsexuals and others who keep both their feminine and masculine characteristics."	Masculinity Femininity Inclusion Labels
	Transvestite	"One who cross-dresses (either sporadically or permanently, and for different psychological or cultural reasons)"	Psychology Culture Phase
Asia and Pacific Islands	*Hijras*	"Hijras are constructed as a third gender, neither man nor woman, and both man and woman, within a basically binary, hierarchical, and patriarchal sex/gender system." India, Pakistan, Bangladesh.	Religion Tradition Region Hierarchy
	Sādhins	"Sādhins renounce marriage and thus, sexuality—they are committed to lifelong celibacy. They otherwise live in the ordinary world. Sādhins wear the everyday clothing of men, not women, and wear their hair close cropped" Bangladesh.	Virginity Celibacy Marriage Wardrobe Commitment
	Bakla/bantut/bayot	"A transgendered male role in the Philippines; the term varies by region."	Region Language
	Bissu	"An androgynous shaman in Indonesia"	Religion
	Kathoey	"A Thai gender variant, originally meaning hermaphrodite, but now mainly referring to transgendered males." Thailand.	Transition in meanings through time
	Tomboi	"The female bodied, masculine performing partner in a lesbian relationship in Thailand and Indonesia".	Relationships Partners
	Lesbi	"The Indonesian rendering of lesbian; biological females who identify as men or masculine females"	Biology and masculinity
	Māhū	"A primarily male gender variant. Tahiti and Hawaii"	Identity
South America	*Ativo*	"Men who penetrate in Brazil"	Intercourse
	Passivo	"Men who are penetrated and takes the subordinate role in sexual relations in Brazil"	Power differences

First, while the genderization of a given subgroup is specific to a given society, most gender types, regardless of society, seem to be the product of the interactions between multiple static and dynamic factors. These variables inhabit social, biological, psychological, genetic, historical, religious, mythological, political, legal, anatomical and physiological aspects of everyday life. Differences in how these factors interact affect how societies understand gender. Consider a society in which religion, medicine and law construe gender as a binary system of two 'holy', 'normal', or 'legal' genders. In this society, authorities such as priests, doctors, and police officers might consider deviations from the binary to be 'blasphemous', 'abnormal', or 'illegal'. Under this scenario, otherwise valid lived experiences that deviate from the binary norm create a sense of social incongruence. That society might attempt to justify, resolve, or reject the incongruence by instituting commandments, guidelines or laws that disown, cure, or incarcerate those who do not obey the binary mandates. These factors, their interactions, and the norms and laws they form a system of genderization. Often, such systems favor normative citizens while oppressing the defiant and the non-conforming. Importantly, this is where oppression becomes spiritually justified, clinically indicated, or legally enforced.

Second, while many of the factors that make up a system of genderization of any given subgroup are easily measurable variables (i.e. sexual organs, religious opinion, and bathroom laws), *many crucial factors are latent, complex constructs* (such as masculinity, femininity, and gender identity) that depend on the subjectivity of the individual, their families and the collective thought of the group undergoing genderization. In addition, the genderization of one group affects the genderization of other groups due to their direct relational proximity. For example, females in the United States are not gendered to

serve in specific occupations (nursing) unless American males are gendered toward serving in complementary occupations simultaneously (surgeons). These disparities have been decreasing in the United States. What is changing in this particular system of genderization in the United States? Was it anti-discrimination laws? Was it the American understanding of masculinity or femininity? The answer is probably all of the above.

Third, the interactions of factors in a system of genderization occur throughout an individual's lifetime, from birth to death, and often before and after. To emphasize this *developmental dimension*, we use an example that occurs throughout the world: the indoctrination that certain colors are for certain genders (i.e. blue for boys and pink for girls). In ***Figure 6*** artist JeongMee Yoon attempts to show the gender socialization of consumerism, capitalism and globalization.[106]

Figure 5 Worldwide genderization of the colors blue (for boys) and pink (for girls). Beyond color, toys are related to the division of consumerism indoctrinated early in the lives of children across many cultures.

Color preference is not a coincidence, and while some have suggested genetically codified differences[107], this is considered to be one of the most prevalent socialization (genderization) systems of modern humanity.[108] But beyond color, scholars have consistently observed that the genderization other essential aspects of modern life[2] including:

- ***Gender status:*** the socially recognized genders are expected to have a narrow range of behavior, gestures, emotions, physical appearance.
- ***Gender imagery*****:** the cultural representations of recognized genders through symbolic language and art.
- ***Gender division of labor***: availability and acceptance of occupations are based on gender
- ***Gender kinship***: family rights, privileges, and responsibilities by gender
- ***Gender sexual scripts:*** normative patters of desire and behavior
- ***Gender social control***: approval of normative behavior and simultaneous criminalization, stigmatization and medicalization of non-conforming genders
- ***Gender ideology*****:** the justification of gender status based on arguments: be they biological, social, religious

Thus, while the genderization of color is *not* a threat to equality in and of itself, the concept it represents *is*. Genderization systems limit the health, jobs, education, and rights of millions daily. Narrowing the gaps *between* males vs. females or *between* homosexual vs. heterosexual persons is increasingly the focus of activists globally. However, we argue that the same systems of genderization also affect people *within* the

same biological sex and people *within* the same sexual orientation. Research on the heterogeneity of gendered health privileges is lacking. The study of the genderization of health, social resources, and other important aspects of sexual health *within males of the same sexual orientation* is the topic of this dissertation.

Intersectionality theory:

Scholars have noted that essential components of the major socialization systems (e.g. the systems of genderization or racialization) tend to affect multiple disenfranchised populations in a synergistic manner. To name the similarity between the oppression of women and homosexuals, Rubin notes:

> *"The suppression of the homosexual component of human sexuality, and by corollary, the oppression of homosexuals, is… a product of the same system whose rules and relations oppresses women"* [109]

We use the definition of intersectionality by Olena Hakivsky[110]:

> *"Intersectionality promotes an understanding of human beings as shaped by the interaction of different social locations (e.g., 'race'/ethnicity, Indigeneity, gender, class, sexuality, geography, age, disability/ability, migration status, religion). These interactions occur within a context of connected systems and structures of power (e.g., laws, policies, state governments and other political and economic unions, religious institutions, media). Through such processes, interdependent forms of privilege and oppression shaped by colonialism, imperialism, racism, homophobia, ableism and patriarchy are created."*

Intersectionality theory refers to the study of ***interlocking systems of oppression*** and emphasizes the structural organizations that oppress marginalized groups.[111] Each system of oppression is maintained by the formation of power differentials. Furthermore,

synergistic systems of oppression can form due the interaction of ***major social stratifiers*** (e.g. race, ethnicity, indigeneity, gender, class, sexuality, geography, age, disability, ability, migration status, religion).[112] Therefore, the concept of intersectionality illustrates the lifetime accumulation of privileges and disadvantages and the junction of social stratifiers.

Beyond theory and methodology, intersectionality is rooted in Black Feminist and Critical Race Theory and has become a social movement for advocacy. Therefore, intersectionality will help us achieve several objectives in this dissertation. First, it will provide a framework for explaining the biopsychosocial heterogeneity present among men of different gender/sexual identities in India. Second, intersectionality as a tool for advocacy can be used to increase solidarity between the genders by highlighting the role of structural systems of oppression and thereby dispel the myth that individual risky behavior is simply the product of our own volition.

To illustrate one approach to conceptualizing intersectionality, we examine a paper by Abichahine and Veenstra that shows "***the intersectional concept of multiplicativity***" in a large group of men in Canada.[113] The study outcome (leisure-based physical activity) was different than the outcomes of interest in this dissertation (STIs and sexual health rights), but the researchers use an ***inter-categorical intersectionality approach*** that can be used for many different outcomes, and which will be used in later chapters. The authors claim that "people's experienced of gender are raced, classed and sexualized; their racial experiences are gendered, classed and sexualized, and so forth."

What Abichahine and Veenstra imply is that the major social stratifiers (gender, race, class) tend to interact with each other, and therefore cannot simply be "controlled

for" using multivariable statistical analysis. Unfortunately, this is precisely what most studies do. For example, most research examines the effects of gender on inequality "while controlling for other factors, such as race, income, and education." In other words, most studies are consistent with ***monoistic theories of social inequality***. In contrast, intersectionality is a departure from previous health research that looked at social stratification in isolation from one another (i.e. in an additive manner).

Key populations

The concept of intersectionality can be applied to currently popular descriptions of "vulnerable" or "key" populations in research.

A definition of what represents a key population is given by the United Nations. Based on UNAIDS, key populations are "*groups who, due to specific higher-risk behaviors, are at increased risk of HIV irrespective of the epidemic type or local context. Also, they often have legal and social issues related to their behaviors that increase their* ***vulnerability*** (emphasis mine) *to HIV*."

Globally, some "*key populations*" that are often under epidemiological surveillance in today's HIV research agenda are:

- Men who have sex with men
- People who inject drugs
- People in prisons and other closed settings
- Sex workers and
- Transgender people

Based on these definitions, a person can be part of different key populations and this affiliation is "important to the dynamics of HIV transmission." UNAIDS concludes

that individuals who belong to these groups are "essential partners in an effective response to the (HIV) epidemic."

Sexuality among gender minority males in India

Table 3 presents descriptions by different scholars about three gender subgroups that are commonly presented in HIV/STI research: *Kothis, Panthis* and *Double-Deckers*.

Table 3 Examples of local terminology referring to non-transgender, male sexual minorities in India

Term	Definition
Kothi	Men characterized by passive roles in anal sex with other men and by a sense of self that is premised on a female sensibility that in some instances might involve wearing female clothing and make-up. Men identifying as *Kothi* are often socially and culturally associated with *hijras* (a "third gender" category found in much of South Asia).[114] *Kothis* may have an effeminate presence with mannerisms and self-expression that are socially recognized as 'feminine'
Panthi	A term used by *Kothi*-identified men as a designation for other men, mainly (prospective) sexual partners. Unlike *Kothis, Panthis* may or may not constitute a self-identifying category and therefore, they are not commonly discretely targeted by HIV prevention activities. In general, *Panthis* are described in research in the context of *Kothis*, to emphasize the sexual-risk dynamics portraying *Panthis* as the insertive partner and *Kothis* as receptive partners in male-to-male anal sex.[114] *Panthis* may show a 'masculine' presence and may have 'dominant' roles with other male partners.
Double Decker	Another term given by *Kothis* to their sexual partners.[115] *Double-Deckers* may form social, sexual and other intimate relationships situationally with other men. For example, in sex with men who prefer to practice receptive sex, *Double-Deckers* may act as a penetrative partner. In situations where a sexual partner practices insertive sex, *Double-Deckers* may be the receptive partners.

From **Table 3** Examples of local terminology referring to non-transgender, male sexual minorities in India, we observe that these identities or subgroups are constructed based on numerous and important quantitative and qualitative aspects of sexuality, not restricted to sex between men but also present in heterosexual partnerships. The qualitative aspects include the presumed occurrence of rather concrete "states" of sexual roles in the context

of anal sex (i.e., mostly passive *Kothis*, mostly active *Panthis*, or situational *Double-Deckers*). We observe the importance of sexual orientation whereby some men (*Kothis*) may presumably desire sexual intimacy mostly with other men while other subgroups (*Panthis*) may desire intimacy with women as well as with men. Other qualitative aspects that can be inferred or postulated are differences in assumptions of masculinity and femininity, power, sexual arousal, eroticism, attraction, intimacy, trust, love, nurturance, social acceptance and respect.

More objective but equally complex phenomenology is also implicit in the descriptions presented in **Table 3**. These components of male-to-male sexuality include differences in sexual roles (i.e. penetration during anal sex), differences in dyadic and societal consensus about the maleness and femaleness of people in general, their body language (i.e., mannerisms, gestures) and even material possessions with social meanings (i.e., clothing or make-up) which in turn determine whether a man wearing female clothes is non-normative.[116] What we mean by "quantitative" aspects of sexuality are attributes that can presumably increase in degree, frequency or intensity, such as the number of sexual partners that a particular individual has or the transiency (or by contrast, the permanency) of intimate relationship with men and women.

What the definitions in **Table 3** lack are conceptual aspects known to affect sexuality among heterosexuals and for which there would be no reasons to suspect that they are not crucial in male-to-male sexuality as well. Some of these aspects include life-course events such as experimentation of sexuality in childhood and adolescence, and the

experience of adversities that shape a man's freedom to explore his sexuality such as parental control and approval.

If these categories have been helpful in public health research, it is because they simplify remarkable levels of complexity in the manifestation of sexuality. Let us assume that intricate and subjective relationships exist connecting the factors that influence sexuality. If that is the case, the "independent risk factor approach" is inflexible. This is arguably the reason why typological approaches to find latent groupings of sexual identities have been limited in Public Health. In other words, many of the categorization schemes used in Public Health today have erratic coherence when used in a risk factor paradigm because, by definition, the factors that affect the construction of these categories are anything but independent.

On the contrary, non-independent factors as well as the relationships that link them to each other, are highly contextual and circumstantial. In fact, one criticism of problematizing the mainstream independent risk factor models in research is that complex constructs might result in seemingly fleeting effects. This does not mean that a cumulative dose of each factor does not operate independently. Rather, we propose that even the most comprehensive categorizations can result in groups with fluctuating epidemiological validity and reliability.

In fact, the problem of invalid classifications is described in a comment titled "*The Kothi Wars: AIDS Cosmopolitanism and the Morality of Classification"* published in a 2011 book devoted to discussions of sexuality and its associations with science and morality worldwide.[116] In this paper, Cohen explains that even the use of the term *Kothi*

in HIV research has gone beyond its ability to represent coherent meaning with valid and reliable attributes. Cohen explains that over the past decade, the label *Kothi* has become a "black box" term "reiterated in HIV and AIDS interventions as if it were *the* culturally obvious way of designating putatively "passive" men who have sex with men (emphasis added)."[114]

These categories, differences in sexual practices or higher likelihood of engaging in receptive anal sex, might partially predispose *Kothis* to higher STI risk. Furthermore, the sociological literature suggests that *Kothis* might also be the most susceptible of all subgroups to confront social vulnerabilities (generally having low education, healthcare discrimination, unsafe professions and sex work) and experiencing physical and sexual violence (rape and unwanted sexual experiences from partners, clients and even police). Due to these differences, interventions that might be effective for one subgroup could simultaneously prove unsuccessful for another.

Another aspect that increases the vulnerabilities of *Kothis* is gender expression. This dimension of gender refers to the behaviors, the roles in sexual partnerships, the choice of clothing and individual or cultural mannerisms, and in general, the ways people express their gender, each of which can conform or deviate from traditional societal gender roles and expectations. *Kothis* are effeminate and easily identifiable based on partnerships, roles, mannerisms and expressions, which might not conform to those expected for a male in India. *Panthis*, on the other hand, may endorse a more traditional masculine presence, which allows them to conform to heterosexual expectations. Those who conform tend to be accepted, but those who do not become

Despite the existence of important research documenting the diversity resulting from the intersection of homosexual identity with social and behavioral factors, unified analyses of large-scale epidemiological data quantifying the magnitude and extent of such heterogeneity are lacking. Such studies are needed to reveal differential predispositions of gender identity subgroups to sexually transmitted infections (STIs).

Considering known STI risk differences between unprotected receptive anal intercourse (URAI), unprotected insertive anal intercourse (UIAI), and insertive vaginal intercourse with female partners, we hypothesized that, as receptive partners, *Kothis* might be the most susceptible to STI risk, followed by *Double-Decker* who adopt versatile roles, and lastly followed by *Panthis* who practice mostly insertive sexual roles. However, Kothis may also be predisposed to other adverse sexual health outcomes, namely human and sexual rights violations.

Male sexuality and the current research lexicon

Nomenclature such as the term "Men who have sex with men" or its acronym "MSM" has been helpful to elucidate an important source of heterogeneity in HIV risk. Despite the increased sense of specificity perceived by using purely behavioral terminology to define an event as complex as sex between men, today's HIV research is far from specific and suffers from clear breaches in validity and lack of generalizability. In a sample of men from Chennai, India, while 92% of men reported sexual intercourse with men, only 74% identified as gay, and 27% were married to females.[117]

The grouping of sexual minorities under the single behavioral label has been criticized since many fundamental social dimensions of homosexuality discussed in

previous chapters become obscured. The term does not sufficiently describe heterogeneity in sexual behavior, and undermines self-labeling of sexual minorities.[118] Indeed, the current use of this term implies that the men under the 'MSM' label constitute a homogenous, undifferentiated group in terms of behavior, identities and even risk of sexually transmitted infections (STI's).

Unselective grouping of male sexual minorities into a single behavioral label does not only overlook important social dimensions of sexual identity (i.e., gender expression). Groupings of men at different STI risk might also translate into probable measurement fallacies, with important quantitative and qualitative implications.

The problem with labels in sexual identity discourse: LGBTQI+, MSMW

Corrêa, Petchesky, and Parker point out the inadequacy of indiscriminately grouping a range of key populations '*into one alphabet soup*'. For example, they note that grouping all Western sexual minorities into the LGBTQ+ label conceals the disparate character and political agendas of individual groups '*who sometimes are in tension rather than unified in any political or ideological sense.*' The researchers appropriately point out that using these terms is sometimes necessary, if done with the understanding that such shorthand notation overlooks sexual, political, cultural and personal diversities.[119]

The term MSM and the illusion of risk homogeneity.

Differences in sexual orientation and gender expression make certain subgroups more vulnerable to situations known to be associated with STI infection. For example, growing attention has focused on the elevated per-act probability of HIV from receptive anal sex, which is believed to be 18 times greater than estimates for vaginal intercourse.[3,4]

Kothis, as previously described, engage predominantly in receptive anal sex. Therefore, despite the illusion that all men who have sex with men share a common behavior that explains STI risk (i.e., anal sex), evidence suggests that important aspects of their behavioral profiles dissimilar.

Oversimplification of sex between men.

Sex between men transcends the individual behavioral experiences of males having sexual intercourse with each other. This is yet another way in which term 'MSM' reduces the experience to shallow, transactional acts. On the one hand, it ignores vulnerabilities like power differentials and sexual roles that may exist just as they occur in heterosexual relationships. On the other hand, it underemphasizes the positive effects that companionship and affection have on the wellbeing of homosexual partners.

Conceptual framework

Figure 6 Sexuality, vulnerability, risk behavior and sexually transmitted infections.

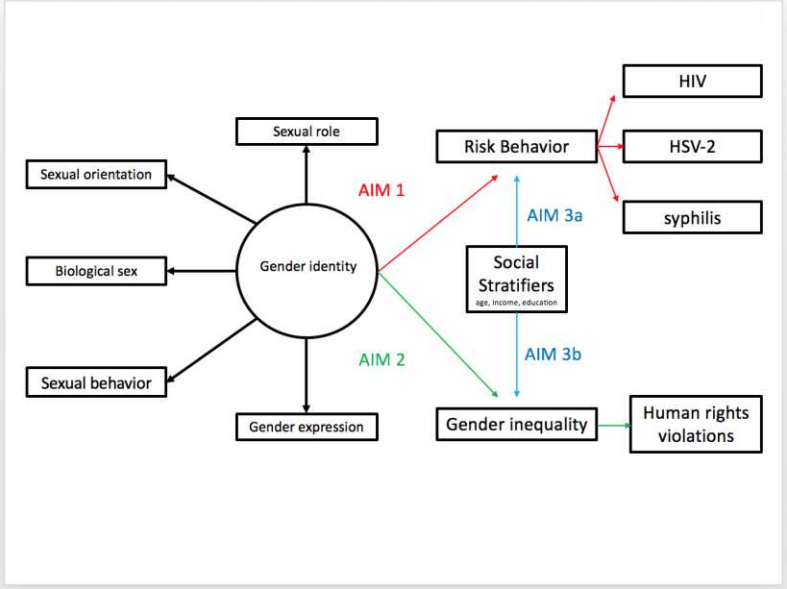


Figure 6 shows the 3 aims of this dissertation using the components of gender/sexual identity and known behavioral determinants of STIs in India. Briefly, gender/sexual identity is expressed (at least partially) through roles, biological traits, and sexual behaviors. *Aim 1:* Certain components of gender/sexual identity inherently carry some risk (e.g. multiple partners, receptive anal sex). Risk behavior increases the likelihood of STIs. *Aim 2*: Other components of gender/sexual identity are stigmatized in India (e.g. gender expression, effeminate mannerisms, having a male partner). Stigma results in gender inequalities which increase the predisposition toward human and sexual rights violations. *Aim 3*: The association between gender/sexual identity and STIs (*aim 3a*) and the association between gender/sexual identity and human rights violations (*aim 3b*) may be different depending on an individual's age, income, education and how these social stratifiers interact with that individual's gender/sexual identity.

CHAPTER 3:

Study design, data, methodology, and analysis plan

Study design:

Main trial:

This dissertation is nested within a larger cluster randomized controlled trial (cRCT) being conducted in 10 cities of India (12 sites are used in this dissertation, although two sites were dropped before randomization). The trial is called *"Integrated Care Centers to Improve HIV Outcomes in Vulnerable Indian Populations"* (ClinicalTrials.gov Identifier: NCT01686750). At the end of study, each city will have been surveyed twice, once at baseline and once about two years after the intervention. This dissertation used data from the baseline cross-section only, which took place from June to September of 2013.

Eligibility:

Eligible participants: (1) are older than 18 years of age at the time of recruitment; (2) self-identify as male; (3) presented a valid RDS referral coupon at a study office and (4) reported oral/anal sex with another male in the prior 12 months. Participants' sexual orientations or sexual identities did not preclude eligibility.

Institutional Review Board:

The institutional review boards (IRBs) of the Johns Hopkins Bloomberg School of Public Health and the YR Gaitonde Centre for AIDS Research and Education approved this study.

Site selection:

Sites were selected based on several considerations:

1) Cities with established HIV epidemics among MSM: Chennai, Hyderabad, and Bengaluru;
2) Smaller cities in high-prevalence states: Vijaywada and Managlore;
3) Cities with anecdotal reports of HIV among MSM but no published reports: Bhopal, Lucknow, and New Delhi.

Table 4 Study sites included in this dissertation

Site name	Site abbreviation	State	Region
Bangalore	BL	Karnataka	South
Belgaum	BG	Karnataka	South
Bhopal	BP	Madhya Pradesh	North/Central
Chennai	CH	Tamil Nadu	South
Coimbatore	CB	Tamil Nadu	South
New Delhi	DL	Delhi	North/Central
Hyderabad	HY	Andhra Pradesh	South
Lucknow	LK	Uttar Pradesh	North/Central
Madurai	MD	Tamil Nadu	South
Mangalore	ML	Karnataka	South
Vijayawada	VJ	Andhra Pradesh	South
Vizag	VZ	Andhra Pradesh	South

Summary of Parent Study Design:

T**able 5** Characteristics of the parent study producing the data used in this dissertation

Characteristic	
Type	Cluster Randomized Controlled Trial
Clusters	1 of 12 cities in India
Comparisons	Intervention vs. Control cross-sectional samples at baseline and follow up
Sampling	Respondent Driven Sampling (RDS)
Intervention	Integrated Health Centers for HIV treatment services in scaled-up facilities
Control	Continue to offer all services in decentralized centers
Population	Men reporting sexual encounters with other men

General data collection method:

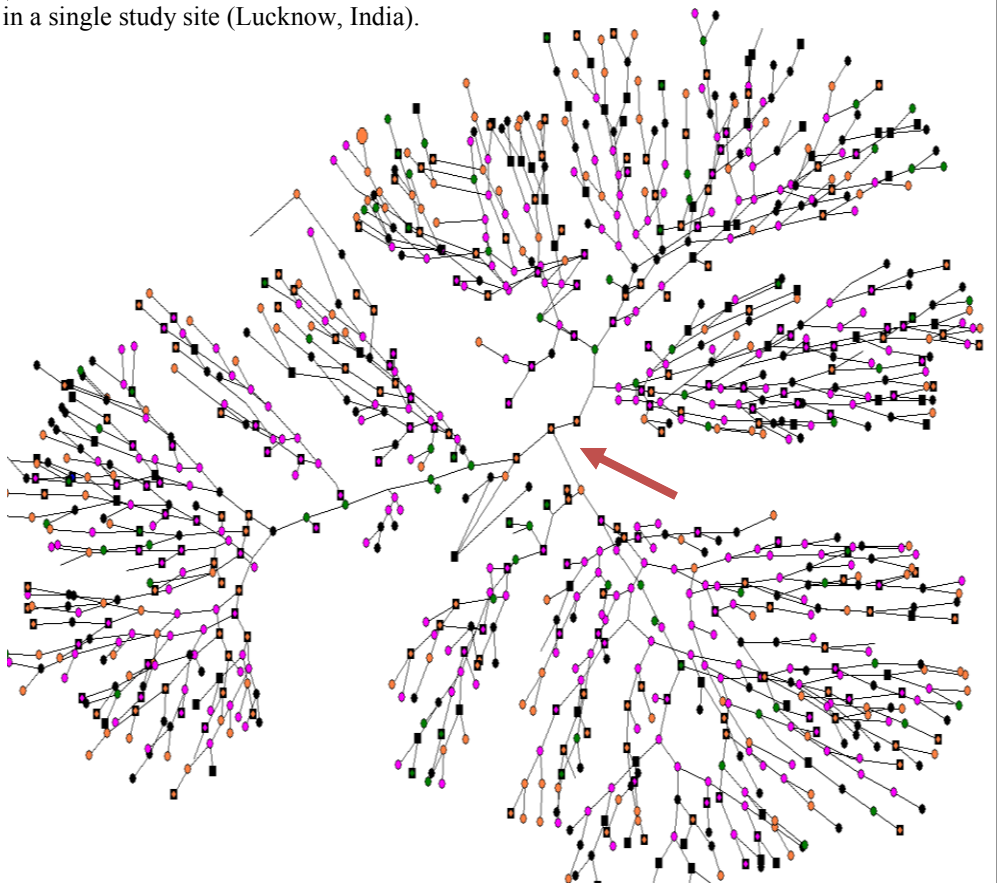
Key informants: Key informants familiar with the MSM community in India were identified in preliminary stages of the study. These informants were asked to name "seeds." These seeds were selected from across the demographic, geographic, and sexual behavior/identity diversity of MSM in each of the 12 study sites. Seeds were the starting point for the chain-referral sampling scheme called Respondent Driven Sampling (RDS).[120]

Participants: Participants consented and were asked to complete the survey with questions describing their sexual identities, sexual behavior, and social networks. Upon completion of the questionnaire, they were offered pre-test counseling and HIV/STI testing. A serologic sample was collected in the study site and an appointment made for the seed to receive their HIV/STI result. Samples were tracked with a unique study ID.

Compensation: 'Seeds' were reimbursed for their participation in the study. They were asked to return in <3 weeks for STI test results and necessary referrals were made. 'Seeds' were then asked to recruit up to 2 members of their social/sexual network who satisfied the eligibility criteria. If seeds referred eligible participants, they received additional reimbursements (~US$0.8). 'Seed'-referred eligible participants were in turn, following the exact process as the 'seeds', and were asked to recruit 2 other eligible participants. This process of enrollment and referral was repeated until the study reached the desired sample size at baseline (N=1,000 for each of the 12 study sites).

Respondent Driven Sampling (RDS):

Figure 7 HSV-2 infection (individuals with bold borders) in the recruitment tree of participants in a single study site (Lucknow, India).



The three identities of interest are color-coded in pink (for *Kothi*s), orange (for *Panthi*s), and green (for *Double-Deckers*). HSV-2 cases are surrounded by a dark border. The red arrow shows the first seed.

Twelve RDS samples were obtained. **Figure 8** is a schematic of the sampling in a single city. The example is given for HSV-2 but the same sampling process captured HIV-1&2 and syphilis The red arrow shows the first seed. Information from participants recruited via RDS include (1) documentation of who recruited them (tracked through a computerized coupon system); (2) information on personal network size; and (3) description of the reciprocal relationship between recruiters and recruits.

Homophily in RDS sampling:

A methodological limitation of RDS is that participants tend to recruit people who are like them in important determinants of health. For example, the 'seed' in wave #1 recruits 2 participants. If the 'seed' is from a very low socioeconomic status (SES), there is a higher probability that he recruits 2 other participants with low socioeconomic status. This higher probability of recruiting participants who resemble the previous wave is called ***homophily***. Due to smaller sample size initially, the probability that homophily results in biased estimates of the target population is higher. However, even if the bias due to homophily is initially high, it is imperfect (i.e., some individuals from low SES will recruit wealthy participants). Homophily is reduced with (1) sample size and (2) as recruitment waves get farther away from the initial 'seed'.[121,122] Reaching the probability of the distribution is called ***equilibrium***.

Weighting:

Even though a sample composition might reach equilibrium and might converge on estimated population composition, which are unbiased, an RDS sample may not necessarily be representative of the target population.[24] If an RDS sample is not representative of a factor, it can be weighted based on evidence-based estimates of the prevalence of that factor. There are 2 types of RDS weights: RDS I and RDS II.

RDS-II weights[123] will be used in this dissertation because they have been observed to produce more conservative and less extreme estimates and have been used in previous peer-reviewed publications from our group.[124] RDS II weights consider the inverse of the network size reported by each participant. The larger the network size a participant knows, the higher the probability of selection into the study.

Exposures, outcomes and biopsychosocial factors:

Measurement of Gender/Sexual Identity:

We adapted measures of sexual identity from the CDC NHBS study for use in the Indian context.[13] We asked participants if they identify as gay, bisexual, or straight using appropriate local terms/slang such as *Kothi, Panthi, and Double-Decker*. This dissertation will only use the subsample of men who selected the 3 locally known gender/sexual identities, namely *Panthi, Kothi,* and *Double-Decker*. Other identities were chosen but were excluded from this dissertation (gay, bisexual, and 'MSM'). The reason for excluding these identities is that they are derived from Westernized terminology and we were interested in non-Western identities. Furthermore, the self-selection of Western identities could reflect self-selection of attitudes, behaviors or socioeconomic variables that could have affected the analyses.

Sexual networks:

We assessed number and type of male and female sex partners in the 12 months. We asked about sexual practices with these partners (oral, receptive and insertive anal intercourse), type of partner (main, casual or exchange).

Social factors, healthcare access measures, sexual and mental health:

Items and scales for the survey were drawn from formative research, prior work of this study's investigators and other published work. The survey collected information on general demographics (ethnicity, SES, marital status), general knowledge of HIV and HIV treatment, lifetime and recent history of substance use (including drugs and alcohol), lifetime and recent history of depressive symptoms, sexual identity, self, experienced and perceived stigma, lifetime and recent information on sexual networks and sexual risk behaviors, perception of risk and lifetime experience health services, both HIV and non-HIV related.

Poverty:

The suggested poverty line includes a food basket with normative requirements of nutrients. The average per capita consumption per month expenditure on food in the 6th fractile is Rs. 554 for rural areas and Rs. 656 for urban areas.[125] The poverty line also includes clothing expenses, rent, and education expenses as the normative requirements of the basic nonfood expenses of clothing, housing, mobility and education of a poverty line basket.[125] In this dissertation, we used SLPs as of March of 2012. Indian SLPs also change based on the State of residence of each participant.

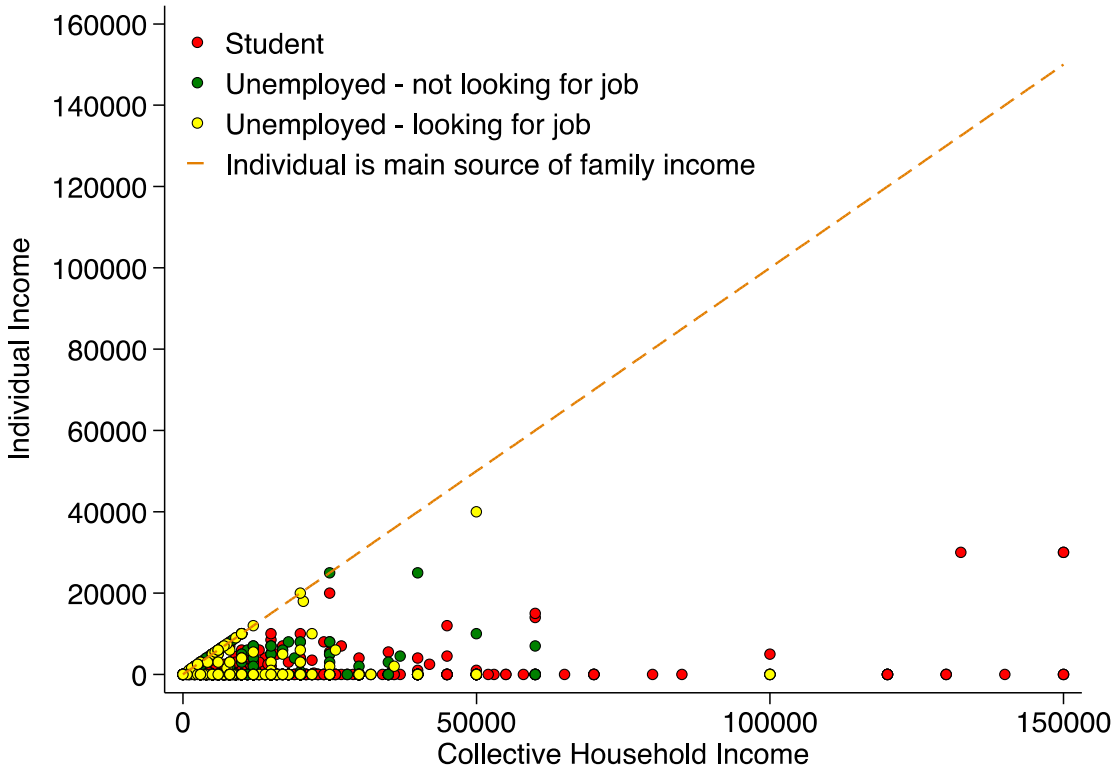
Income:

Participants reported their ***individual income***. While we will briefly describe these measures in this section, individual incomes have not been not included in **Table 9** or and will be excluded from subsequent multivariable models for several different reasons. First, the purpose of including income measures (individual, household, per-capita) was to describe this element as a source of socioeconomic resources available to each participant. However, among 1,308 participants reporting an income of 0 INR per month, 1,010 (77.22%) were students, 169 (12.92%) were unemployed and looking for work, and 107 (8.18%) were employed but not looking for work.

These subgroups might not necessarily depend on individual incomes and might instead subsidize basic necessities with their family income and shared family resources. In fact, the median household income for unemployed student participants was 12,000 INR (~195.12 USD per month). Likewise, the median per-capita monthly income for households of student participants was 3,400, almost 3 times above the highest State Poverty Line (See New Delhi SLP in Appendix B **Table 15**). Therefore, participants with little or no income may not be affected by poverty depending on their collective household income.

Figure 8 shows that the many of students and unemployed participants reported a monthly individual income of 0 INR but their family incomes varied widely. No one is above the equality line since individual incomes may not exceed household incomes. However, a subgroup of people, particularly unemployed participants looking for jobs may remain the main source of whatever family income they earn and thus, fall directly on the dashed line where individual income = collective income.

Figure 8 Individual *vs*. Collective Household Income for Unemployed Participants



Individual *vs*. household income for employed participants: At the other end of the spectrum, many employed participants had incomes that strongly influenced the collective household income of their families. For example, many participants who reported large individual incomes also reported similarly large household incomes. Such individuals may be the main provider of the household.

Figure 9 Individual vs. Collective Household Income for Employed Participants

As seen in **Figure 8** and **Figure 9**, collective household income compensates for individual income, particularly if individual wages are insufficient (e.g. unemployed participants including students). For participants who were the main source of income for their household, collective incomes tended to be < 50,000 INR. As one might expect, fewer individuals were the primary source of income as the collective household income increased. For collective household incomes >50,000 INR, more participants with individual daily wages subsidized their household income compared to fewer with those with monthly wages.

Outcome ascertainment

The presence of IgG against HIV-1 and 2 and HSV-2 was identified using the standard ELISA-based assays shown in ***Table 2***. Rapid tests were used for HIV onsite. One rapid test was performed for HSV-2. For syphilis, a rapid plasma reagin test was used (RPR; non-treponemal test) and confirmed using a Treponema pallidum haemagglutination test (TPHA, treponemal test).

Table 6 Tests used to ascertain the three STI outcomes of interest

Test Name		By:
HIV-1 & HIV-2	Alere™ Determine™ HIV-1/2	Alere Medical Co., Ltd., Chiba, Japan
	First response HIV card test 1-2.0	PMC Medical India Pvt Ltd, Daman, India
	Signal Flow Through HIV 1+2 Spot/Immunodot Test kit	Span Diagnostics Ltd, Surat, India
HSV-2	Presence of antibodies (IgG) to HSV-2 using Anti-HSV-2 (gG2) ELISA	Euroimmun Medizinische Labordiagnostika AG, Lubeck, Germany
Syphilis	RPR Test Kit	Span Diagnostics Ltd. Surat, India
	Confirmed using the Immutrep TPHA	Omega Diagnositcs Limited, Scotland, UK

CD4+ count: estimated using the FlowCARE™ PLG CD4 (CD45-FITC/CD4-PE) assay (Beckman Coulter, CA, USA)

HIV-1 RNA: measured with RealTime HIV-1 assay (Abbott Laboratories, Abbott Park, Illinois, USA), in samples from HIV positive participants

Statistical Analyses

Data management, software, missing data approach:

Data management and analyses were performed with STATA/SE statistical software, version 14 (Stata Corp). We used a model-wise approach for missing data.

Measures of Association based on marginal models:

We estimated Odds Ratios (OR) that reflect the multiplicative change in the odds of a given outcome comparing two sexual identities (either *Kothis* or *DDs*) to *Panthis.* Marginal logistic regression models were created to assess the overall association between gender/sexual identity and multiple outcomes of interest. All marginal models include a random intercept for site and should be interpreted as the sample-specific prediction of the association between the exposure (gender/sexual identity) and the outcome.

Conditional Models

Conditional logistic regression models were also created and are only presented in Appendix B as sensitivity analyses. There were no major differences between conditional and marginal models.

Descriptive statistics:

Continuous variables are presented as mean (SD), whereas categorical variables are presented as the number (percentage) of patients. *P* values for continuous variables correspond to a Kruskal-Wallis rank sum test of the null, assuming the location parameters of the distribution of the variable are the same in each exposure group. *P* values for categorical variables correspond to a Fisher exact test for testing the null of independence of rows and columns in a contingency table with fixed marginal.

RDS process measures

Assessment of RDS process measures (equilibrium and homophily) by HIV status, demographic factors and risk behaviors have been assessed in previous publications and were within expected ranges. Data from "seeds" were excluded as they inflate homophily. We used the RDS-II estimator (Volz-Heckathorn estimator),[121] a sampling weight that is based on the reported network size of male sexual minorities of each participant: the original survey asked for the "number of MSM in the city whom the participant saw in the prior 30 days."

Analysis Plan:

The analysis will have three sections (each of which will be a Chapter). The three sections have several subsections:

1. Analysis of the heterogeneity of STIs and STI risk factors by gender/sexual identity.
2. Analysis of the heterogeneity of human/sexual health rights by gender/sexual identity.
3. Analysis of effect modification of the association between gender/sexual identity and STIs and sexual rights (from aim 1 and 2) by levels of income, age, education.

The analysis plan for the three sections above will be detailed in each respective chapter (i.e. Chapters 4, 5, and 6). Briefly, associations between sexual/gender identity and the 3 STIs of interest were first analyzed using univariable random-effects logistic regression. Subsequently, multivariable models were created which adjust for other factors including age, education, marital status, injection drug use, alcohol use, intercourse type, sex work, number of partners and circumcision. Factors that were associated with the outcome at $P<0.10$ in univariable models were considered for inclusion in multivariable models. Certain demographic factors (e.g., age, marital status, education) and behavioral characteristics (e.g., lifetime number of male sex partners and sex work) were considered for inclusion in specific multivariable models regardless of statistical significance. Except for age, which was included regardless of statistical significance in all multivariable models, only those variables associated with the outcome at $p<0.05$ were retained in the final multivariable models.

CHAPTER 4:

STI heterogeneity and gender identity in India

General Characteristics:

The parent trial recruited a total of 12,022 men who self-reported sexual encounters with other males. This analysis was restricted to 9,542 (79.37%) men who self-reported 3 specific identities: *Kothi*, *Panthi* and *Double-Deckers*. The missing data rates varied by gender/identity subgroup. For HIV and syphilis, missing data rates were <1%. For HSV-2 infection, missing data rates ranged from 2.32% to 3.23%. Overall, the mean age was 28.45 years and 33.1% were married. Median age at first intercourse with a man was 18 years. *Panthis* represented the largest subgroup (32.7%), followed by *Kothis* (23.5%), and *Double-Deckers* (23.3%), while the remaining 32% include participants who reported other gender identities (5 men did not provide a response to this question).

Panthis were marginally younger (mean 26.8 years) than *Double-Deckers* and *Kothis* (29.3 and 29.9 years, respectively; P<0.001). In terms of individual poverty, 17.55% of *Panthis* had individual incomes less that the per-capita State Poverty Line (SPL), followed by *Double-Deckers* (14.27%) and *Kothis* (9.81%). However, the median monthly salary for *Panthis, Kothis* and *Double-Deckers* was the same: 6,000 Indian rupees (~97.56 USD per month, based on 2013 estimates[1]). The median number of adult

[1] Based on 2013 estimates at the time of data collection: https://www.irs.gov/businesses/small-businesses-self-employed/treasury-reporting-rates-of-exchange-as-of-december-31-2013

individuals per household was also the same for *Panthis, Kothis* and *Double-Deckers:* 3 members per household. The percentage of *Panthis* who lived in households where the Collective Household Income (CHI) was below the State Poverty Line (SPL) was 7.81% compared to *Double-Deckers* (8.33%) and *Kothis* (7.00%). The crude unemployment rate was lower among *Panthis* (3.36%) compared to *Double-Deckers* (4.04%) and *Kothis* (4.37%). A significantly higher percentage of *Panthis* did not complete primary schooling (24.8%) compared to *Kothis* (22.5%) and *Double-Deckers* (18.1%).

With regards to anal sexual intercourse, *Panthis* reported primarily insertive roles (80.2%) or both insertive and receptive roles (15.0%) but infrequently reported primarily receptive anal sexual intercourse (0.6%). *Double-Deckers* reported both receptive and insertive anal sex (89.7%) with a fraction reporting primarily insertive roles (7.1%) and fewer reporting primarily receptive roles (1.7%). Most *Kothis* reported primarily receptive sex (50.8%) with many reporting both insertive and receptive roles (40.4%) and with a minority reporting primarily insertive roles (3.5%). Injection drug use (IDU) was reported by 1.42% of *Panthis*, 1.47% of *Double-Deckers* and 0.89% of *Kothis*. In contrast, 16.23% of *Panthis* reported being sex workers compared to 32.22% of *Double-Deckers* and 57.26% of *Kothis*. Circumcision was most prevalently reported by *Panthis* (19.29%) with similar rates among *Double-Deckers* (14.31%) and *Kothis* (13.36%). The median number of male sexual partners was higher for *Kothis* (100), followed by *Double-Deckers* (20) and *Panthis* (8); note that estimates include sex workers. Marriage rates to females was highest for *Double-Deckers* (36.25%) and *Panthis* (31.42%) and lowest for *Kothis* (25.48%). Sex with females, on the other hand, was highest for *Panthis* (83.80%) and *Double-Deckers* (76.83%) and lowest for *Kothis* (36.92%).

Table 7 Socioeconomic, behavioral & network characteristics by gender/sexual identity in India

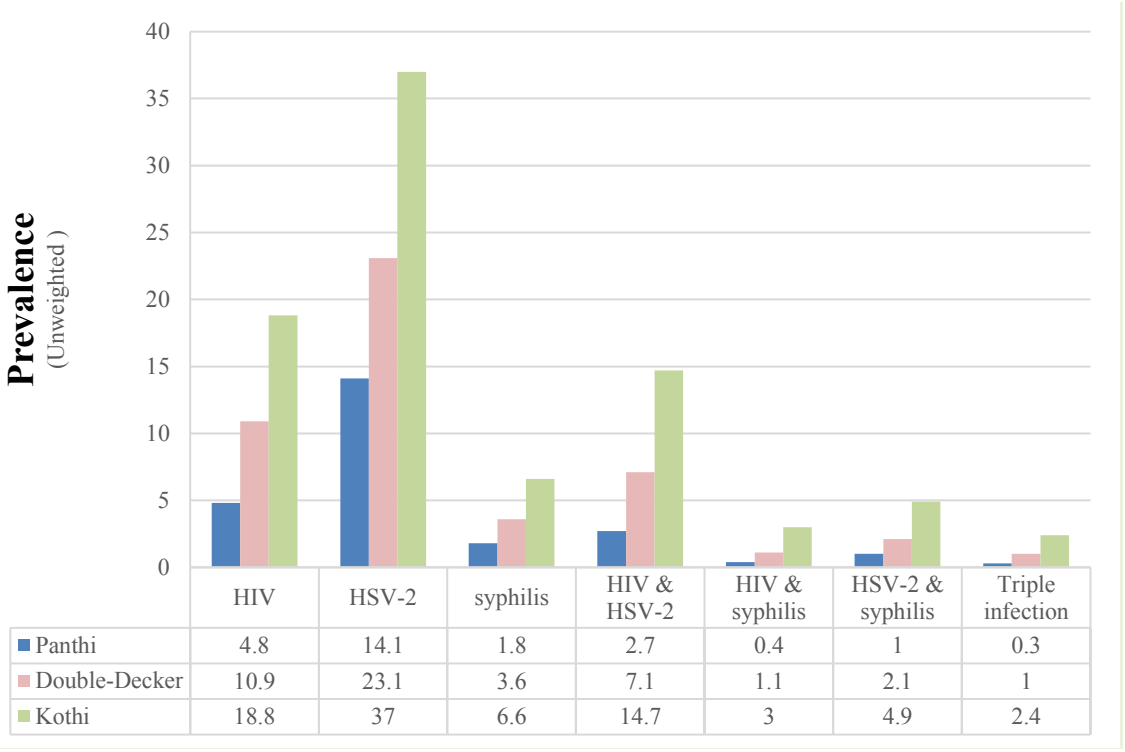
	Panthis (N=3931)			*Double-Deckers* (N=2,797)			*Kothis* (N=2,814)			P [d]
	Crude [a, b]	Weighted	95% CI [c]	Crude	Weighted	95% CI	Crude	Weighted	95% CI	
Socioeconomic										
Age [*]	26.8	26.2	(25.8, 26.6)	29.3	29.5	(29.0, 30.1)	30.0	29.7	(28.9, 30.4)	< 0.001
Individual income < SPL [e]	17.5	20.6	(18.4, 23.0)	14.3	15.7	(13.6, 18.1)	9.8	13.7	(11.0, 16.9)	< 0.001
CHI<SPL [e]	7.6	8.1	(6.8, 9.5)	6.8	9.3	(7.5, 11.5)	7.0	7.7	(6.1, 9.7)	< 0.001
Unemployment	3.4	3.4	(2.4, 4.6)	4.0	4.7	(3.4, 6.6)	4.4	4.4	(3.2, 5.9)	0.086
No Primary Educ.	24.8	22.6	(20.6, 24.8)	18.1	16.8	(14.6, 19.2)	22.5	23.7	(20.9, 26.9)	< 0.001
Bio-behavioral										
Sexual role										< 0.001
Mostly receptive	0.6	0.2	(0.1, 0.5)	1.7	1.6	(1.0, 2.5)	58.5	50.8	(47.0, 55.0)	
Mostly Insertive	80.2	83.7	(81.7, 85.5)	7.1	8.7	(6.9, 11.0)	3.6	3.5	(2.6, 4.7)	
Both	15.0	11.1	(9.7, 12.7)	89.7	88.0	(85.3, 90.0)	34.7	40.4	(36.6, 44.4)	
Lifetime IDU	1.4	1.0	(0.7, 1.4)	1.5	0.8	(0.5, 1.1)	0.9	0.6	(0.3, 1.1)	0.089
Sex worker	16.2	12.0	(10.5, 13.6)	32.2	26.9	(24.4, 30.0)	57.3	40.1	(36.7, 43.7)	< 0.001
Circumcised	19.3	15.8	(13.8 ,18.0)	14.3	14.1	(11.5, 17.1)	13.4	12.5	(10.3, 15.1)	< 0.001
Network factors										
Number of male sex partners	35.6	23.4	(18.1, 28.7)	92.7	52.1	(46.0, 58.2)	275.0	141.8	(127.9, 155.7)	< 0.001
Married to female	31.4	28.9	(26.6, 31.3)	36.3	36.1	(33.1, 39.2)	25.5	27.71	(23.9, 30.4)	< 0.001
Sex with females	83.8	83.4	(81.5, 85.2)	74.1	75.8	(71.4, 76.7)	36.9	40.9	(37.3, 45.6)	< 0.001

[a] Crude & weighted data presented as % of participants unless otherwise indicated; [*] for continues variables, the mean is shown. [b] The percentages of some categorical variables may not total 100% because of limited missing data. [c] 95% Confidence Intervals corresponds to the weighted statistics. [d] *P*-values for continuous variables were obtained using the Kruskal–Wallis one-way analysis of variance to test crude means differences between subgroups; *P* values for categorical variables were obtained using a Chi-square test for significant differences in crude proportions between subgroups. [e] The collective household income (CHI) was considered to be below a State Poverty Line (CHI<SPL) if its per capita monthly income was below the 2011-2012 poverty lines published by the Reserve Bank of India (see references) (http://www.rbi.org.in/scripts/PublicationsView.aspx?id=15283 Accessed on 12/27/2014).

Prevalence of STIs by gender/sexual identity

Figure 10 shows the unweighted prevalence estimates of 3 STIs measured with serum markers (HIV, HSV-2, and syphilis) as well as possible concurrent epidemics of these infections based on gender/sexual identity. **Table 8** shows weighted and unweighted estimates. Only unweighted estimates are highlighted in the text.

Figure 10 Prevalence* of HIV, HSV-2, syphilis and concurrent epidemics of these infections by gender/sexual identity. Estimates are unweighted.



	HIV	HSV-2	syphilis	HIV & HSV-2	HIV & syphilis	HSV-2 & syphilis	Triple infection
Panthi	4.8	14.1	1.8	2.7	0.4	1	0.3
Double-Decker	10.9	23.1	3.6	7.1	1.1	2.1	1
Kothi	18.8	37	6.6	14.7	3	4.9	2.4

* There are 7 groups of bar graphs in this figure. Each group shows the prevalence for 3 subgroups of gender/sexual identity. The first 3 groups (HIV, HSV-2 and syphilis) show the prevalence of an STI *regardless of whether an individual has other concurrent infections*. For example, the prevalence for HIV for all identities (first group of bar graphs) includes all HIV/HSV-2 co-infections, all HIV/syphilis co-infections and all triple infections with HIV, HSV-2 and syphilis.

The general trend in this descriptive prevalence estimates of infections and co-infections of HIV, HSV-2, and syphilis was *Kothis>Double-Deckers>Panthis*.

Table 8 Prevalence of STIs based on serology and self-reported data among Indian men with different self-reported gender identities. 2012.

	Panthi (N=3931)			*Double-Decker* (N=2,797)			*Kothi* (N=2,814)			P [d]
	Crude [a, b]	Weighted	95% CI [c]	Crude	Weighted	95% CI	Crude	Weighted	95% CI	
Seropositive										
HIV	4.76	3.18	(2.52, 4.00)	10.94	9.70	(7.99, 11.74)	18.80	16.96	(14.44, 19.81)	< .001
HSV-2	14.14	13.42	(11.70, 15.34)	23.13	24.70	(21.81, 27.83)	37.03	37.41	(33.83, 41.12)	< .001
Syphilis	1.76	1.87	(1.25, 2.81)	3.61	3.83	(2.74, 5.31)	6.57	5.30	(4.17, 6.70)	< .001
Self-reported history										
Gonorrhea	1.63	1.53	(0.09, 2.47)	3.25	1.64	(1.07, 2.50)	5.54	3.10	(1.86, 5.14)	< .001
Chlamydia	0.69	0.69	(0.40, 1.20)	0.75	0.39	(0.20, 0.79)	1.60	0.80	(0.46, 1.40)	< .001
Hepatitis B	0.41	0.57	(0.23, 1.44)	0.61	0.67	(0.26, 1.70)	1.24	1.07	(0.57, 2.00)	< .001
Trichomonas	0.20	0.38	(0.11, 1.32)	0.79	0.46	(0.22, 0.96)	1.31	0.38	(0.26, 0.56)	< .001
Co-infection										
HIV & HSV2	2.70	1.81	(1.30, 2.52)	7.08	6.17	(4.75, 7.98)	14.68	14.07	(11.68, 16.86)	< .001
HIV & syphilis	0.36	0.22	(0.11, 0.40)	1.11	1.04	(0.59, 1.87)	2.99	2.41	(1.73, 3.32)	< .001
HSV-2 & syphilis	0.99	0.72	(0.48, 1.09)	2.11	2.12	(1.39, 3.25)	4.94	3.82	(2.92, 4.98)	< .001
HIV, HSV-2 & syphilis	0.25	0.18	(0.08, 0.37)	0.97	1.11	(0.63, 1.98)	2.42	3.54	(2.47, 5.07)	< .001

[a] Crude & weighted data are presented as % of participants unless otherwise indicated. [b] The percentages of some categorical variables may not total 100% because of limited missing data. [c] 95% Confidence Intervals corresponds to the weighted statistics. [d] *P* values for categorical variables were obtained using a Chi-square test for significant differences in crude proportions between gender/sexual identity subgroups. [e]

Univariable models

HIV infection

Compared to *Panthis, Kothis* had 4.33 (95% CI 2.58, 7.24) times higher odds of HIV infection. In contrast, *Double-Deckers* had 1.91 (1.01, 3.60) higher odds of HIV compared to *Panthis*. Several correlates of HIV that were statistically significant in this analysis are shown in **Table 9** and have been published elsewhere by our group.[62]

HSV-2 infection

Compared to *Panthis, Kothis* had 3.27 (95% CI 2.48 - 4.31) times higher odds of HSV-2 infection. *Double-Deckers* had 1.63 (95% CI 1.12 - 2.36) higher odds of HSV-2 compared to *Panthis*.

The odds of HSV-2 infection were also significantly higher for men who practiced both receptive and insertive roles (1.57; 1.12 - 2.18), those who practiced mainly receptive anal intercourse had (2.52, 1.75 - 3.65), sex workers (4.91; 3.27 - 7.36), for men who were in long term partnerships with other men (1.61; 1.23 - 2.10) and those married to or in long-term relationships with females (2.82; 2.17 - 3.67) compared to those who had never married. In addition, a 10-year increase in age (2.34; 2.05 - 2.67) also significantly increased the odds of HSV-2 infection.

In contrast, the odds of HSV-2 infection were significantly decreased by completing high school (0.47; 0.31 - 0.71) and for every additional 1000 Indian rupees a family earned 0.97 (0.96 - 0.98). Circumcision was not statistically associated with HSV-2 infection (0.94; 0.63 - 1.39).

Syphilis infection

Kothis had 3.33 (1.96, 5.68) times higher odds of syphilis infection compared to *Panthis. Double-Deckers* had 2.09 (95% CI 1.32, 3.33) higher odds of testing positive for syphilis compared to *Panthis*.

The odds of syphilis infection were significantly increased for men reporting both receptive or insertive sex had (2.03; 1.46 - 2.82), men who practice only receptive anal intercourse had (3.88, 2.32 - 6.49), sex workers (2.05; 1.14 - 3.69). In addition, a 10-year increase in age was significantly associated with higher odds of syphilis infection (1.64; 1.40 - 1.91). Participants married to or in long-term relationships with females had higher odds of syphilis infection (1.70; 1.20, 2.41) compared to those who had never married. Circumcision was not statistically associated with syphilis infection (1.34; 0.64, 2.81).

Compared to individuals who did not complete any formal education, completing any level of education reduced the odds of syphilis infection: primary education (0.55; 0.42, 0.72), high school completion (0.50; 0.29, 0.86) and college level education or beyond (0.56; 0.30, 1.05; P>0.05).

Multivariable Results

All multivariable models were adjusted for behavioral and social factors (type of sexual intercourse, number of sexual partners, sex work, injection drug use, alcohol use, circumcision, age, education, household poverty and marital status).

HIV infection:

In multivariable models, when all sites are averaged, *Kothis* had 2.20 (95% CI 1.60, 3.03) significantly higher odds of HIV infection compared to *Panthis*. *Double-Decker* men also had elevated odds of HIV infection compared to *Panthis* (1.41; 95% CI 1.04, 1.91). Thus, the magnitude of the association between gender/sexual identity and HIV decreased after adjusting for relevant biological and social variables but remained significant for both *Kothis* ($OR_{univariable} = 4.64$ *vs.* $OR_{multivariable} = 2.20$) and *Double-Deckers* ($OR_{univariable} = 1.91$ *vs.* $OR_{multivariable} = 1.41$) compared to *Panthis.*

Other predictors that significantly elevated the odds of HIV in multivariable models infection include 1) increasing number of male sexual partners, 2) history of sex work as an occupation, 3) history of injecting recreational drugs, 4) age, 5) long term relationships with female partners (including marriage to females) and 6) being single while not being in a relationship.

In contrast, factors that significantly decreased the odds of HIV infection in marginal models include 1) having a positive screening for high risk drinking, 2) reporting a history of circumcision, and 3) having primary, high school or college level education.

HSV-2 infection:

In multivariable models, when all sites are averaged, *Kothis* had 2.55 (2.04, 3.20) significantly higher odds of HSV-2 infection compared to *Panthis*. *Double-Decker* men also had elevated odds of HSV-2 infection compared to *Panthis,* but this association was not statistically significant (1.35; 95% CI 1.09, 1.66). Therefore, the magnitude of the association between gender/sexual identity and HSV-2 decreased after adjusting for relevant biological and social variables but remained significant for both *Kothis* ($OR_{univariable} = 3.64$ *vs.* $OR_{multivariable} = 2.55$) and *Double-Deckers* ($OR_{univariable} = 1.82$ *vs.* $OR_{multivariable} = 1.35$) compared to *Panthis.*

Other predictors that significantly elevated the odds of HSV-2 in marginal models infection include 1) increasing number of male sexual partners, 2) history of sex work as an occupation, 3) belonging to a household below the SPL, 4) age, 5) long term relationships with female partners (including marriage to females) and 6) being single while not being in a relationship.

Factors that significantly decreased the odds of HSV-2 infection in marginal models include 1) the practice of receptive partner compared to insertive anal sex, 2) having a positive screening for high risk drinking, and 3) having primary, high school or college level education.

Syphilis infection:

Kothis had 2.35 (95% CI 1.42, 3.90) significantly higher odds of syphilis infection compared to *Panthis*. *Double-Decker* men also had elevated odds of syphilis infection compared to *Panthis,* but this association was not statistically significant (1.53; 95% CI 0.94, 2.49).

Other predictors that significantly elevated the odds of syphilis in marginal models include 1) increasing number of male sexual partners, 2) history of circumcision, and 3) age. Factors that significantly decreased the odds of syphilis infection in marginal models include 1) having a positive screening for high risk drinking, and 3) having primary or high school education.

Table 9 Univariable predictors of HIV, HSV-2 and syphilis

	HIV		HSV-2		Syphilis	
	OR	95% CI	OR	95% CI	OR	95% CI
Main predictor						
Gender/Sexual Identity						
Panthi	*Ref -1*		*Ref -1*		*Ref -1*	
DD	1.91*	1.01 - 3.60	1.63*	1.12 - 2.36	2.09**	1.32 - 3.33
Kothi	4.33**	2.59 - 7.25	3.27**	2.48 - 4.31	3.33**	1.96 - 5.68
Behavioral practices						
Type of sexual practice with males						
Insertive only	*Ref -1*		*Ref -1*		*Ref -1*	
Receptive only	3.65**	2.08 - 6.41	2.52**	1.75 - 3.65	3.88**	2.32 - 6.49
Insertive or receptive situationally	2.20**	1.32 - 3.68	1.57**	1.12 - 2.18	2.03**	1.46 - 2.82
Lifetime male sexual partnerships						
<5	*Ref -1*		*Ref -1*		*Ref -1*	
6-15	1.29	0.80 - 2.08	1.44**	1.24 - 1.66	1.96**	1.19 - 3.24
16-60	2.00**	1.18 - 3.37	2.25**	1.71 - 2.96	4.13**	2.84 - 5.99
61-300	4.54**	2.70 - 7.61	4.32**	3.41 - 5.48	5.65**	3.25 - 9.82
300 or +	7.95**	4.25 - 14.8	5.18**	3.45 - 7.78	7.89**	5.07 - 12.2
Sexual or drug-related behavior						
History of sex work vs. no history	5.36**	3.01 - 9.56	4.91**	3.27 - 7.36	2.05*	1.14 - 3.69
History of IDU vs. no history	4.39	0.73 - 26.4	0.94	0.51 - 1.74	0.94	0.27 - 3.26
High risk drinking vs. low risk	0.59**	0.41 - 0.84	0.83*	0.69 - 1.00	0.89	0.60 - 1.32
Circumcised vs. not	0.87	0.60 - 1.27	0.94	0.63 - 1.39	1.34	0.64 - 2.81
Demographic characteristics						
Age						
10-year increase	2.21**	1.77 - 2.77	2.34**	2.05 - 2.67	1.64**	1.40 - 1.91
Education						
None	*Ref -1*		*Ref -1*		*Ref -1*	
Primary	0.59*	0.38 - 0.90	0.76	0.57 - 1.02	0.55**	0.42 - 0.72
High school	0.32**	0.15 - 0.65	0.47**	0.31 - 0.71	0.50*	0.29 - 0.86
College or beyond	0.29**	0.13 - 0.62	0.44**	0.31 - 0.64	0.56	0.30 - 1.05
Household Poverty						
CHI < Federal Poverty Line	0.92**	0.89 - 0.94	0.97**	0.96 - 0.98	0.99	0.97 - 1.02
Marriage and civil partnerships						
Never married	*Ref -1*		*Ref -1*		*Ref -1*	
Long term, male partner	1.74**	1.21 - 2.51	1.61**	1.23 - 2.10	1.09	0.54 - 2.23
Married to female partner	2.97**	1.80 - 4.90	2.82**	2.17 - 3.67	1.70**	1.20 - 2.41
Long term, transgender partner	0.66	0.25 - 1.73	0.76	0.52 - 1.11	0.07	0.00 - 1.07
Not married or in a relationship	5.66**	1.89 - 17.00	4.95**	2.87 - 8.54	2.47**	1.35 - 4.53

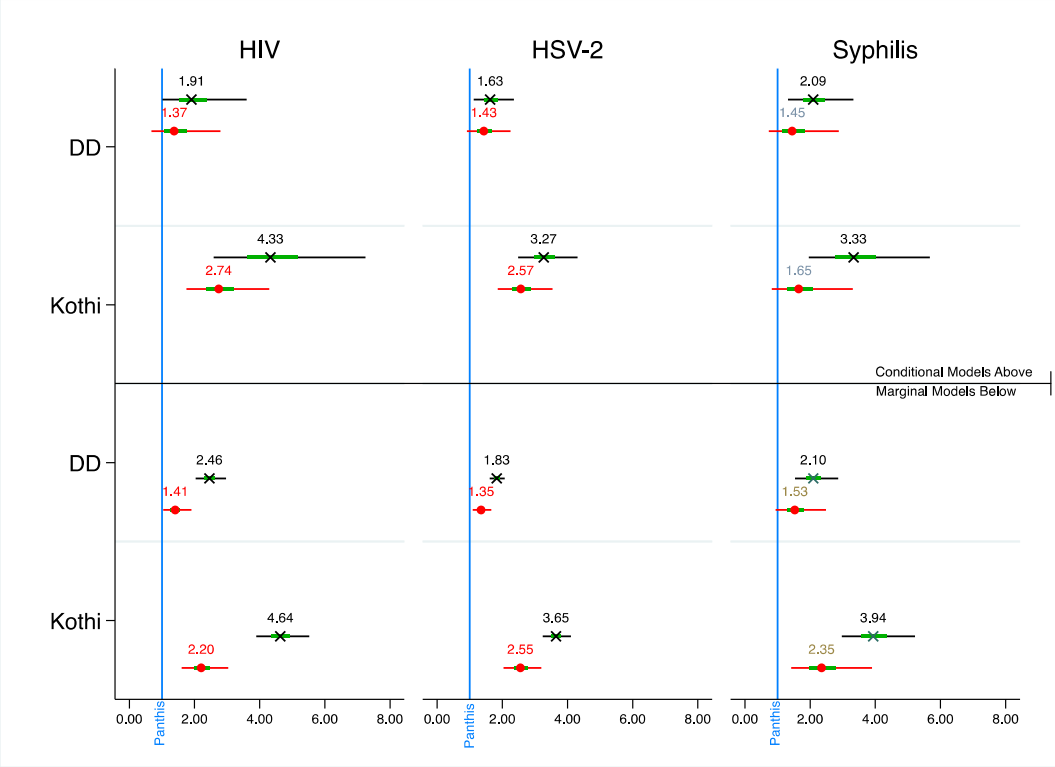
Odds Ratios and 95% confidence intervals. All estimates are conditional on a random intercept of the outcome to account for significant clustering effects by site. Confidence intervals are built with robust standard errors.

Table 10 Multivariable predictors of HIV, HSV-2 and syphilis

	HIV		HSV-2		Syphilis	
	OR	95% CI	OR	95% CI	OR	95% CI
Main predictor						
Gender/Sexual Identity						
Panthi	*Ref -1*		*Ref -1*		*Ref -1*	
DD	1.41*	1.04 - 1.91	1.35**	1.09 - 1.66	1.53	0.94 - 2.49
Kothi	2.20**	1.60 - 3.03	2.55**	2.04 - 3.20	2.35**	1.42 - 3.90
Behavioral practices						
Type of sexual practice with males						
Insertive only	*Ref -1*		*Ref -1*		*Ref -1*	
Receptive only	1.02	0.72 - 1.46	0.71**	0.55 - 0.91	0.94	0.55 - 1.61
Insertive/receptive situationally	1.33	0.99 - 1.80	1.02	0.83 - 1.24	1.15	0.72 - 1.83
Lifetime male sexual partnerships						
<5	*Ref -1*		*Ref -1*		*Ref -1*	
6-15	1.23	0.93 - 1.62	1.27*	1.06 - 1.53	1.25	0.78 - 1.98
16-60	1.59**	1.23 - 2.06	1.97**	1.66 - 2.34	2.10**	1.40 - 3.17
61-300	2.77**	2.12 - 3.61	2.66**	2.20 - 3.23	3.00**	1.95 - 4.61
300 or +	3.65**	2.74 - 4.86	2.32**	1.86 - 2.89	3.03**	1.90 - 4.84
Sexual or drug-related behavior						
Sex work vs. no sex work	2.39**	1.65 - 3.45	3.21*	2.28 - 4.53	1.02	0.55 - 1.88
History of IDU vs. no history	3.61**	2.17 - 5.99	0.70	0.41 - 1.20	1.20	0.43 - 3.34
High vs. low risk drinking	0.56**	0.48 - 0.66	0.70**	0.62 - 0.79	0.65**	0.50 - 0.84
Circumcised vs. not	0.76*	0.61 - 0.96	1.02	0.87 - 1.19	1.39*	1.04 - 1.87
Demographic characteristics						
Age						
10-year increase	1.74**	1.59 - 1.91	1.85**	1.71 - 1.99	1.28**	1.11 - 1.47
Education						
None	*Ref -1*		*Ref -1*		*Ref -1*	
Primary	0.81*	0.68 - 0.98	0.84*	0.73 - 0.97	0.67**	0.50 - 0.89
High school	0.47**	0.36 - 0.63	0.67**	0.55 - 0.81	0.63*	0.42 - 0.94
College or beyond	0.72**	0.56 - 0.92	0.75**	0.62 - 0.90	0.7	0.49 - 1.01
Household Poverty						
CHI < Federal Poverty Line	1.13	0.87 - 1.47	1.29*	1.06 - 1.58	1.13	0.75 - 1.70
Marriage and civil partnerships						
Never married	*Ref -1*		*Ref -1*		*Ref -1*	
Long term, male partner	0.92	0.67 - 1.25	1.24	1.00 - 1.54	1.38	0.91 - 2.09
Married or long term female partner	1.47**	1.21 - 1.78	1.38**	1.20 - 1.60	1.24	0.92 - 1.67
Long term, transgender partner	1.65	0.39 - 7.05	1.25	0.48 - 3.28	1.81	0.24 - 13.60
Not married or in a relationship	2.37**	1.56 - 3.58	1.51*	1.04 - 2.19	1.29	0.62 - 2.68

Odds Ratios and 95% confidence intervals. All models included a random intercept of the outcome to account for significant clustering effects by site. Effects are marginal (not conditional). Confidence intervals are built with robust standard errors.

Figure 11 Summary of univariable (black X) vs. multivariable (red circle) Odds Ratios for STIs estimated with conditional (top) vs. marginal (bottom) models for HIV, HSV-2 and syphilis by gender/sexual identity in India. The blue line marks the odds of infection of the reference group (*Panthis*).



** The green area denotes the middle 50% of the confidence interval.*

In **Figure 11**, we have summarized the findings relating to the association between gender/sexual identity and 3 STIs (HIV, HSV-2 and syphilis). Briefly, the point estimates for the Odds Ratio comparing *Kothis* to *Panthis* are generally larger in magnitude than the Odds Ratios comparing *Double-Deckers* to *Panthis*, indicating higher odds of HIV, HSV-2 and syphilis for *Kothis* compared to the other identities.

Concurrent infections of HIV, HSV-2 and syphilis:

In univariable analyses, compared to *Panthis*, *Kothis* had higher odds of HIV/HSV-2 co-infection (6.21, 4.98-3.49), HIV/syphilis co-infection (8.61, 4.88-15.19), HSV-2/syphilis co-infection (5.19, 3.62-7.42), and HIV/HSV-2/syphilis triple infection (13.86, 7.12-27.0).

Double-Deckers had higher odds HIV/HSV-2 co-infection (2.75, 2.16-3.50), HIV/syphilis co-infection (OR 3.14, 95% CI 1.67-5.90), HSV-2/syphilis (2.15, 1.43-3.23) and HIV/HSV-2/syphilis triple infection (4.40, 2.13-9.11).

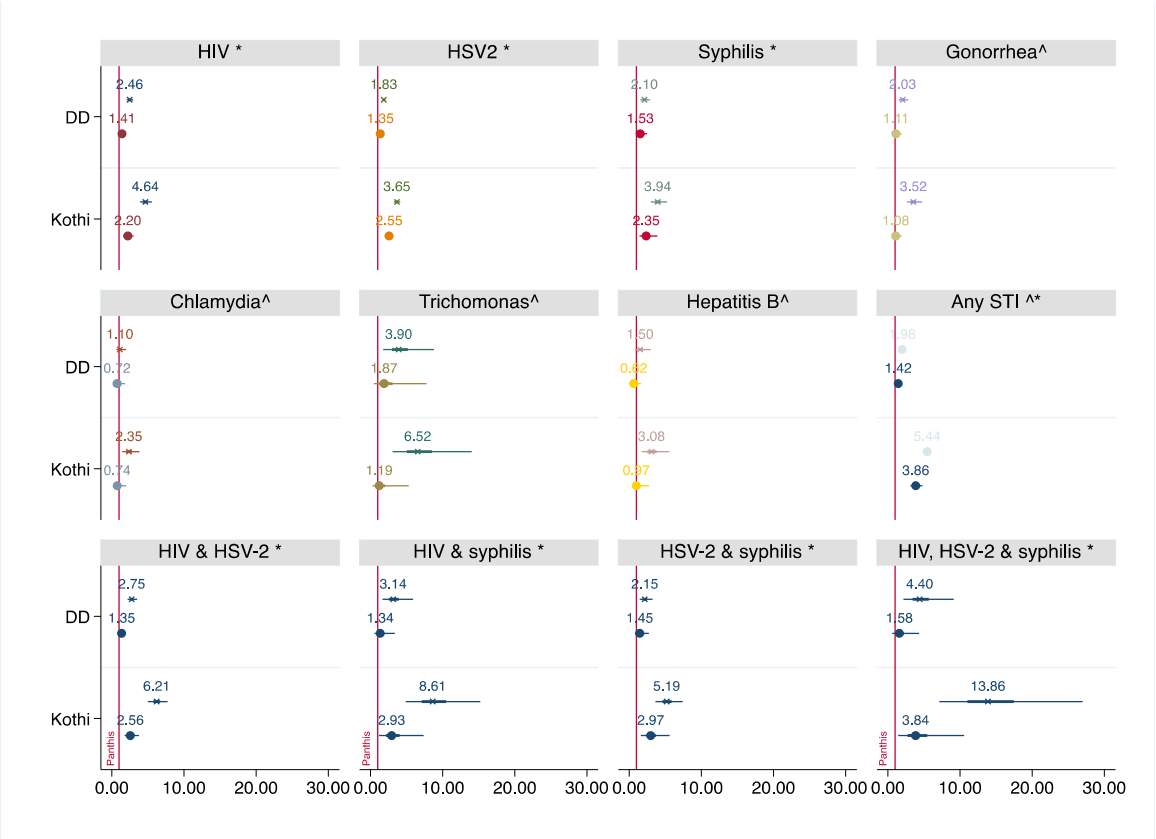
In multivariable models, *Kothis* had higher odds of HIV/HSV-2 co-infection (2.56, 1.74-3.75), HIV/syphilis co-infection (2.93, 1.17-7.34), HSV-2/syphilis co-infection (2.97, 1.58-5.59), and HIV/HSV-2/syphilis (3.84, 1.40-10.56). In contrast, in multivariable models, coinfections were not significantly different for *Double-Deckers* compared to *Panthis*.

12 types of sexually transmitted [co] infections by gender/sexual identity:

Figure 13 highlights univariable and multivariable marginal models describing the odds of different types of sexually transmitted infections as well as co-infections based on gender/sexual identity.

In univariable models, *Kothis* have significantly higher odds of all STIs and co-infections compared to *Panthis*. In multivariable models, such differences persist for *Kothis* except for self-reported STIs, which tend to have larger confidence intervals compared to STIs ascertained via serology.

Figure 12 Univariable (X) and multivariable (Circle) Odds Ratios of the association between subgroups of men with different gender/sexual identities and Sexually Transmitted Infections and co-infections.



The asterisk (*) in the figure denotes STIs ascertained using serum markers (immunological and serological). The caret sign (^) denotes STIs that were self-reported by participants.

The associations for *Double-Deckers* in univariable models are smaller in magnitude than that of *Kothis* when compared to *Panthis*. In multivariable models, most differences between *Double-Deckers* and *Panthis* are not statistically significant.

Gender/sexual identity and the social determinants of health

We analyzed the association between gender/sexual identity and several social determinants of health including 1) belonging to a household under federal poverty, 2) unemployment, 3) sex work, 4) no primary education, 5) inability to secure protected housing (homelessness and living in a slum), and 6) inability to subsidize basic necessities (monthly and daily over the past year).

For *Double-Deckers,* the odds of belonging to households in federal poverty, the odds of unemployment, the odds of homelessness, and the odds of living in a slum were not statistically different compared to *Panthis.* On the other hand, the odds of having no primary education were significantly lower for *Double-Deckers* compared to *Panthis* (OR 0.67, 95% CI 0.59-0.76) while the odds of sex work were significantly higher for *Double-Deckers* compared to *Panthis* (OR 6.59, 95% CI 1.89-22.9). *Double-Decker*s also had higher odds of being unable to afford basic needs every month for the past year compared to *Panthis* (OR 1.27, 95% CI 1.14-1.43).

For *Kothis,* the odds of belonging to a household in federal poverty or the odds of living in a slum were not statistically different compared to *Panthis.* The odds of having no primary education and the odds of homelessness were significantly lower for *Kothis* compared to *Panthis* ($OR_{\text{no education}}$ 0.88, 95% CI 0.78-0.98; $OR_{\text{homelessness}}$ 0.65, 95% CI 0.45-0.92). Compared to *Panthis, Kothis* had higher odds of being unable to afford basic needs every *month* for the past year (OR 1.31, 95% CI 1.17-1.47) as well as every *day* for the past year (OR 2.15, 95% CI 1.67-2.77). We analyzed the odds of sex work (for completion) but regression analysis was not required to evaluate this association. Models between sex work and sexual identity were unstable due to the high predisposition of one

identity to house most sex workers. *Kothis* had significantly higher odds of sex work compared to *Panthis* (OR 109.41, 95% CI 34.97-342.24). The magnitude of this OR favoring *Kothis* and the large standard error are a result of the minimal reports of sex work among *Panthis*. Among 234 participants who reported sex work, 3 were *Panthis*, 14 were *Double-Deckers* and the large majority (217) were *Kothis*. However, while most sex workers were *Kothis*, the large majority (92.29%) of *Kothis* were <u>not</u> sex workers.

Table 11 Association between sexual/gender identity and other social determinants of health

	Double-Deckers vs. Panthis		*Kothis vs. Panthis*		*Was the social variable statistically associated with higher odds of HIV, HSV-2 or syphilis?*		
Social Variables	OR	95% CI	OR	95% CI	HIV	HSV-2	Syphilis
Education, occupation & unemployment							
Collective Household income in federal poverty[1]	0.90	0.74 – 1.09	0.96	0.80 – 1.16	Yes	Yes	No
Unemployment	1.21	0.93 – 1.56	1.31*	1.02 – 1.69	No	No	No
Sex worker	6.59*	1.89 – 22.9	109.41**	34.97 – 342.24	Yes	Yes	Yes
No primary school	0.67**	0.59 - 0.76	0.88*	0.78 – 0.98	Yes	Yes	Yes
Housing, travel & economic Insecurity							
Housing							
Homeless	0.80	0.57 - 1.12	0.65*	0.45 – 0.92	No	No	No
Lives a slum	0.82	0.48 – 1.41	1.01	0.61 – 1.67	No	No	No
Cannot afford basic needs							
Every month (past yr.)	1.27**	1.14 - 1.43	1.31**	1.17 - 1.47	Yes	Yes	Yes
Nearly every day (past yr.)	1.21	0.90 - 1.61	2.15**	1.67 - 2.77	Yes	Yes	No

* Homeless: lives on the street, in a park, in a bus station, etc.

\Gender/sexual identity and STI behavioral risk factors

We analyzed variables related to 1) sex with women, 2) sex with men, and 3) other behaviors, including condom use, injection drug use, paying for sex, or selling of sex. *Note*: the number of partners in the following analysis has been rounded down to the next integer.

Sex with women: Compared to *Panthis*, Kothis had lower odds of having sex with a woman in their lifetime (OR 0.11; 0.10, 0.13) and had fewer overall female partners (11 fewer female partners; 95% -13, -8). *Double-Deckers* also had lower odds of having sex with a woman in their lifetime (OR 0.64; 0.57, 0.72) and had fewer overall female partners (4 fewer female partners; 95% -5, -2).

Age of initiation with other men: Compared to *Panthis*, for *Kothis*, the age of first **oral** sex with other men was 1.99 years earlier (-2.28, -1.70), the age of first **insertive** anal sexual intercourse with other men 2.30 years earlier (-2.65, -1.95), and the age of first **receptive** anal sexual intercourse with other men was 4.81 years later (4.33, 5.30). For *Double-Deckers*, the age of first **oral** sex with other men was not statistically different, the age of first **insertive** anal sexual intercourse with other men was 0.28 years later (0.01-0.54), and the age of first **receptive** anal sexual intercourse with other men was 7.34 years later (6.85, 7.82).

Number of sexual partners with other men: Compared to *Panthis*, for *Kothis*, the number of **lifetime** male sexual partners (after excluding sex) workers was 216 more male partners (205, 227), the number of total (casual and regular) male partners **in the last 6 months** was 20 more (18, 22). For *Double-Deckers*, the number of **lifetime** male sexual

partners (after excluding sex) workers was 216 more male partners (95% 205, 227), the number of male total (casual and regular) male partners **in the last 6 months** was 5 more (3, 7).

Other risk behaviors (condom use, injection drug use, selling/purchasing sex): To understand if there is heterogeneous exposure to risk behaviors associated with gender/sexual identity, we estimated univariable associations for 1) condom use, 2) injection drug use, 3) use of drugs before sex and 3) history of paying or selling of sex transactionally. Additional estimates are shown in **Table 12**.

Compared to *Panthis,* Kothis had higher odds of always using condoms with casual partners (OR 1.44; 95% CI 1.21, 1.72), lower odds of using injection drugs in a participant's lifetime (OR 0.62; 95% CI 0.39, 0.99) and lower odds of (sometimes or always) using drugs before sex with the prior 4 sexual partners (OR 0.53; 95% CI 0.46, 0.62). These differences were not statistically different between *Double-Deckers* and *Panthis.* In terms of transactional sex, compared to *Panthis,* the odds of ever receiving money, alcohol, drugs, gifts or food for sex was 2.42 times higher for *Double-Deckers* (95% CI 2.16, 2.73) and 6.01 times higher for *Kothis* (95% CI 5.36 – 6.74). In contrast, compared to *Panthis,* the odds of ever giving money, alcohol, drugs, gifts or food for sex was 0.43 times lower for *Kothis* (95% CI 0.69 – 0.79). There was no difference between *Double-Deckers* and *Panthis* in terms of buying of sex.

Table 12 Association between sexual/gender identity and behavioral and age-related determinants of sexual health

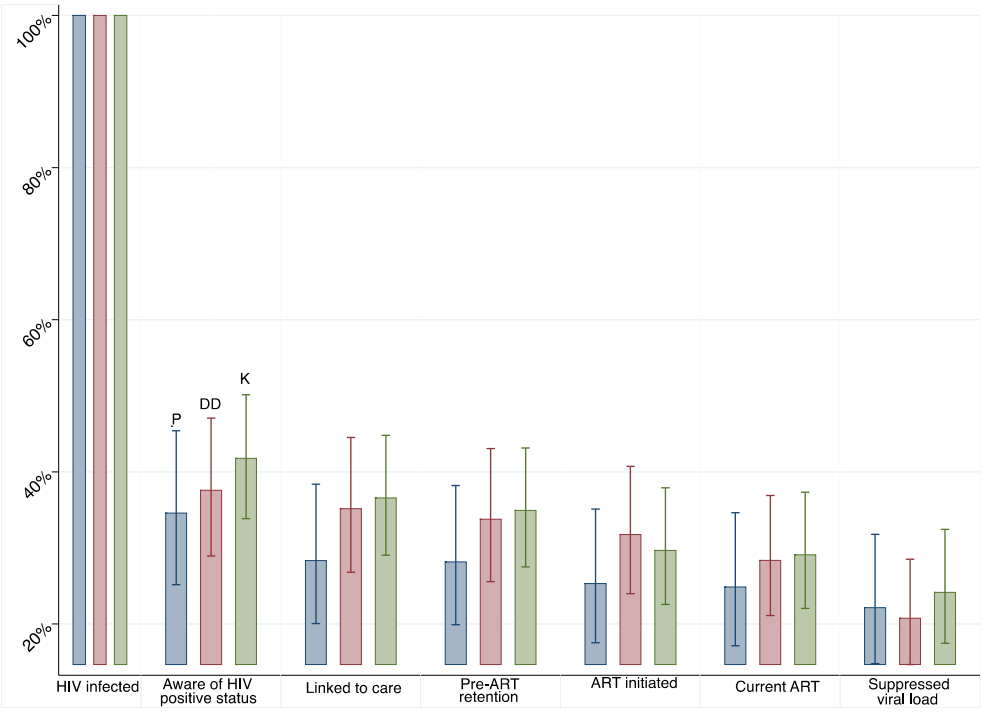
	Double-Deckers vs. Panthis		*Kothis vs. Panthis*	
Behavioral Variables	Odds Ratio *or* Δ*	95% CI	Odds Ratio *or* Δ*	95% CI
Sex with women				
Odds of sex with women	0.64**	0.57, 0.72	0.11**	0.10, 0.13
Age of first sexual encounter with women	1.45**	1.21, 1.60	2.64**	2.34, 2.95
Number of female partners, lifetime ^ *	- 4 **	- 5, - 2	-11 **	- 13, - 8
Number of female partners, last 6 months ^ *	-1**	-1, -1	-2 **	- 2, - 2
Sex with men				
Age of first ***oral*** sex with other men	0.19	-0.10, 0.48	-1.99**	-2.28, -1.70
Age of first ***insertive anal*** sex with other men	0.28*	0.01, 0.54	-2.30**	-2.65, -1.95
Age of first ***receptive anal*** sex with other men	7.34	6.85, 7.82	4.81**	4.33, 5.30
Number of ***total*** male partners ***excluding*** sex workers, lifetime ^*	55 **	44, 65	216 **	205, 227
Number of ***total*** male partners *including* sex workers, lifetime ^*	57 **	45, 68	239 **	228, 250
Number of ***total*** male partners ***excluding*** sex workers, last 6 months ^*	5 **	3, 7	20 **	18, 22
Number of ***total*** male partners including sex workers, last 6 months ^*	5 **	3, 7	25 **	23, 27
Number of ***casual*** male partners ***excluding*** sex workers, last 6 months ^ *	7 **	2, 12	29 **	24, 33
Number of ***casual*** male partners including sex workers, last 6 months ^ *	7 **	1, 14	35 **	30, 41
Number of ***regular*** male partners ***excluding*** sex workers, last 6 months ^ *	1 **	1, 2	2 **	2, 3
Number of ***regular*** male partners including sex workers, last 6 months ^ *	1 **	1, 2	2 **	1, 4
Odds of other behaviors				
Always using condoms with casual male partners	0.95	0.78, 1.15	1.44*	1.21, 1.72
Always using condoms with regular partners	0.91	0.74, 1.13	1.10	0.74, 1.13
Ever injecting drugs	1.03	0.69, 1.54	0.62*	0.39, 1.00
Sometimes or always using drugs before sex with past 4 partners	0.88	0.76, 1.03	0.53**	0.46, 0.62
Ever receiving money, alcohol, drugs, gifts or food for sex (excluding sex workers)	2.42**	2.16, 2.73	6.01**	5.36, 6.74
Ever giving money, alcohol, drugs, gifts or food for sex	0.95	0.86-1.05	0.43**	0.69, 0.79

* For continuous variables, the regression model estimates the difference (Δ) in the average value of the outcome of interest (i.e. difference in the average number of partners)
^ We have chosen to present the number of partners rounded down to the next integer for non-sex work

Gender/sexual identity among HIV-infected men

Previous sections focused on the correlates of HIV, HSV-2, and syphilis and included infected and uninfected participants. In this section, we focus only on HIV-infected men and exclude those without HIV. HIV-infected individuals are key to the control of the epidemic but they must be appropriately linked to HIV care. The HIV care continuum is a complex, multi-stage, life-long endeavor. We examined if gender/sexual identity affects progression of participants through the care continuum.

Figure 13 Human immunodeficiency virus (HIV) care continuum for 1,022 HIV-infected men with different gender/sexual identities.



P=Panthis (blue); *DD=Double-Deckers* (pink); *K= Kothis* (green)

There were no statistically significant differences within (or across) stages of the HIV continuum by gender/sexual identity. In terms of descriptive statistics, unadjusted participation rate across the HIV continuum favored *Kothis* in nearly all stages (apart from ART initiation), followed by *Double-Deckers* and last followed by *Panthis*.

CHAPTER 5:

Heterogeneity in sexual rights and human rights

General methodology:

The survey instrument used during the main trial collected information related to the life experiences of participants in various domains (including work, home, and healthcare settings). While this survey was not originally intended to review Human Right violations, several items in the survey reflect adverse experiences (discrimination, violence, and stigma) that suggest human rights violations.

The WHO has adapted a subset of the articles listed in the Universal Declaration of Human Rights (UDHR) to promote equality in sexuality and sexual health. WHO Sexual Rights were previously listed in Chapter 1 (*See section on* Gender, Human Right) and are publicly described online:

http://www.who.int/reproductivehealth/topics/sexual_health/sh_definitions/en/

The statistical methodology for the analysis has been reviewed in Chapter 3. This chapter will involve regression analysis (adjusted for age) using marginal models adjusting for clustering of participants with sites. Within each Sexual Right, we have selected items from the study's original survey that will serve as the outcomes of interest in each regression.

Sexual Right #1: The right to equality and non-discrimination

The right to equality and non-discrimination is linked to Article #7 in the Universal Declaration:

"All are equal before the law and are entitled without any discrimination to equal protection of the law. All are entitled to equal protection against any discrimination in violation of this Declaration and against any incitement to such discrimination."

To analyze differences in the experience of *equality* and *non-discrimination*, we have chosen selected items in the survey explicitly referring to discrimination in healthcare and housing using 4 items. The answers that were accepted for inclusion in the analysis of this sexual right are also provided.

Healthcare discrimination due to gender/sexual identity

- **Item #1.1**
  Q: How often has a hospital worker mistreated you because you are MSM?
  A: "Frequently"

- **Item #1.2**
  Q: How often have you been refused medical care or denied hospital services because you are MSM?
  A: "Frequently"

Housing and family discrimination due to gender/sexual identity

- ***Item #1.3:***
  Q: How often have family members forced you to move out of your home because you are MSM?
  A: "Frequently"

- **Item #1.4:**
  Q: How often have you been refused housing because people suspect that you are MSM?
  A: "Frequently"

Univariable models for sexual right #1

Compared to *Panthis*, *Kothis* had 4.59 (95% CI 3.54, 5.94) times higher odds of frequently being mistreated by a hospital worker, 5.08 (3.79, 6.80) times higher odds of frequent refusal of medical care or denial of hospital services, 4.86 (3.79, 6.23) times higher odds of frequently being forced to move out of one's home by a family member, and 5.49 (4.20, 7.16) times higher odds of frequently being refused housing due to being MSM.

Double-Deckers instead had 1.41 (95% CI 1.03, 1.93) times higher odds of frequently being mistreated by a hospital worker, 1.60 (1.13, 2.27) times higher odds of frequently refused medical care or denied hospital services, 1.67 (1.25, 2.24) times higher odds of frequently being forced to move out of one's home by a family member and 1.59 (1.16, 2.20) times higher odds of frequently being refused housing due to being MSM.

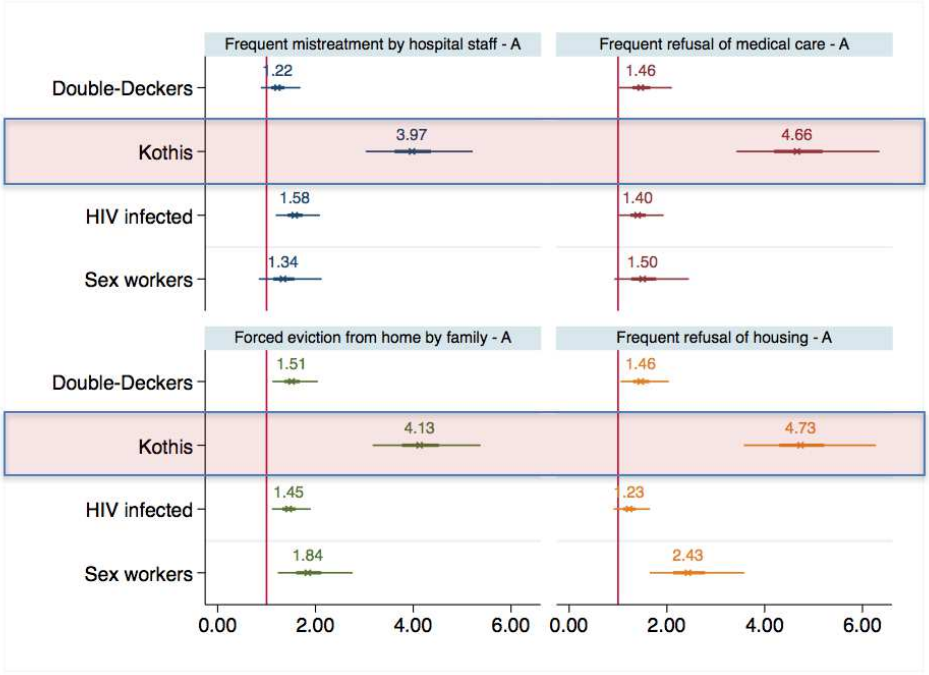
Multivariable models for sexual right #1

After adjustment for social factors (age, education, family income, unemployment) and factors that are potentially stigmatizing in India (injection drug use, HIV serostatus, and sex work), compared to *Panthis*, *Kothis* had 3.97 (95% CI 3.03, 5.22) times higher odds of frequently being mistreated by a hospital worker, 4.66 (3.42, 6.35) times higher odds of frequently being refused medical care or denied hospital services, 4.13 (3.17, 5.38) times higher odds of frequently being forced to move out of one's home by a family member, and 4.73 (3.57, 6.28) times higher odds of frequently being refused housing due to being MSM.

Double-Deckers instead had 1.46 (95% CI 1.02, 2.10) times higher odds of frequently refused medical care or denied hospital services, 1.51 (1.12, 2.05) times higher

odds of frequently being forced to move out of one's home by a family member and 1.46 (1.05, 2.04) times higher odds of frequently being refused housing due to being MSM.

Figure 14 Multivariable associations between gender/sexual identity and violations of the right to equality and non-discrimination (Article 7 of the Universal Declaration of Human Rights).
Odds Ratios and 95% Confidence Intervals.



* The reference line is unlabeled because it is specific to each comparison group. *Kothis* and *Double-Deckers* are compared to *Panthis*, HIV infected are compared to uninfected men, and sex workers are compared to non-sex workers. Two additional subgroups (HIV infected and sex workers) are shown since they are known to be stigmatized in India and are therefore at high risk of human right abuses but they are not discussed in the text since the focus of this thesis is gender/sexual identity. *Kothis* have higher Odds Ratios compared to all other subgroups (including those not shown in the graph: unemployed, injection drug users, low education, low family income). All associations are adjusted estimates.

Sexual Right #2:

The right to be free from degrading treatment

The right to be free of inhumane treatment is linked to Article #5 in the Universal Declaration:

"No one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment"

We analyzed differences in the experience of *violence, abuse and degrading treatment* using selected items explicitly referring to fear of abuse, threats, serious physical violence, and sexual violence in healthcare and home.

Fear, violence, abuse and mistreatment related to gender/sexual identity status

- **Item #2.1:**
  Q: How often has someone threatened to hurt you physically because you are MSM?
  A: "Frequently"

Sexual assault, physical violence, intimate partner violence

- **Item #2.2:**
  Q: When you were growing up (before 16 years old), did you experience any serious physical violence? By physical violence, I mean were you ever hit, hit with an object, punched, kicked, or beaten up in a way that resulted in injury, severe pain, or other serious harm?
  A: "*Yes"*
- **Item #2.3:**
  Q: When you were growing up (before 16 years old), did you have any unwanted sexual experiences? By sexual experiences, I mean sexual touching or sexual intercourse (including oral, anal, or vaginal sex)?
  A: "Yes"
- **Item #2.4:**
  Q: Has anyone (including a current or former spouse, boy/girlfriend, family member/relative, friend or other sexual partner) ever tried to make you have sex when you didn't want to?
  A: "Yes"

Univariable models for sexual right #2

Compared to *Panthis*, *Kothis* had 5.79 (95% CI 4.58, 7.31) times higher odds of reporting that others in the community have frequently threatened to hurt the participant for being MSM, 3.80 (3.41, 4.23) times higher odds of experiencing serious physical violence before reaching 16 years of age, 6.69 (5.97, 7.49) times higher odds of having unwanted sexual experiences before reaching 16 years of age and 4.11 (3.67, 4.61) times higher odds of having experiences where an intimate partner attempted to make the participant have unwanted sexual intercourse.

Double-Deckers had 1.73 (1.31, 2.28) times higher odds of reporting that others in the community have frequently threatened to hurt the participant for being MSM, 1.71 (1.52, 1.91) times higher odds of experiencing serious physical violence before reaching 16 years of age, 2.79 (2.49, 7.49) times higher odds of having unwanted sexual experiences before reaching 16 years of age, and 2.31 (2.06, 2.60) times higher odds of having experiences where an intimate partner attempted to make the participant have unwanted sexual intercourse.

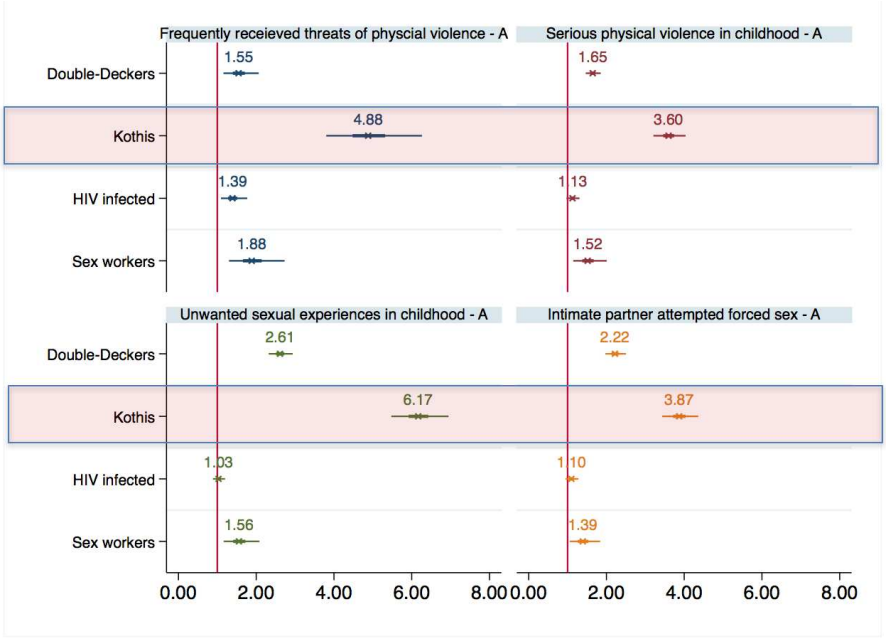
Multivariable models for sexual right #2

After adjustment for social factors and potentially stigmatizing characteristics, compared to *Panthis*, *Kothis* had 4.88 (95% CI 3.80, 6.26) times higher odds of reporting that others in the community have frequently threatened to hurt the participant for being MSM, 3.60 (3.21, 4.04) times higher odds of experiencing serious physical violence before reaching 16 years of age, 6.17 (5.48, 6.95) times higher odds of having unwanted sexual experiences before reaching 16 years of age and 3.87 (3.44, 4.36) times higher odds of having experiences where an intimate partner attempted to make the participant have unwanted sexual intercourse.

Double-Deckers had 1.55 (1.16, 2.06) times higher odds of reporting that others in the community have frequently threatened to hurt the participant for being MSM, 1.65 (1.47, 1.85) times higher odds of experiencing serious physical violence before reaching 16 years of age, 2.61 (2.32, 2.94) times higher odds of having unwanted sexual experiences before reaching 16 years of age, and 2.22 (1.97, 2.50) times higher odds of having experiences where an intimate partner attempted to make the participant have unwanted sexual intercourse.

Figure 15 shows occurrences of physical and psychological abuse, cruelty, violence, and sexual assault (Violations of Sexual Right #2).

Figure 15 Associations between gender/sexual identity and violations of the right to live from torture, cruelty or degrading treatment (Article 5 of the Universal Declaration of Human Rights). Odds Ratios and 95% Confidence Intervals.



* In addition, adjusted for age, education, quintile of family income, & injection drug use

* The reference line is unlabeled because it is specific to each comparison group. *Kothis* and *Double-Deckers* are compared to *Panthis*, HIV infected are compared to uninfected men, and sex workers are compared to non-sex workers. Two additional subgroups (HIV infected and sex workers) are shown since they are known to be stigmatized in India and are therefore at high risk of human right abuses but they are not discussed in the text since the focus of this thesis is gender/sexual identity. *Kothis* have higher Odds Ratios compared to all other subgroups (including those not shown in the graph: unemployed, injection drug users, low education, low family income). All associations are adjusted estimates.

Sexual Right #3:

The right to privacy

The right of human beings to be free from interference with their privacy is linked to Article #12 in the Universal Declaration:

"No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honor and reputation. Everyone has the right to the protection of the law against such interference or attacks."

We analyzed experiences where privacy was threatened or compromised using selected items explicitly referring to decisions made by a participant to protect his privacy (i.e. avoid disclosures) that result in healthcare consequences.

Item # 3.1, 3.2, 3.3: [For participants not tested for HIV]

Q: Have you not been tested…

$A_{3.1}$: because you were worried your name would be reported to the government if you tested positive?

$A_{3.2}$: because you were afraid of someone finding out about the test result?

$A_{3.3}$: because you were afraid of losing your job, insurance, or housing if you tested?

Item # 3.4: [For participants who have needed medical care in the past month]

Q: In the last month, why have you not gotten the medical care that you needed or that was recommended for you?

$A_{3.4}$: I did not want to be seen at a clinic

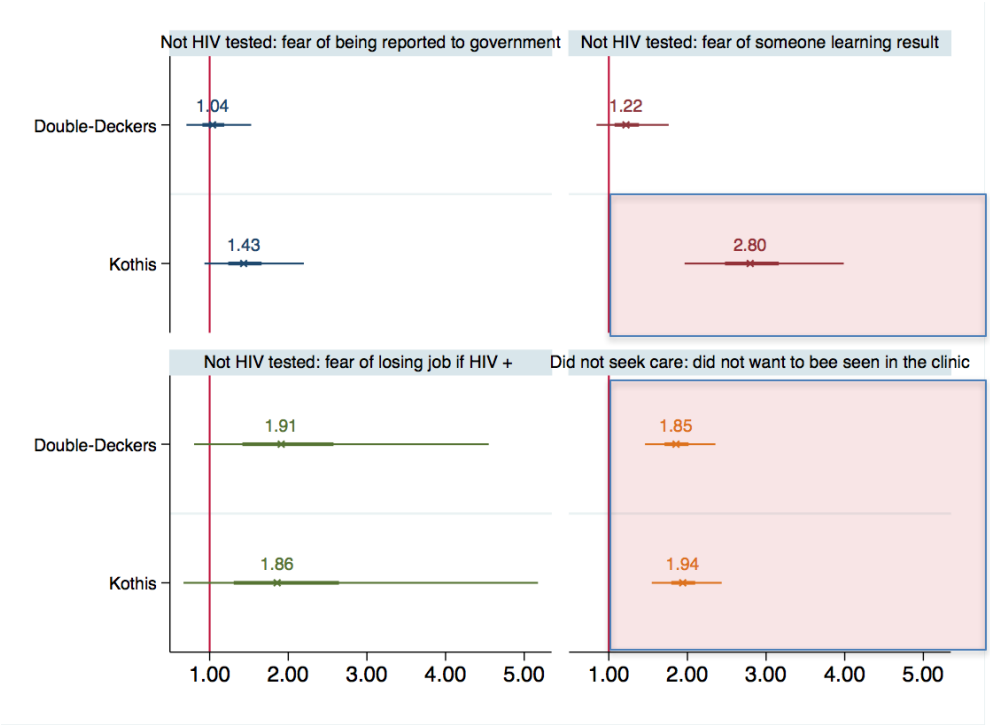
Univariable models for sexual right #3

Compared to *Panthis*, *Kothis* had 2.88 (2.04, 4.05) times higher odds of avoiding HIV testing due to fear of someone else finding out about the test results and 2.05 (1.65, 2.55) times higher odds of failing to seek/obtain medical care due to not wanting to be seen in a clinic. *Double-Deckers* had 2.07 (1.65, 2.61) times higher odds of failing to seek/obtain medical care due to not wanting to be seen in a clinic.

Multivariable models for sexual right #3

After adjustment for social factors and potentially stigmatizing characteristics, compared to *Panthis*, *Kothis* had 2.80 (1.96, 3.99) times higher odds of avoiding HIV testing due to fear of someone else finding out about the test results and 1.94 (1.54, 2.44) times higher odds of failing to seek/obtain medical care due to not wanting to be seen in a clinic. *Double-Deckers* had 1.85 (1.46, 2.36) times higher odds of failing to seek/obtain medical care due to not wanting to be seen in a clinic. All other associations were not statistically significant.

Figure 16 Associations between gender/sexual identity and violations of the right to privacy (Article 12 of the Universal Declaration of Human Rights). Odds Ratios and 95% Confidence Intervals.



* *Kothis* and *Double-Deckers* are compared to *Panthis* (reference line). All associations are adjusted for the factors shown in the figure. These models were not adjusted for HIV status because there might be differential rates of HIV testing reports among those who are HIV positive vs. those who are HIV negative. Therefore, these estimates apply to participants who reported that have not been tested regardless of whether they have HIV or not.

Sexual Right #4:

The right to determine decisions about one's children

The right of human beings to determine decisions about their own children is linked to the 1994 International Conference on Population and Development in Cairo (ICPD) which defined reproductive rights

"...reproductive rights embrace certain human rights that are already recognized in national laws, international human rights documents and other relevant United Nations consensus documents. These rights rest on the recognition of the basic right of all couples and individuals to decide freely and responsibly the number, spacing and timing of their children and to have the information and means to do so, and the right to attain the highest standard of sexual and reproductive health. It also includes the right of all to make decisions concerning reproduction free of discrimination, coercion and violence as expressed in human rights documents. In the exercise of this right, they should take into account the needs of their living and future children and their responsibilities towards the community.' (ICPD Programme of Action 1994, para 7.3)"

We analyzed experiences where a participant's decision-making was affected to have children, to live with children or was a threat to children.

- **Item # 4.1:**
  Q: How many children do you have?
  $A_{4.1}$: 0

- **Item # 4.2:** [For participants who have children]
  Q: Who currently lives with you?
  $A_{4.2}$: Your children

- **Item # 5.3:** [For participants who have children]
  Q: Why have you NOT told your spouse/primary sexual partner that you are an MSM?
  $A_{4.3}$: Fear of not being able to be with children

- **Item # 5.3:**
  Q: How often have you been asked to stay away from children because you are MSM?
  $A_{4.4}$: Frequently

Univariable models for sexual right #4:

Compared to *Panthis*, *Kothis* had 4.49 (3.92, 5.15) higher odds of being told to stay away from children, 1.37 (1.08, 1.34) higher odds of not having children, and 1.37 (1.06, 1.78) higher odds of not living with one's children (for participants who have children).

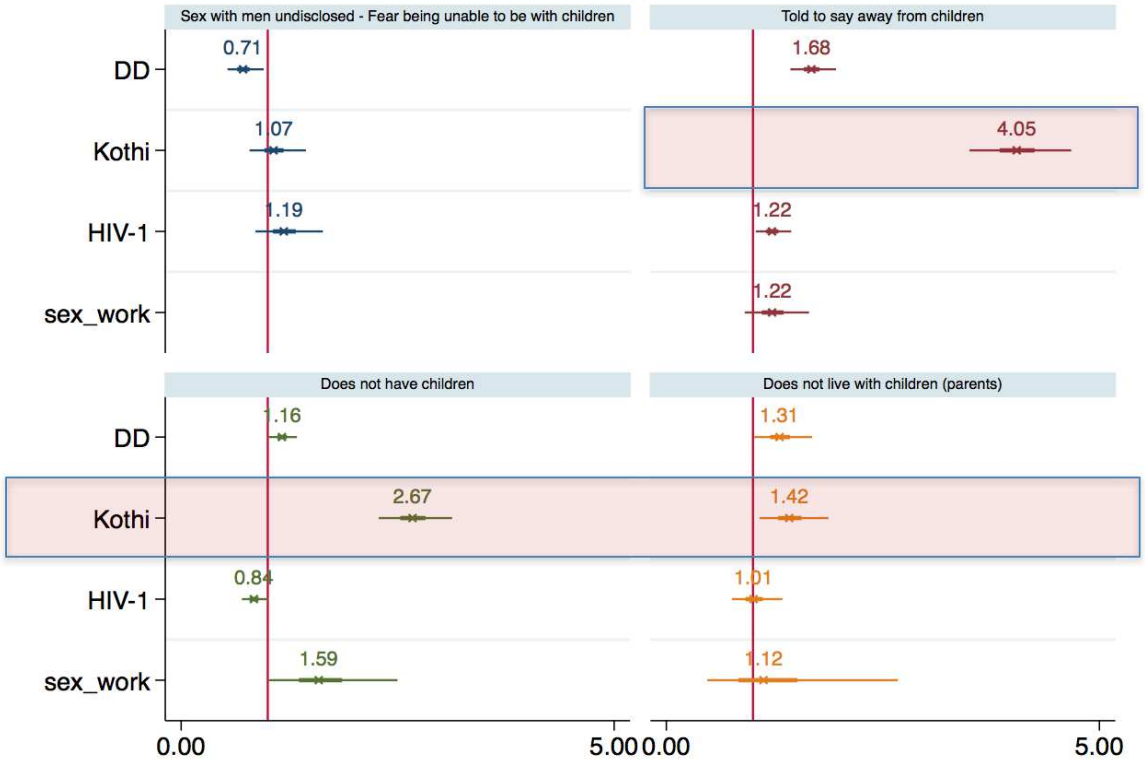
Compared to *Panthis*, *Double-Deckers* had 0.75 (0.57, 0.99) lower odds of not disclosing sex with men to their spouse for fear of being unable to be with their children, 1.84 (1.58, 2.14) higher odds of being told to stay away from children, 0.80 (0.72, 0.89) lower odds of not having children, and 1.28 (1.01, 163) higher odds of not living with one's children (for participants who have children).

Multivariable models for sexual right #4:

After adjustment for social factors and potentially stigmatizing characteristics, compared to *Panthis*, *Kothis* had 4.05 (3.50, 4.67) higher odds of being told to stay away from children, 2.67 (2.28, 3.13) higher odds of not having children, and 1.42 (1.08, 1.87) higher odds of not living with one's children (for participants who have children).

Compared to *Panthis*, *Double-Deckers* had 0.71 (0.54, 0.95) lower odds of not disclosing sex with men to their spouse for fear of being unable to be with their children, 1.68 (1.43, 1.96) higher odds of being told to stay away from children, 1.16 (1.01, 1.34) lower odds of not having children, and 1.31 (1.02, 1.68) higher odds of not living with one's children (for participants who have children).

Figure 17 Associations between gender/sexual identity and violations of the right to determine decisions about one's children. Odds Ratios and 95% Confidence Intervals.



CHAPTER 6:

Effect modification by social stratifiers of the association between gender/identity in STI epidemics and other sexual health outcomes in India

Income and education may increase agency, ability, and privilege and were associated with lower odds of HIV and HSV-2 in previous chapters. There are no published reports analyzing if income or education affect adverse sexual health outcomes for *Kothis* or *Panthis* of different ages. The is also scarce research describing how age, income, education and gender/sexual identity interact to affect sexual health outcomes. The aim of this chapter is to conduct preliminary analyses to understand if the associations between gender/identity and STIs and other adverse sexual health outcomes (estimated in previous aims 1 and 2) differs across strata of age, income, and education. The outcomes for this aim are: 1) HIV infection - medium prevalence epidemic, 2) HSV-2 infection - high prevalence epidemic, 3) frequent healthcare refusal, 4) serious physical violence. The social stratifiers that will be used for this analysis are:

- *Low income:* this term refers to participants who reported per-capita collective household incomes in the 1st or 2nd quartile.
- *High income:* this term refers to participants who reported per-capita collective household incomes in the 4th or 5th quartile. *Note*: for specific information on income quantiles, please see appendix.
- *Low education (no high school):* this term refers to participants who reported that their highest level of education was < grade 12.

- *High school education or beyond:* this term refers to participants who reported that their highest level of education was ≥ grade 12.
- *Younger vs. Older*: We divided the data into 5 quintiles of age. For the purposes of analysis, we arbitrarily define the 1st, 2nd and 3rd quintiles as "younger" participants. The 4th and 5th quartiles are designated as "older" participants. *Note*: for specific information on age quantiles, please see appendix.

The following is the distribution of quantiles for age and income.

Age quantiles (in years)

1. First quintile of age: mean 19.73 years; Range 18-21 years of age
2. Second quintile of age: mean 22.95 years; Range 22-24 years of age
3. Third quintile of age: mean 26.48 years; Range 25-28 years of age
4. Fourth quintile of age: mean 31.81 years; Range 19-35 years of age
5. Fifth quintile of age: mean 43.15 years; Range 36-75 years of age

Income quantiles (in rupees)

1. First quintile of income: mean 928 INR; Range 0-1333 INR
2. Second quintile of income: mean 1748 INR; Range 1340-2000 INR
3. Third quintile of income: mean 2628 INR; Range 2040-3000 INR
4. Fourth quintile of income: mean 4084 INR; Range 3045-5000 INR
5. Fifth quintile of income: mean 10804 INR; Range 5083-225000 INR

Odds of HIV among younger men:

Younger Panthis and HIV: Compared with younger *Panthis* who reported low collective incomes and low education, the odds of HIV infection were significantly reduced if participants reported a high collective household income (OR *younger Panthis* = 0.27, 0.08, 0.88), if participants reported a high school education or beyond (OR *younger*

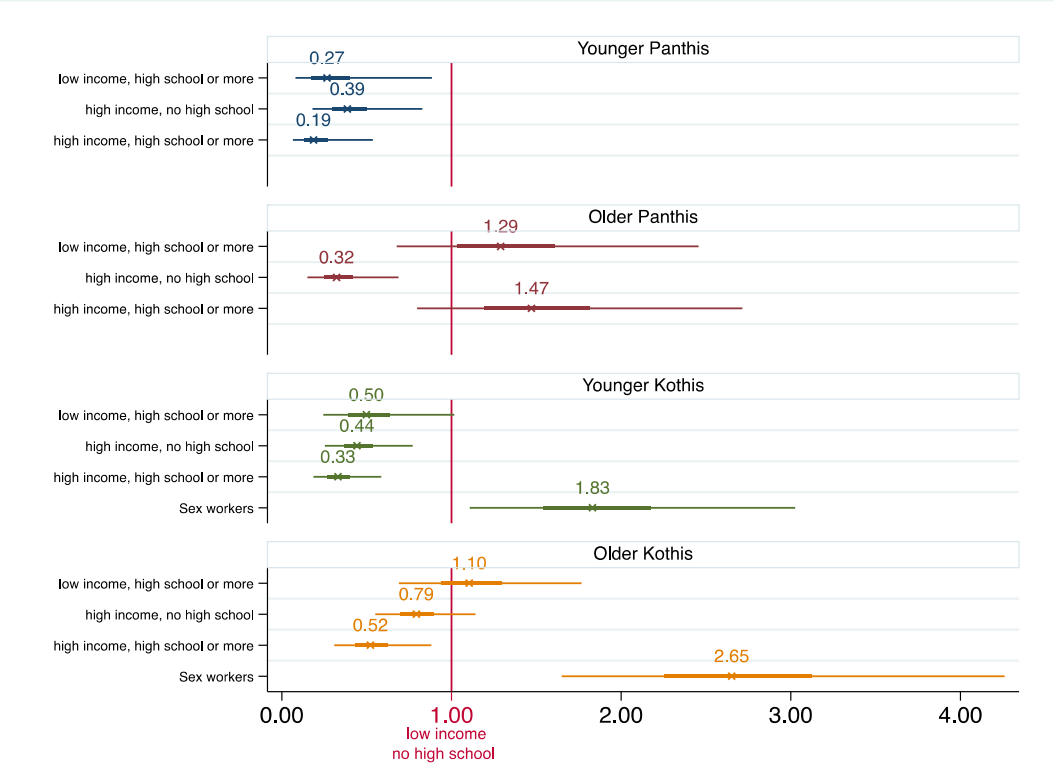
$_{Panthis}$ = 0.39, 0.18, 0.83), or if participants simultaneously reported both a high collective household income and high school education or beyond (OR $_{younger\ Panthis}$ = 0.19, 0.06, 0.54).

Younger Kothis and HIV: Compared with younger *Kothis* who reported low collective incomes and low education, the odds of HIV infection were reduced if participants reported a high school education or beyond (OR $_{young\ Kothis}$ = 0.44, 0.25, 0.77), or if participants simultaneously reported both a high collective household income and high school education or beyond (OR $_{young\ Kothis}$ = 0.33, 0.19, 0.59). The only exception was young *Kothis* who were sex workers, in which case participants had significantly higher odds of HIV infection compared to young non-sex worker *Kothis* reporting low collective incomes and low education (OR $_{young\ sex\ worker\ Kothis}$ = 1.83, 95% CI 1.11, 3.02).

Older Panthis and HIV: Compared with older *Panthis* who reported low collective incomes and low education, the odds of HIV infection were significantly reduced if participants reported a high collective household income (OR $_{older\ Panthis}$ = 0.32, 95% CI 0.15, 0.69).

Older Kothis and HIV: Compared with older *Kothis* who reported low collective incomes and low education, the odds of HIV infection were reduced if participants simultaneously reported both a high collective household income and high school education or beyond (OR $_{older\ Kothis}$ = 0.52, 95% CI 0.31, 0.88). The only exception was older *Kothis* who were sex workers, in which case participants had significantly higher odds of HIV infection compared to older non-sex worker *Kothis* reporting low collective incomes and low education (OR $_{older\ sex\ worker\ Kothis}$ = 2.65, 95% CI 1.65, 4.26).

Figure 18 Intersectionality of collective household income (per capita), age, sex work occupation, and education in the association between gender/identity and HIV infection



Odds of HSV-2 based on different intersections of social determinants

<u>*Younger Panthis and HSV-2:*</u> Compared with younger *Panthis* who reported low collective incomes and low education, the odds of HSV-2 infection were significantly reduced if participants reported a high school education or beyond (OR $_{younger\ Panthis}$ = 0.44, 95% CI 0.24, 0.79) or if participants simultaneously reported both a high collective household income and high school education or beyond (OR $_{younger\ Panthis}$ = 0.62, 95% CI 0.42, 0.95).

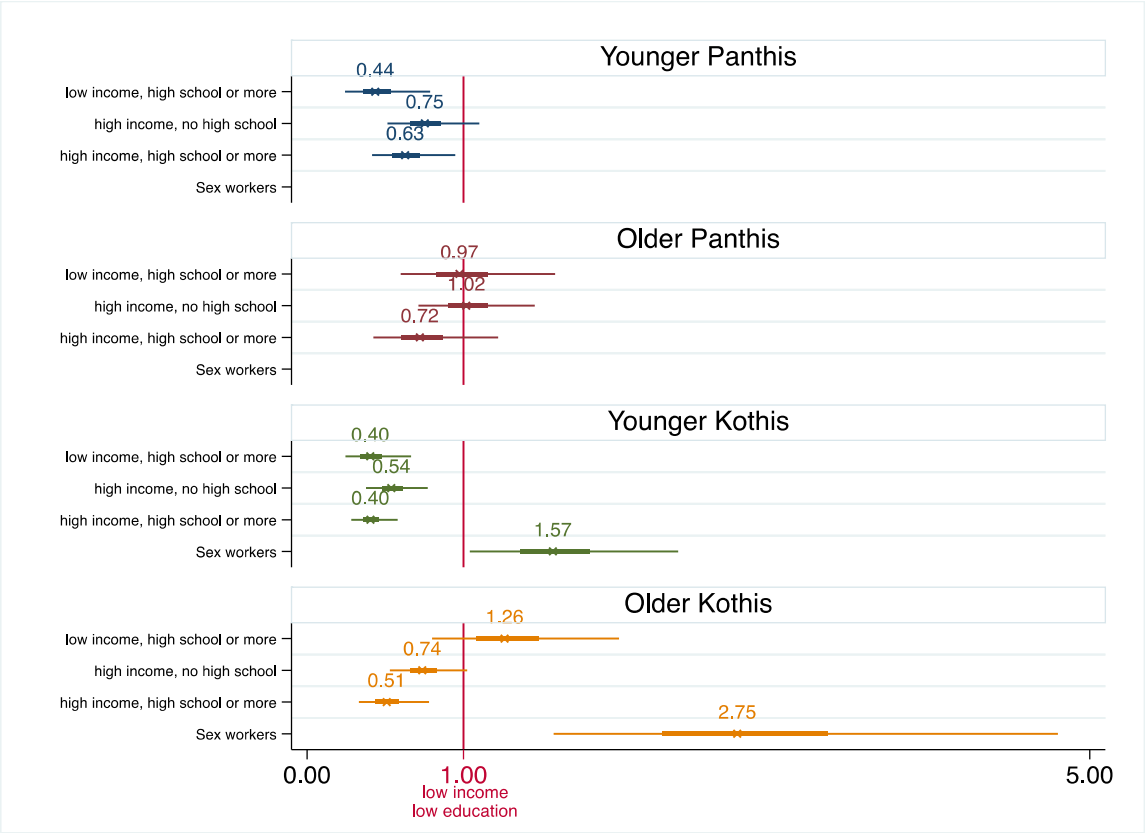
<u>*Younger Kothis and HSV-2:*</u> Compared with younger *Kothis* who reported low collective incomes and low education, the odds of HSV-2 infection were reduced if participants reported a high school education or beyond (OR $_{younger\ Kothis}$ = 0.40, 95% CI

0.25, 0.66), if participants reported a high collective household income (OR $_{younger\ Kothis}$ = 0.54, 95% CI 0.38, 0.77), or if participants simultaneously reported both a high collective household income and high school education or beyond (OR $_{younger\ Kothis}$ = 0.40, 95% CI 0.28, 0.58). The only exception was young *Kothis* who were sex workers, in which case participants had significantly higher odds of HSV-2 infection compared to young non-sex worker *Kothis* reporting low collective incomes and low education (OR $_{younger\ sex\ worker\ Kothis}$ = 1.83, 95% CI 1.11, 3.02).

Older Panthis and HSV-2: There were no significant differences in the odds of HSV-2 infection between the income and education categories for older *Panthis*.

Older Kothis and HSV-2: Compared with older *Kothis* who reported low collective incomes and low education, the odds of HSV-2 infection were reduced if participants simultaneously reported both a high collective household income and high school education or beyond (OR $_{older\ Kothis}$ = 0.51, 95% CI 0.33, 0.78). In contrast, older *Kothis* who were sex workers had significantly higher odds of HSV-2 infection compared to older non-sex worker *Kothis* reporting low collective incomes and low education (OR $_{older\ sex\ worker\ Kothis}$ = 2.75, 95% CI 1.57, 4.79).

Figure 19 Intersectionality of collective household income (per capita), age, sex work occupation, and education in the association between gender/identity and HSV-2 infection



Odds of healthcare refusal based on different intersections of social determinants

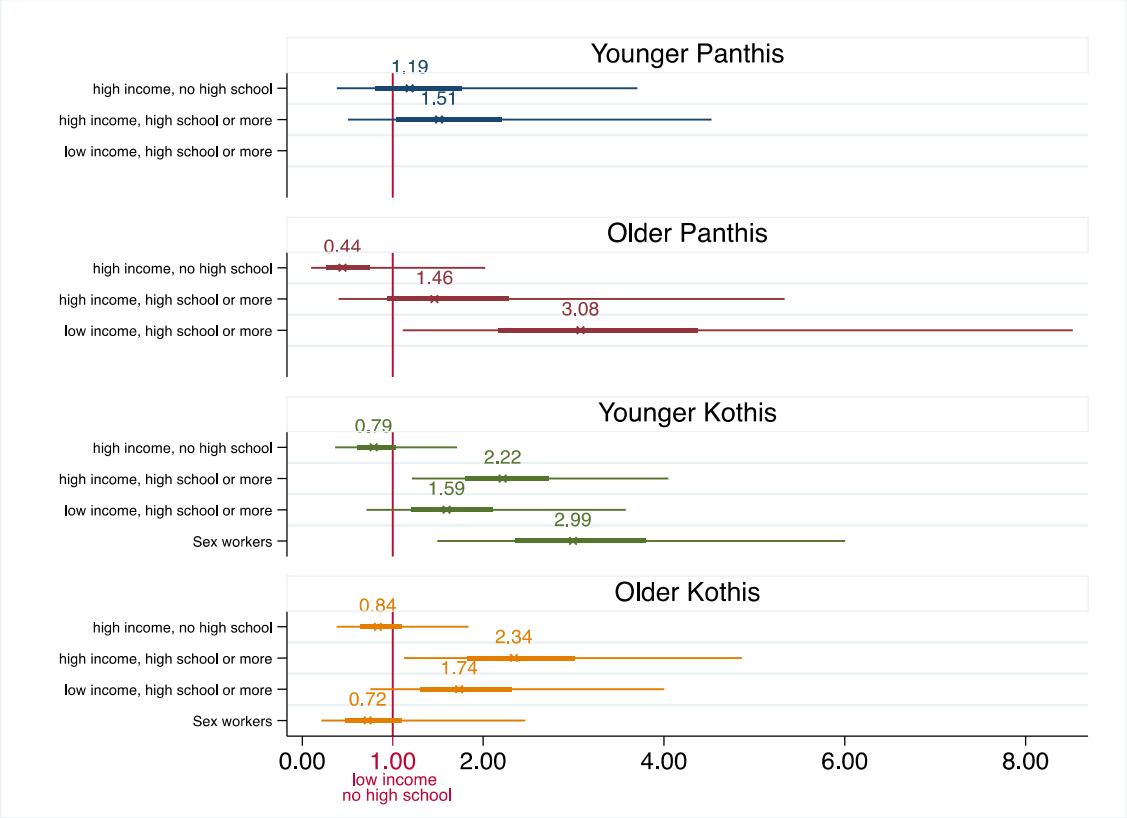
Younger Panthis and healthcare refusal: There were no significant differences in the odds of healthcare refusal between income/education categories for younger *Panthis*.

Younger Kothis and healthcare refusal: Compared with younger *Kothis* who reported low collective incomes and low education, the odds of healthcare refusal were increased if participants simultaneously reported both a high collective household income and high school education or beyond (OR $_{younger\ Kothis}$ = 2.22, 95% CI 1.21, 4.05) or if they were young sex workers (OR $_{young\ sex\ worker\ Kothis}$ = 2.99, 95% CI 1.49, 6.00).

Older Panthis and healthcare refusal: Compared with older *Panthis* who reported low collective incomes and low education, the odds of healthcare refusal were increased if participants reported high school education or beyond (OR $_{older\ Panthis}$ = 3.07, 95% CI 1.11, 8.52).

Older Kothis and healthcare refusal: Compared with older *Kothis* who reported low collective incomes and low education, the odds of healthcare mistreatment were increased if participants simultaneously reported both a high collective household income and high school education or beyond (OR $_{older\ Kothis}$ = 2.34, 95% CI 1.13, 4.86).

Figure 20 Intersectionality of collective household income (per capita), age, sex work occupation, and education in the association between gender/identity and healthcare refusal



Odds of serious physical violence growing up (i.e. <16 years of age) based on different intersections of social determinants

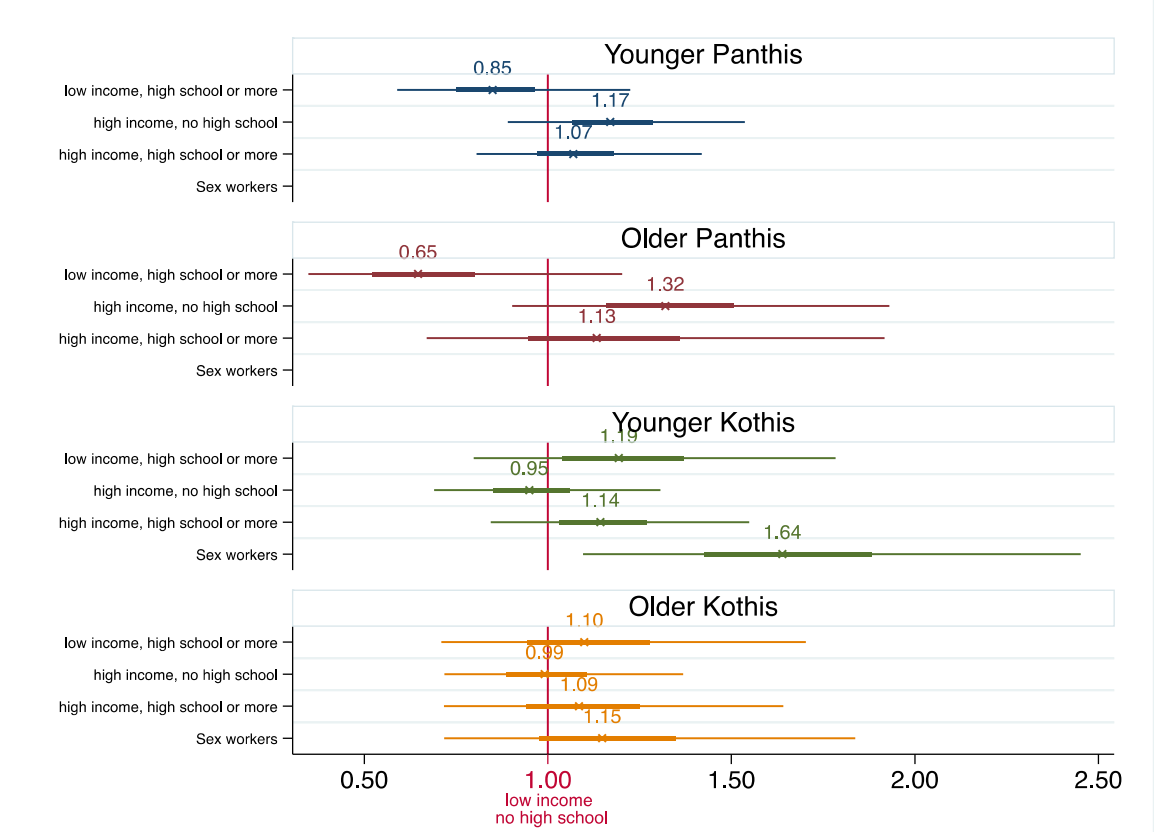
There were no significant differences in the odds of serious physical violence growing up between income/education categories for younger *Panthis*.

Younger Kothis and serious physical violence growing up: Compared with younger *Kothis* who reported low collective incomes and low education, the odds of serious physical violence growing up were increased if participants if they were young sex workers ($OR_{young\ sex\ worker\ Kothis} = 1.64$, 95% CI 1.10, 2.45).

Older Panthis and serious physical violence growing up: There were no significant differences in the odds of serious physical violence growing up between income/education categories for older *Panthis*.

Older Kothis and serious physical violence growing up: There were no significant differences in the odds of serious physical violence growing up between income/education categories for older *Kothis*.

Figure 21 Intersectionality of collective household income (per capita), age, sex work occupation, and education in the association between gender/identity and serious physical violence growing up (<16 years of age)



Effect modification of the association between gender/sexual identity and HIV

As we have seen in the previous subgroup analysis, there is stronger evidence to suggest that the association between education and income and HIV is affected by a person's age and gender/sexual identity. Younger men, both *Kothi* and *Panthi*, may experience lower odds of HIV infection if they have above high school education, above median family incomes or both. Evidence suggesting that income and education are also associated with HSV-2 is also present but we will not analyze it further in this dissertation - we use HIV as an example of sexually transmitted infections. The data for the association between income/education and human/sexual rights are not as statistically robust so we also omit this analysis.

To illustrate the differences between sexual identity, age, income and education, we will use a graphical analysis where significant differences are easily highlighted.

Figure 22 Effect modification of the association between gender/sexual identity and HIV by age, education and income.

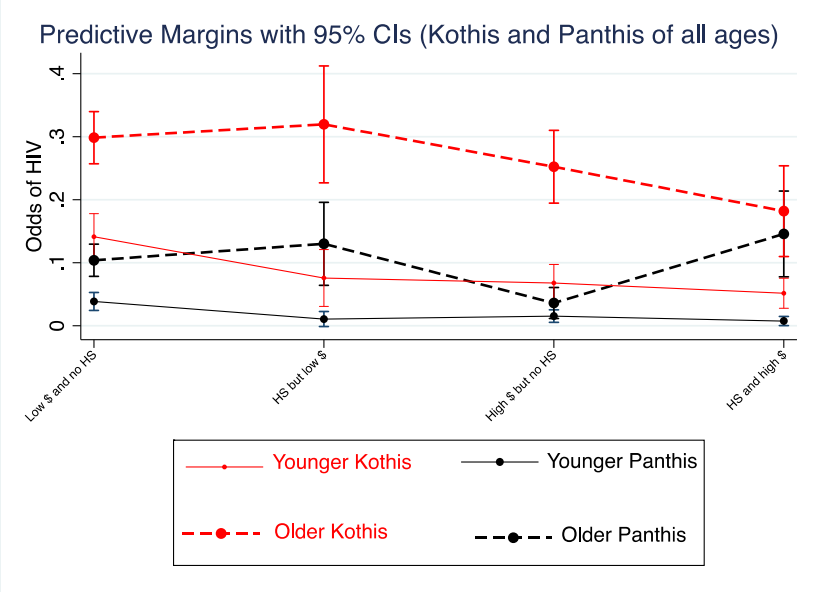
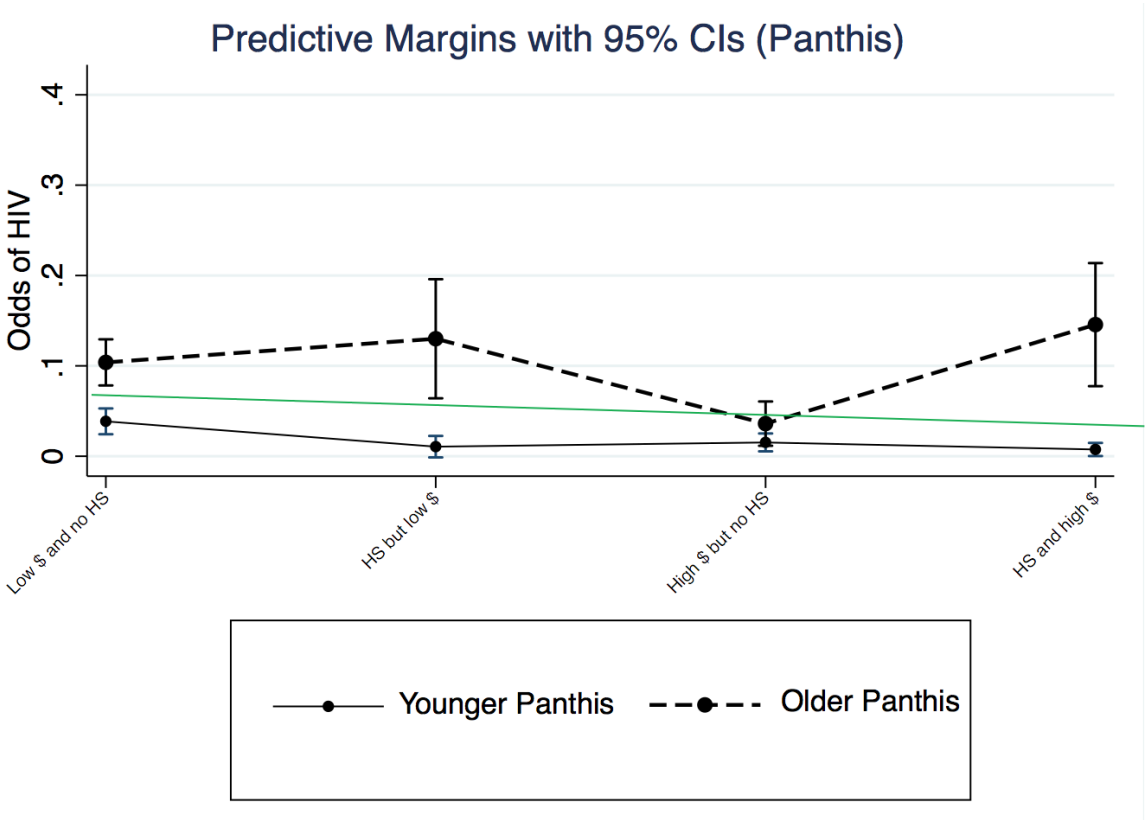


Figure 22 shows the marginal predictions of a 3-way interaction between income/education strata, age and gender/sexual identity. There are several comparisons that are statistically significant. First, we will look at the role of age within each of two gender/sexual identities.

The following figure (**Figure 23**) shows the odds of HIV infection for *Panthis* only. This allows us to see the effects of age and income holding gender/sexual identity constant. We can see that older *Panthis* have significantly different odds of HIV infection in all income/education strata except for men with high income and no high school education.

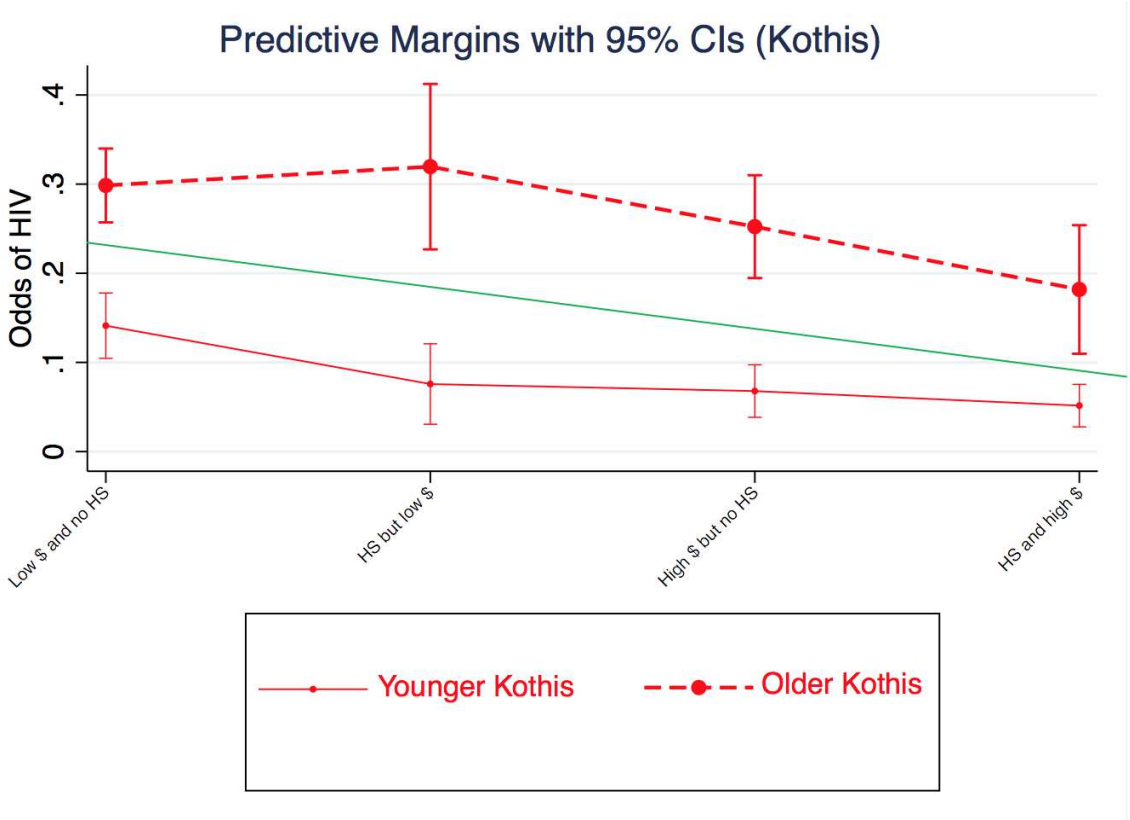
Figure 23 The effect of age on *Panthis* with different levels of income/education



* The green line emphasizes the significant differences in the figure as the lack of overlap of 95% confidence intervals for all except for 1 subgroup.

In the next figure (**Figure 24**), we also hold gender/sexual identity but we look only *Kothis* to show that age also strongly influences the odds of HIV for this subgroup. In the case of *Kothis*, the effect of age is even more clear than that for *Panthis*.

Figure 24 The effect of age on *Kothis* with different levels of income/education

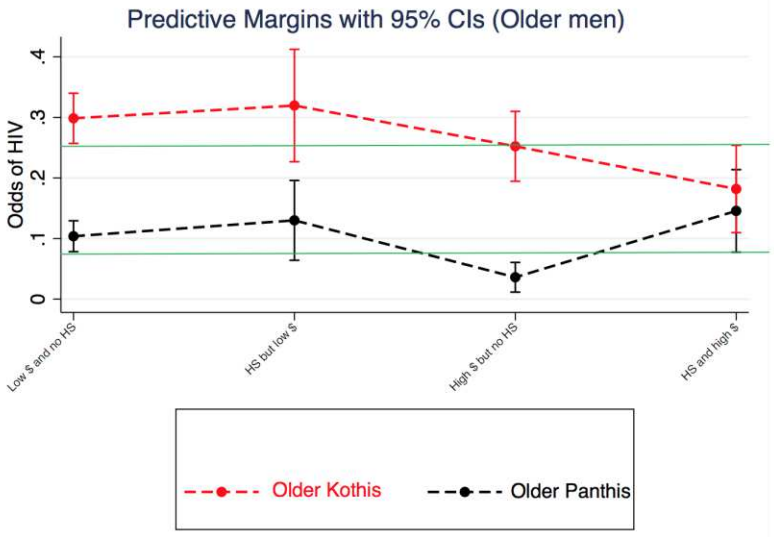


* The green line emphasizes the significant differences in the figure as the lack of overlap of 95% confidence intervals for all subgroups of income.

We now hold age constant to show the effects of sexual identity on HIV among older men with different levels of income or education (**Figure 25**). We can highlight various trends in this figure. First, *Kothis* have distinctly higher odds

of HIV infection in 3 out of 4 subgroups of income/education. Specifically, 1) having high school education but low family income or 2) having a high family income but no high school education seems insufficient to explain the differences between *Panthis* and *Kothis*. In contrast, in one subgroup (men with ***both*** high school education ***and*** high family incomes) the differences between older *Kothis* and *Panthis* are not statistically significant. Second, the trend towards lower odds is more prominent for *Kothis* than for *Panthis* (i.e. the odds of HIV decrease for *Kothis* with higher education and income but *Panthis* have similar HIV odds across income strata). Third, looking only at *Kothis* (red curve), the odds of HIV for *Kothis* who completed high school and belong to families with high incomes are lower compared to *Kothis* who did not complete high school and come from families with low incomes. For *Panthis,* a beneficial effect of income and education is less apparent.

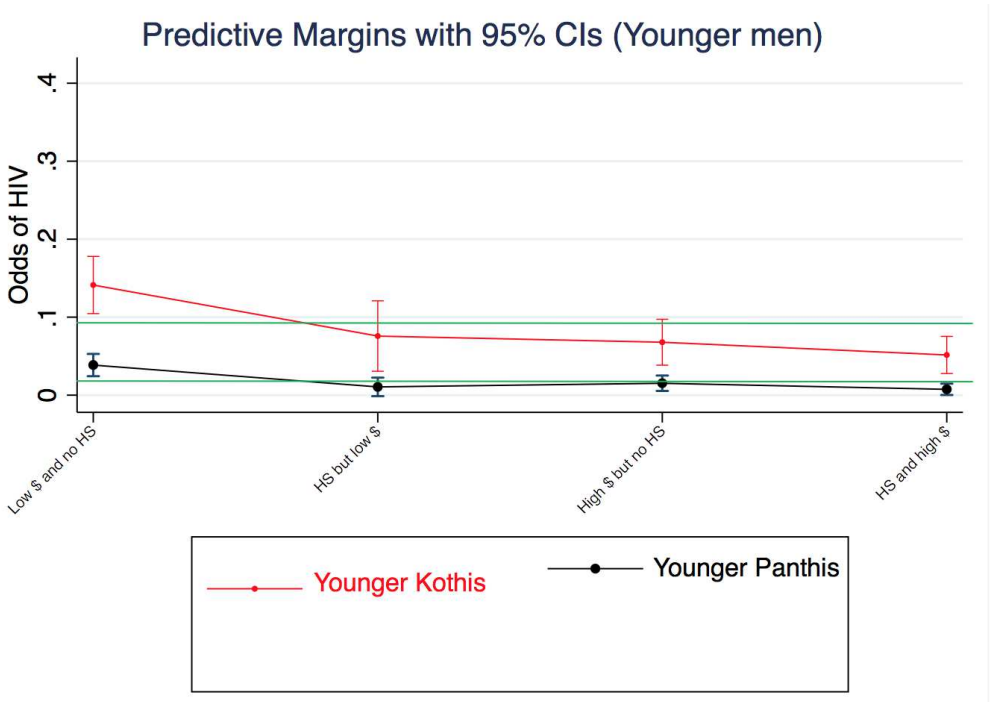
Figure 25 The effect of income and education comparing older *Kothis* and *Panthis*



* The green lines emphasize significant differences in the figure as the lack of overlap of 95% confidence intervals (e.g. Compare lack of overlap between high income educated *Kothis* to low income uneducated *Kothis*).

In contrast to the analysis of older men, the differences between younger *Kothis* and *Panthis* across levels of income and education are more robust. First, the odds of HIV decrease as participants' education and family incomes increase for both *Kothis* and *Panthis*. However, for *Kothis*, the decline is sharper (more precipitous) than for *Panthis* (the latter group has low odds of HIV infection regardless of income/education). Second, focusing in each identity separately, we observe that the odds of HIV for men with higher education and higher incomes do not overlap the 95% CI for men with lower education and lower family incomes (i.e. the comparison of the extremes of income and education are statistically significantly different). The green lines in **Figure 26** highlight the lack of overlap between the 95% CIs for *Kothis* and *Panthis*.

Figure 26 The effect of income and education comparing younger *Kothis* and *Panthis*



* The green lines emphasize significant differences in the figure as the lack of overlap of 95% confidence intervals (e.g. Compare lack of overlap between high income educated *Kothis* to low income uneducated *Kothis; the same is true for panthis*).

CHAPTER 7

Discussion, strengths, limitations and future directions

The main finding of this dissertation is the *unidirectional, ranked-ordered,* and *statistically robust risk heterogeneity* of adverse sexual health outcomes between subgroups of men of different gender/sexual identities in India.

First, what we mean by ***unidirectional adversity in sexual health outcomes*** is the finding that Indian men who self-identified as *Kothis* consistently showed higher odds of adverse sexual health outcomes compared to men identifying as *Double-Deckers* and compared to men identifying as *Panthis*. These adverse outcomes include epidemics and syndemics of STIs, sexual right violations, stigma, fear, and discrimination.

Our second observation about risk heterogeneity in this study is the ***ranked-ordered heterogeneity of adverse sexual health outcomes*** between the three gender/sexual identities. In other words, there was a consistent order for the increase in the odds of virtually all adverse sexual health outcomes. Such a trend resembles a dose-dependent response, as if gender expression were a quantitative variable. In nearly all adverse sexual health outcomes the data consistently showed the following trend:

Odds (adversity | *Kothi*) > Odds (adversity | *Double-Decker*) > Odds (adversity | *Panthi*)

Our third general observation about risk heterogeneity is that ***trends in heterogeneity were statistically robust in many scenarios***. The unidirectional and ranked-ordered nature of the associations affecting *Kothis* was constant using several types of statistical modeling. In addition, the same heterogeneity was also present across sites, social strata and HIV status. This signifies systematic sexual health disparities based on gender identity.

Indian men who self-identify as *Kothi* were most severely affected by numerous adverse sexual health outcomes. This is an example of **cumulative, composite or compounded adversity**, where multiple negative outcomes affect a single subgroup in a population.

The construct of ***cumulative adversity (CA)*** has been described in different disciplines with observable effects on human physiology, psychology and behavior. With regards to the natural stress response in humans, CA has been defined as the individual exposure to adverse social and environmental events throughout a lifetime that results in heightened stress responses[126]. In terms of mental health, CA is associated with depression, anxiety, post-traumatic stress disorder (PTSD) and maladaptive behavior.[127] In the context of other chronic diseases, CA can accrue as individuals experience multiple comorbidities, traumatogenic changes in life circumstances, invasive medical therapies and changes in disease trajectory.[128]

We differentiate CA from a related concept frequently used to describe the accumulation of disadvantage within groups: ***cumulative disadvantage*** (CD). Research on CD tends to describe aggregate-level adversity that occurs based on

characteristics of social clusters (such as poor neighborhoods, minority ethnicities, or low income regions). The major focus of CD research has been ***economic deprivation*** with fewer studies focusing on other social disadvantages such as low education. For the purposes of this dissertation, however, when we use the term cumulative adversity (CA), we intend to describe the adversity that individuals experience (not neighborhoods or communities) with respect to a variety of adverse events other than economic outcomes (infections, violence, trauma, and stigma). The use of both terms has been largely interchangeable in the literature.

After multivariable adjustment for age and other social and behavioral covariates, *Kothis* experienced multiple additional adversities compared to *Panthis*, including denial of healthcare, higher odds of STIs, syndemics of STIs, violence and human rights violations.

Cumulative adversity, cumulative disadvantage, and human ageing have evident logical, theoretical, and empirical connections because they are inherently and irreducibly linked to the passage of time.[129,130] Furthermore, in epidemiology, cumulative adversity processes are related to the cumulative incidence of chronic and infectious diseases (such as HIV/AIDS) due to age-dependent accrual of risk as time elapses. Although this dissertation was not originally intended to elucidate the nature, chronology or the impact of adversity for Indian male sexual minorities, we could uncover trends in numerous adverse outcomes across age groups showing that CA may occur throughout life and across gender/sexual identities in India. For example, age was an important factor contributing

incrementally to the risk of sexually transmitted infections. A 10-year increase in age was significantly associated with higher odds of HIV (2.21; 95% CI 1.76, 2.77), higher odds of HSV-2 infection (2.34; 2.05, 2.67), and higher odds of syphilis infection (1.64; 1.40, 1.91). Thus, not only does CA begin to accrue early in the lives of sexual minorities in India but at each stage of life, the number of adverse outcomes is also higher for some (*Kothis*) compared to others (*Panthis*). Some research suggests that the ***severity*** of adversities may differ as the ***number*** of cumulative adversities increases.[131] For example, age-related dysfunctions are more noticeable (i.e. more severe) for people who have experienced higher numbers of adversities.[132]

Not all adverse outcomes increased with age, however. For example, reports of healthcare refusal and healthcare mistreatment may decrease with age regardless of gender/sexual identity. Therefore, adversity accumulates differentially for younger and older sexual minorities. As men of different gender/sexual identities age, the number and the type of adversities changes, some decrease and some escalate, some may matter more and some less.

On the one hand, CA may dysregulate the stress response and may predispose to adverse psychological and behavioral consequences but on the other hand, adverse experiences may foster resilience and subsequent advantages for mental health and well-being. One study found a U-shaped curve indicating that a history of some (i.e. non-zero) adversity predicted lower global stress, lower self-rated functional impairment, fewer post-traumatic stress symptoms, and higher life satisfaction over time.[133] This same U-shaped parabolic response has been

hypothesized to drive the emergence of resilience. In fact, there are accruing data suggesting that resilience is partially adversity-derived.[134]

In this dissertation, *Kothis* illustrate the strength of a subgroup of Indian men, who, in the face of compounded adversity continue to promote their personal and social wellbeing through education, participation in their communities and self-development. Indeed, despite the obstacles related to discrimination and stigma affecting *Kothis* and other non-normative men in India, our data suggest that several social determinants of health were favorable for *Kothis* and *Double-Deckers*, including education and income. A higher percentage of *Panthis* did not complete primary schooling (24.8%) compared to *Kothis* (22.5%) and *Double-Deckers* (18.1%). In addition, a large majority (77.51%) of *Kothis* completed primary education, with a substantial minority 17.95% graduating from college (compared to 18.54% of Panthis). Importantly, in multivariable models, having a high school education was associated with lower odds of HIV (OR 0.47; 95% CI 0.36 – 0.64), HSV-2 infection (0.67; 0.55-0.81) and syphilis (0.63; 0.42 – 0.94). In terms of income and poverty, 90.19% of *Kothis* were above the State Federal Poverty Line (SFPL) based on their individual incomes and 87.81% were above the SFPL based on collective household incomes. The finding that most *Kothis* and *Double-Deckers* have similar education and income profiles compared to other *Panthis* highlights the individual and collective autonomy and resilience evident in many parts of the world, where men and women of all genders improve their social situations despite the pervasive attacks on their non-normative existences.

A market-based comment on male sex work:

Sex work was highly associated with infections and human/sexual rights reports. Furthermore, there is a nearly categorical link between *Kothis* and sex work. It is important to note that these analyses were not able to study the reasons *why* most sex workers are *Kothis* compared to other gender/sexual identities. Presumably, a preference for receptive anal sex would make the occupation compatible with market demands due to the preponderance of penetrative clients.

In our study, most *Kothis* reported primarily receptive sex (50.8%) but many reported both insertive and receptive roles (40.4%). Furthermore, 161 of the 217 *Kothis* who had ever participated in sex work reported practicing receptive anal sex (51 reported both receptive and insertive sex). Meanwhile, a minority of all *Kothis* reported primarily insertive roles (100 men; 3.5% of *Kothis*) and of those, only 1 man had ever participated in sex work. Rates should be weighed against the finding that *Double-Deckers* also engage in receptive sex yet the prevalence of sex work among *Kothis* is 7.71% compared to 0.50% among *Double-Decker* – a rate nearly 14 times higher. Nevertheless, the data suggest that ***India may be experiencing a genderization of sex work toward Kothis***.

We draw attention to what might seem decidedly intuitive to avoid the risk of neglecting the parallel systems of oppression that affect the "less powerful genders." As is the case among heterosexuals, where females (receptive) are workers and males (penetrative) are clients, effeminate receptive *Kothis* may be the objects of sexual markets socially arranged to satisfy the demands and needs of the more "powerful genders." Notice that we are not discussing differences

between the sexes. We mean to discuss differences in gender. In fact, we mean to highlight differences in gender within the same sex. The same differences in power that perpetuate rape and intimate partner violence, may also facilitate the perpetuation of sex work among feminized gendered identities. Furthermore, violence in the setting of criminalization of socially stigmatized factors (HIV, sex work, homosexuality) occurs with impunity. In a recent paper by our group, reports of violence were common in the context of sex work.[135]

It is also critical to note that while sex work is an important source of income for *Kothis*, unemployment comparing *Kothis vs. Panthis* in models that include sex workers are not statistically different (OR 1.49, 95% CI 1.16, 1.92) compared to models that exclude sex workers (OR 1.74, 95% CI 1.34, 2.25); P>0.05. Purely economic reasons are therefore unlikely to explain the incentives for one identity to be overrepresented in sex work. It is more likely that social constructions of who is socially allowed to be sex worker vs. a client *without* violating the normative feminine-masculine dichotomy continues to operate even among males, as it is prevailing among heterosexual persons.

In this dissertation, *Panthis* were 2-3 times more likely to buy sex compared to other identities. Linking this finding to previous discussion on hegemonic masculinity, in studies of heterosexual men who buy sex from females, researchers have shown how clients draw on heteronormative sexual scripts to construct, make sense and enact paid sexual encounters.[136] In other words, hegemonic masculinity, a phenomenon that positions heterosexual men as clients of female sex workers, may also position *Panthis* as the clients of *Kothis*.

Conclusions about aim 1: risk of sexually transmitted infections

From these findings, we draw several conclusions:

1. Conclusion#1: There is strong heterogeneity in the risk of sexually transmitted infections associated with the gender/identity of men in India.
2. Conclusion#2: *Kothis* have higher prevalence of STIs compared to *Double-Deckers* and *Panthis.*
3. Conclusion#3: The association between *Kothis* and STIs is reduced (but not eliminated) by adjustment for behavioral determinants.
4. Conclusion#4: There is strong heterogeneity in fundamental STI determinants associated with the gender/identity of men in India.
5. Conclusion#5: India could be experiencing the '***genderization of sex work* among *male sexual minorities*'**. Specifically, sex work seems to be genderdized toward *Kothis*. In other words, sex work is being '*Kothicized'*. If this is due to femininity of *Kothis* (which we were unable to assess), this could be related to the '*feminization'* of sex work that already occurs worldwide.
6. Conclusion#6: The gender/sexual identity of Indian men is a fundamental social determinant in sexual health, as it affects sexually transmitted infections and the risk factors of these infections.

Findings about sexually transmitted infections

Gender/sexual identity was associated with the prevalence of the three main outcomes of interest: HIV infection, HSV-2 infection and syphilis infection, as well as concurrent infections with these main outcomes and self-reported STIs.

In univariable models, compared to *Panthis*, *Kothis* higher burden of HIV, HSV-2, and syphilis as well as concurrent epidemics of these infections. Some of the factors that increased the relative burden of disease were receptive anal sex (2-3 times the rate of insertive anal sex), number of sexual partners (2 times higher odds for >15 partners, 4-8 times for >60), sex work (2-5 times), and age (1.5-2 times with each 10-year increase). As stated before, education was consistently associated with lower odds of HIV, HSV-2 and syphilis.

One explanation for the robust trend between *Kothis* and *Panthis* across many STIs that has been highlighted in HIV research is the concurrence of several factors associated with adverse sexual health in specific subgroups. For example, 1) the biological differences in risk comparing receptive vs. insertive anal sex (a behavioral determinant), 2) the differences in the number of male sexual partners between the sexual identities (a behavioral determinant), 3) differences in the predisposition toward sex work by *Kothis* (a socioeconomic determinant) all incrementally predispose *Kothis* to HIV and other STIs.

Notably, while receptive anal sex, number of partners, and sex work were factors that were statistically significantly associated with all STIs in this study, none of them independently explained the association between gender/sexual identity and STIs in its entirety, particularly for *Kothis*. This is perhaps due to the

clustering of causal mechanisms within the *Kothi* identity. In other words, the correlation between the above factors suggests that all of them have partially common causes or alternatively, that one is a cause of another. For example, sex workers tend to be *Kothis*; *Kothis* tend to practice receptive anal sex and; by the nature of their occupation, sex workers tend to have many sexual partners (i.e. clients).

Associations between known risk factors and STIs are well established. The incremental increase in the odds of HIV with increasing number of sexual partners occurs since HIV risk increases as the per-act probability of infection accumulates with each sexual encounter. Likewise, unprotected anal sex is prevalent and plays an important role in the spread of HIV. In a recent study, nearly half of all participants reported unprotected anal sex in the past 6 months.[135]

We purposely depart from focusing on these well-established bio-behavioral factors (i.e. anal sex and number of partners) because while it is crucial to understand *how* HIV is transmitted (through unsafe anal sex with many partners), it is also essential to understand *why* HIV is transmitted (partners may not be able negotiate safe sex).

One way in which risk of STIs can accrue is ***impaired safe sex negotiation*** since it may uniquely affect men of different gender expressions in India based on power differentials between sexual partners. Indeed, violence in intimate relationships is one of the key mechanisms through which power differentials are established and perpetuated. For Kothis violence starts early.

Compared to *Panthis*, *Kothis* had 6.69 (95% CI 5.97, 7.49) times higher odds of having unwanted sexual experiences when growing up, before age 16 (i.e. unwanted sexual touching or sexual intercourse including oral, anal, or vaginal sex). *Kothis* also reported 4.11 (95% CI 3.67, 4.61) times higher odds of having experiences in which an intimate partner forcefully attempted to have sexual intercourse. In the context of prevalent sexual assault, rape, and other forms of intimate partner violence, a discussion of how *Kothis* negotiate safe sex behavior seems almost frivolous. We highlight what we consider an obvious assertion to emphasize the universality of power differentials in sexual encounters be they homosexual or heterosexual: ***differences in partner attitudes, beliefs, and power affect sexual risk behavior***. The extent to which beliefs affect the risk of STIs at the population level is not so obvious. Negotiation depends on a multifaceted understanding of risk factors, power, agency, and safety, which is varied among sexual partners and clearly varies based on sexual identity.

Beliefs can be strong, widespread and can limit or exacerbate power differentials in intimate relationships. Specifically, the varied definitions of manhood, maleness and masculinity (or womanhood, femaleness and femininity) may affect safe sex negotiation and risk sharing in male-to-male couples just as they affect heterosexual negotiations. Discussions on masculinity and femininity are often abridged in HIV/STI research, if included at all. There is, however, growing interest about the ways in which the perception of these complex cultural constructs influence prevention and treatment of sexually transmitted epidemics.

A concept associated with two important STI risk factors (multiple sexual partners and unprotected anal sex) is ***reputational masculinity*** **(RM)**. RM is related to a set of high-risk attitudes based on classic masculinity ideologies. RM has been associated with increasing number of sexual partners in young adult African American males in the United States.[137] In other regions of the world, ***hegemonic masculinity*** **(HM)** is thought to influence high-risk sexual behavior by promoting a sense of personal invulnerability to HIV/AIDS among young men despite high levels of knowledge about HIV risk factors. The paradoxical mix of adequate knowledge of HIV/AIDS with risk behaviors then interferes with prevention campaigns in sub-Saharan Africa.[138]

A recent systematic review assessing the role of HM among men who have sex with other men in the United States included 31 articles with 7 emergent themes affected by masculinity: 1) number of sexual partners, 2) attitudes towards condoms, 3) drug use, 4) sexual positioning, 5) condom decision-making, 6) attitudes toward testing, and 7) treatment compliance. The authors conclude that these outcomes represent the "enactment of masculine norms." [139] If in fact these risk behaviors are the manifestations of hegemonic masculinity, then it is evident that more research about how men who have sex with other men construct their emotions, behavior and attitudes may have an impact on HIV prevention. Despite its worldwide importance, there is little evidence on how most effectively to change (or reconstruct) harmful norms related to masculinity.[140]

In terms of the social construction of masculinity in India (i.e. what it means to be a man), the accepted trajectory for men in India revolves around

fatherhood, marriage (to women) and responsibility. For example, one idealized notion of a 'responsible man' in India might be a father who can provide for himself, his wife and his dependents. Under this norm, *Kothis* may struggle to negotiate contradictory social expectations of masculinity and femininity. The social construction of masculinity and fatherhood may explain why across the identities 24.83% of *Kothis*, 33.13% of *Double-Deckers*, and 28.43% of *Panthis* were parents. Compulsory notions of manhood, maleness and masculinity may also help explain why 25.48% of *Kothis*, 36.25% of *Double-Deckers*, and 31.42% of *Panthis* were married to females in the general population. In a different study, our group also showed that several men had been forced into marriage by their families. [135]

A concept that has been proposed to explain the conflict and consequences of normative masculinity constructions on non-normative homosexual men is ***gender role strain*** **(GRS)**. In a study of young black men in the United States, GRS was enacted through pressuring participants to conform to rigid, anti-homosexual expectations of masculinity from their families, peers and communities. These pressures and conflicts to conform to normative expectations despite their homosexuality resulted in 1) psychological distress, 2) efforts to camouflage their homosexuality, and 3) strategies to prove their masculinity. Furthermore, participants believed that GRS increased HIV risk through 1) social isolation, 2) reduced access to HIV prevention messages, and 3) limited parental involvement in sexuality development and sexual decision-making. The authors conclude that GRS may be an important target of HIV prevention.[141]

Norms that shape notions about masculinity do not always result in adverse risk behavior. In fact, norms have been used to increase the acceptability of interventions such as circumcision, particularly among heterosexual men, regardless of gender identity. Circumcision has been found in several ethnographic studies to "confer" masculinity. In a study in the Dominican Republic, 42% of males felt more masculine after circumcision. In that same study, feeling more masculine was associated with feeling more potent erections post-circumcision and increased ability to satisfy partners after circumcision. The authors conclude that circumcision is not simply a biomedical intervention and that circumcision programs need to incorporate considerations of male sexuality into their programming.[142] In South Africa, participating in cultural practices such as traditional circumcision aligns men to idealized forms of masculinity that afford those men full citizenship in those communities.[138] In this study, circumcision was most prevalently reported by *Panthis* (19.29%) with similar rates among *Double-Deckers* (14.31%) and *Kothis* (13.36%).

A cautionary note seems appropriate, however. As conceptualizations about masculinity increase in sexual health and public health research, it has become evident that even those aspects of masculinity (or femininity) that may be interpreted by researchers as innocuous must be used with caution in educational campaigns since they have a wide variety of consequences. In Uganda, *Stand Proud, Get Circumcised* is an HIV campaign promoting circumcision that includes posters highlighting positive reactions of women toward circumcised men. These newer campaigns have "playful" innuendos, and in contrast to older

ABC (abstain, be faithful, use condoms) campaigns, they also acknowledge pre-marital and extra-marital sex. These campaigns, however well-intended, exploit male anxieties about performance and appearance and promote circumcision as an idealized body aesthetic.[143]

Masculinity has been hypothesized to be a barrier to seeking help due to incongruence with the normative expectations of help-seeking decisions, self-reliance, help-seeking stigma, resistance to self-disclosing, and self-compassion.[144,145] Some of these factors related to masculinity affect men of all gender identities. Men's poorer engagement in healthcare in general and HIV specifically compared to women is well documented. In this study, all subgroups of gender/sexual identity had poor engagement in the HIV continuum, however, *Panthis* had the lowest (but not significantly different) representation. In India, issues related to masculinity may affect male of all gender/sexual identities (*Kothis* and *Double-Deckers*), not only those perceived to be masculine (*Panthis*).

A brief comment on religion

Among 9,542 participants included in this analysis, 77.35% were Hindu, 7.90% were Christian and 14.25% were Buddhist. In terms of HIV prevention, religion was highlighted in the background of this dissertation as a powerful institution influencing practices and decisions about sexuality that influenced risk of STIs. In one study in North India, religion was associated with chlamydia, gonorrhea, syphilis, HIV and other STIs.[146] In this dissertation, univariable models also showed that religion was associated with HIV infection. Compared with Hindu men, Christian men had 1.50 times significantly higher odds of HIV infection (1.21, 1.85). In contrast, Buddhists had 0.69 significantly lower odds of HIV infection (0.56, 0.85) compared to Hindus. After multivariable adjustment for behavioral and social factors, however, differences between religions were no longer statistically significant. This is not an argument against a more granular understanding of religion in the spread of HIV or other STIs. In fact, certain interventions have demonstrated success after specifically addressing the needs of religious subgroups (i.e. Muslim communities in India).[147] In India, religion affects decisions about partnerships, marriage and extra-marital sex and even testing rates.[148] Therefore, it is possible that the relationship between religion and HIV in this sample may be mediated by social and behavioral variables, thus explaining the mediation of the univariable association after multivariable adjustment. Lastly, this dissertation was not designed to study the complex relationship between religion and STIs. More research will be needed.

Findings on human rights

All UN member states have endorsed their commitment to protect human rights in the global control of the HIV epidemic and to ensure universal access to HIV prevention, treatment, care and support.[149] However, numerous problems continue perpetuating sexual rights abuses. One of these problems poor enforcement of these so called 'universal rights' for gendered sexual minorities. Kevin Moody, in a 2009 Bulletin of the WHO, explains:

> *"When countries sign declarations of rights – human, health, workplace – there are no exemption clauses stating: "These rights apply to everyone except men who have sex with men (MSM) and people living with HIV".*
>
> *However, in practice, HIV-positive MSM are not able to access their full rights, either due to repressive laws or discrimination practices. Violations of rights are not reported due to fear of reprisals and, in the rare cases that reports are made, they are not taken seriously.* [150]

In India, Criminalization due to Section 377 of the Penal Code is an evident example of how gendered minorities may be intimidated by social institutions. If indeed *Kothis* and *Double-Deckers* are "easily identifiable" as published data suggest[114,151-153], criminalization of sexuality predisposes the most 'visible' of sexual minorities to gender profiling. In turn, profiling in the setting of criminalization results in destructive yet legally permissible outcomes. In this dissertation, we provide a cross-sectional account of rape, sexual assault and serious physical violence but the impact of violence on the existence of gendered persons in India is a daily and severe occurrence.

Globally, the trends in criminalization synergize with a homophobic climate to interfere with public health strategies to control HIV. In regions like sub-Saharan Africa, where men who have sex with men are also criminalized, stigmatized and marginalized, there is no amnesty for sexual minorities in healthcare. In this context, anti-homosexual laws encourage the reporting of male-to-male sexual activity to authorities, and healthcare is often seen as an agent of authority rather than as an agent of care.[154] In this study, for example, compared to *Panthis*, *Kothis* had 4.59 (95% CI 3.54, 5.94) times higher odds of frequently being mistreated by a hospital worker due to being men who have sex with other men. Likewise, *Kothis* had 5.08 (95% CI 3.79, 6.80) times higher odds of frequently being refused medical care or denied hospital services due to being men who have sex with other men.

Another problem obstructing the universalization of human rights is cultural acceptability. For sexual minorities in non-Western societies, some research suggests that campaigns for sexual rights and 'coming out' are frequently seen as impositions of Western cultural imperialism related to the exportation of Western gay identities that result in patriotic defensiveness.[155] Research on the relationship between 'universal' human rights and 'local' acceptability of such rights based on cultural norms is currently limited.[149]

In terms of global burden of abuses, research reports about human rights and sexual right violations in other parts of the world show a high prevalence. In one study in Lesotho 76% of participants reported at least one abuse, including rape, fear of seeking healthcare, police discrimination, and verbal or physical

harassment.[156] Similar findings have been found in Malawi, Namibia, and Botswana.[157] In this study, violence was also prevalent and as the case of sexually transmitted infections, violence and human rights abuses affected *Kothis* most than other subgroups. For example, compared to *Panthis*, *Kothis* had 3.80 (95% CI 3.41, 4.23) times higher odds of experiencing serious physical violence growing up before age 16. *Kothis* also had 6.69 (95% CI 5.97, 7.49) times higher odds of having unwanted sexual experiences growing up (i.e. unwanted sexual touching or unwanted sexual intercourse including oral, anal, or vaginal sex).

Furthermore, social perceptions about masculinity and femininity synergize with stigma and criminalization resulting in yet another implication: ***the easy identification and targeting of non-normative sexual minorities***. Easy identification subsequently leads to targeting and harassment of sexual minorities, particularly for *Kothis* whose sexuality contradicts social norms of masculinity. Studies in North Americans suggest that laypeople can judge the sexual orientation of others with greater than chance accuracy based on brief observations of their behavior (i.e. "gaydars" exist).[158] In this context, criminalization (a socio-legal determinant of health) and stigmatization (a socio-cultural determinant of health) of sexuality in India results in profiling of men of non-normative gender expressions (i.e. effeminate men). ***Gender profiling*** makes use of subjectively perceptible aspects sexuality (i.e. femininity or masculinity). These aspects of sexuality then become targeting tools that allow violence to occur with impunity since attacks are perceived as 'legally and socially permissible'.

The previous section on fear and intimidation by social institutions regrettably but logically precedes a discussion of the impact that such attacks on

sexuality have on the mental health of gendered male minorities. In this dissertation, we have not directly studied whether the burden of STIs (or the numerous adverse sexual health outcomes) affecting *Kothis* and *Double-Deckers* impact their mental health. However, a recent publication by our colleagues proposed that adverse mental health outcomes (such as depression) could be conceptualized using "the minority stress model" and even as a syndemic due to the strong association between HIV and depression.[135] Our colleagues reported "high levels of distress, anxiety, sadness, psychological injury, depression and suicidality" in this group.. K*othis* and *Double-Deckers* specifically identified their feminine appearance or behavior as the basis for their systematic stigmatization, harassment, and violence, which led to emotional distress. The effect of human rights abuse on everyday life of gendered minorities is extensive.

Despite the frequent violations of human and sexual rights in India, R. Ramassubban (2008) explains that ***the response to the challenge has come not from the political and social mainstream but from the criminalized margins***: ***people with different alternative sexualities***, who have launched a struggle for reform of Section 377 of the Penal Code.[159] However, in Ramassubban's opinion, going beyond legal reform requires coalition of other groups to construct a broad-based political agenda of ***sexual rights for all***. Such an agenda must critique 1) patriarchy, 2) dominant masculinity, and 3) sexual violence since those are forces that perpetuate the repression of alternative sexualities.[159]

Law and policy are obvious targets for interventions aimed at protecting human rights. In one meta-analysis of 28 countries on published data of

surveillance reports, legal protections for sexual minorities was associated with a 10.9% (95% CI 3.8% to 12.8%) decrease in country level HIV prevalence among men who engage in transactional sex. Legal protections for sex workers (male and female) was also associated with a 7.0% (95% CI 1.3% to 12.8%) decrease in country-level HIV prevalence.[160]

However, results of approaches based on anti-discrimination laws in the setting of criminalization show mixed results. A recent study by Zhan *et. al.* (2016) compared the reported experiences of 738 men who had sex with other men and who lived in countries that criminalized same-sex behavior. The comparison made was between men in Botswana, Malawi, and Namibia versus men in South Africa.[161] South African men were selected as the comparison group because in 1994, their country had approved a constitution providing freedom from discrimination based on sexual orientation. The research found that men who have sex with men in Cape Town were more likely to disclose their sexual orientation to their family or healthcare workers and less likely to be blackmailed than men in Botswana, Malawi or Namibia. Unfortunately, South African men were just as likely to experience human rights abuses compared to the three other countries. The authors conclude that while legal protections may reduce the experience of certain abuses, legislative changes alone are insufficient to protect gendered minorities. They propose multi-target interventions aimed at 1) attitudes, 2) discrimination, and 3) violence.

Another point of intervention for the protection of human rights is accountability of established healthcare systems to increase compliance with

international treaties at the local level. In Kenya, the HIV and AIDS tribunal was established under Section 25 of the HIV Prevention and Control Act of 2006. As of 2016, the Tribunal was the only HIV-specific statutory body in the world with the mandate to adjudicate HIV-related human rights. An analysis by Michael Eba (2016) reports that after a slow start, the Tribunal is now addressing barriers to access to justice, swift ruling and application of the law for the advancement of human rights.[162]

India has passed various treaties, agreements and declarations related to the protection of human rights for people living with HIV. Some conventions that protect individuals from discrimination are International Covenant on Civil and Political Rights, the International Covenant on Economic, Social and Cultural Rights.A recent paper by Ross et. al. (2015) proposed a model for providing sexual health services to men who have sex with men where their health and human rights are compromised. They propose the following ***SPEND*** model:

- ***S***afe treatment for STIs and HIV
- ***P***harmacy sites for treatment of STIs in countries where pharmacies and drug stores are the source of medical advice and treatment
- ***E***ducation in sexual issues for health professionals to reduce discrimination against men who have sex with men
- ***N***avigation for patients who have HIV and are rejected or discriminated against for treatment; and
- ***D***iscrimination reduction through education of potential leaders in tertiary education in issues of human sexuality

Findings on effect modification of gender-sexual health associations by social stratifiers (intersectionality)

The last aim of this dissertation was exploratory and descriptive (as opposed to inferential). In epidemiology, the framework of intersectionality most closely resembles the concept of ***effect modification*** or ***heterogeneity of effects***. The term '*effect'* in fact suggests that a causal event has occurred in which the exposure of interest (E_1) directly influenced the outcome, while the term '*modification'* implies that the causal event can be affected (in quantity or quality) by the presence (or absence) of another exposure (E_2). There are formal techniques in causal inference to study effect modification. Most of these techniques make assumptions about causality, which could not be made from the data for several reasons (*see Limitations*). Furthermore, to accurately assess the presence or the effects of intersectionality, Hankivsky[110] proposes "*multi-level analyses that link individual experiences to broader structures and systems*". We could not specify such models since the primary study was not intended to study the structures, systems or processes affecting the oppression of gendered minorities. Therefore, we think of this aim as preliminary and exploratory for the purposes of hypothesis generation.

With these limitations in mind, claims about the possible intersectionality of social factors were derived from stratified, subgroup models. The main motivation for this aim is that intersectionality is a social and a research movement that endorses the idea that ***no social position is devoid of privileges, just as none is devoid of disadvantages***. Larson et al., explains that "*rather than*

seeing a particular social category as uniformly negative, intersectionality considers how individuals can simultaneously experience and embody privileges and disadvantage as different social hierarchies combine in varied ways across time and diverse locations."[112]

For example, our preliminary data suggest that having low levels of education and low levels of family income may be associated with higher rates of HIV and HSV-2 infection for both *Kothis* and *Panthis.* Simultaneously, older age is associated with higher rates of HIV and HSV-2. In this case, higher education and better family incomes may alleviate some of the risk for younger (but not for older) Panthis and Kothis. In this study, age seems to be a critical determinant since it is related to cumulative exposure and accumulation of risk. However, at young ages, the cumulative exposure of age is lower, family income and education may also be important in risk accrual.

In contrast, compared to men who 1) did not report a history of sex work and 2) belong to families with low incomes and have low education, sex workers had higher odds of HIV and HSV-2. In this case, age increases the odds of HIV but less so than the sex work itself. In other words, sex worker may accrue risk with age, as do men who are not sex workers, but their occupation (not their age) may be the main mechanism of risk. This may seem like an obvious conclusion but an intersectionality framework allows us to formalize our inferences and compare them to the conclusions about income and education that we saw for younger *Kothis* and *Panthis* in the previous paragraph.

We conclude this discussion of intersectionality by highlighting a central principle of this approach called *reflexivity*, which refers to the positionality of the researchers who are attempting to understand the social positions of others in their study through their own intersectionality location. While there were diverse teams collecting data in India, the writers and reviewers of this dissertation are American professionals of different ethnicities and genders who work in public health, medicine, epidemiology and statistics from the Johns Hopkins Bloomberg School of Public Health, a large academic center in the United States. All of us are interested in promoting human rights and social justice and our aim in several sections of this dissertation is to explore how the confluence of social and behavioral determinants can alter important outcomes in STI epidemiology and sexual health in general.

Table 13 Examples of intersectionality in this study and other studies

Examples in this study:

- Age is associated with higher odds of HIV and HSV-2 for *Kothis* and *Panthis*. This fits within current cumulative exposure paradigms (more time → older age → more sex → more risk)
- Education was instead associated with lower odds of HIV and HSV-2. ‘
- *Kothis* has higher rates of HIV and HSV-2 compared to *Panthis*. As time elapses and as men age, *Kothis* and *Panthis* differ in risk behavior and accrue risk through different mechanisms (receptive vs. insertive sex in the setting of power differentials).
- For Panthis, education is associated with lower odds for younger men (but not older men). Older men have accrued risk due to the passage of time (i.e. through cumulative exposure) and the effect of education is limited in older subgroups. For younger *Panthis*, however, education may matter more and was associated with lower odds of HIV and HSV-2 since the risk due to ageing has only begun to accrue.
- For *Kothis*, education was also associated with lower odds of HIV and HSV-2. For younger *Kothis*, the decrease in odds due to education and income is evident. For older *Kothis*, cumulative risk exposure has already decreased the benefit of education. In addition, there is a (very modest) suggestion that *Kothis* still benefit from higher education and income in older age groups. Kothis report higher rates of violence, fear of abuse and forced sex even in older groups. The mild association between higher incomes or higher education could be due to remaining need of *Kothis* to negotiate safe sex even in older ages. *Panthis* do not have high reports of intimate partner violence compared to *Kothis* in this age group, so income and education in older age groups might help less compared to *Kothis*.

Examples in other studies:

- Single mothers are frequently seen as disadvantaged, particularly among minority women. However, a well-educated, single mother with significant financial resources and privileged social networks may experience motherhood as liberating.[110,113]
- African American males in the USA experience social privilege (because of their gender) and disadvantage (because of their race). This differs from white males who experience social privilege in relation to the intersection of their gender and race.[112]

Strengths

Two major strengths of this study are 1) the large sample size and 2) the amount of data collected for each participant. Thus, the analyses of all outcomes for each aim will be some of the largest in the literature. Furthermore, we were fortunate to have trained interviewers to reduce data collection errors and improve accuracy and reliability.

Related to the size and quality of the data, the study collected multiple important outcomes available for this dissertation. Thanks to these features, we could analyze key outcomes in sexual health and epidemiology including sexually transmitted infections and human/sexual rights that are scarce currently.

This dissertation is part of a large study and part of a large series of investigations. Some papers have already demonstrated differences by gender identity although the focus has not been the study of sexuality. This concerted effort allows for inferences in this thesis to be contextualized with already published findings.

The analysis for the outcomes of this thesis uses current frameworks to operationalize the research. For example, the study of STIs in aim 1 used a biopsychosocial framework where social factors (poverty) and behavior (sexual behavior and drug use) are considered to make the claim that distal and proximal variables affect the spread of HIV and other STIs.

In terms of generalizability, even though the men included in these analyses are limited to three of many gender/sexual identities in India, the overarching objective of this work is to demonstrate how and why an in-depth study of gendered differences

among men facilitates the study of a myriad health conditions (be they infectious or chronic outcomes) affecting many important populations (be they sexual minorities, women, children, or the elderly).

Limitations

This parent trial provided a large amount of data which could be rearranged into 3 specific aims. However, the main objective of the trial was different than the objectives of all 3 aims in this dissertation. This could result in decreased power or increased type I error and selection bias (depending on the specific variables used in each analysis and depending on whether those variables were ultimately representative from the target population).

First, there are limitations in the data collection process (i.e. RDS) that are applicable to all aims. Most limitations relate to possible sources of bias that affect the inclusion of participants into the study. In the background of this dissertation, we reviewed some of these problems and how they may influence a participant's probability of inclusion (personal network size, homophily, and whether the sampling reached equilibrium). These aspects of RDS may have favored the selection of participants from subgroups with larger network sizes and larger homophily, particularly if equilibrium was not reached.[123] However, the prevalence estimates for the outcomes of interest resemble recent estimates in different independent studies. In addition, some studies suggest that besides these features of the sampling method, even the study goals and the research design may affect recruitment.[163] Therefore, the results may not represent a random sample and need to be interpreted with caution when generalizing to the diverse general population of India.

In terms of aim 1, we have generally focused on ***marginal multilevel models*** because our aim was to estimate population-averaged associations – not site-specific associations. The major distinction between marginal *vs.* conditional models is whether the research compares observations between all clusters (marginal) or within clusters (conditional). Therefore, these two types of models technically estimate *different* associations and are *not* comparable. Our results showed large similarities between conditional and marginal models of the main outcomes of interest (see appendix B); the main differences were related to the Odds Ratios (slightly larger for marginal models) and confidence intervals (slightly narrower for marginal models). Ultimately, we chose to use marginal models but in the large majority of models, the same qualitative inference was obtained using both techniques. Note that both marginal and conditional models consider the clustering of participants into sites.

In terms of aim 2, the purpose of the study was not to address the ways in which gender/sexual minorities negotiate access to public healthcare spaces (*i.e.* community resources, hospitals, interactions with physicians or healthcare staff, and mental health resources). We can only infer from the data that this specific sample of *Kothis* and *Double-deckers* seem to report significant discrimination by healthcare staff, by their own families, by their friends, and by their intimate partners. For example, *Kothis* where most likely to be denied housing or to be refused medical care but we do not *why* or on *what grounds* was this discrimination enacted. In addition, to be discriminated in healthcare, one must be able to have access to healthcare. The differences in access to healthcare may have resulted in a selected group of people (with more agency or more ability to secure access) that could also be empowered to denounce healthcare incidents resulting in

the overestimation of the rates of discrimination. In terms of the mechanisms for human rights abuses and discrimination, one possibility that we have offered is that based on their sexual identity in general, and based on their gender expression specifically, *Kothis* might be easily identified as homosexual men by healthcare staff, by police officers, and by strangers. We are unable to substantiate that identifiability of *Kothis* is causative of human rights abuses. From the literature, reports of widespread homophobia may affect the daily interactions that *Kothis* have with their families, their healthcare providers, and Indian society at large. These data were not available in the main trial.

Lastly, aim 3 of this dissertation is preliminary. First, the objective of the primary study differed from the objective of aim 3. Thus, the study design can interfere with power, type I error, and selection bias as mentioned previously. Second, the data are cross-sectional and temporality is impossible to guarantee. Third, we found no reports in the literature on which to base hypotheses about effect modification by gender/sexual identity, age, education, and income in India. Finally, formal tests for effect modification tend to require more statistical power since multiple interactions are tested simultaneously (2 levels of education x 2 levels of income x 5 quantiles of age x 2 sexual/gender identities).

In addition, several limitations must be acknowledged that pertain to the conceptualizations of gender identity and other complex constructs.

In terms of the operationalization of gender/identity, just as there are criticisms against using behavioral terms devoid of gender identity such as 'MSM', there are several criticisms related to the use of categories to conceptualize gender (even if these include aspects of gender identity). Indeed, identity movements have been heavily criticized for

reinforcing the very same social ascription and hierarchy that they are trying to dismantle. For example, Queer theory and the gay rights movement are critical of dichotomizations including masculine/feminine, Black/White, gay/straight, male/female[164] since these boundaries fail to capture the diversity of expressions and experiences, particularly among non-normative individuals. On the one hand, queer theory proposes a theoretical framework for sexuality and on the other hand, lesbian and gay rights movements have served as advocacy groups by allowing individuals to self-categorize (i.e. LGBTQQI+).[165] However, in choosing to categorize identity, we create arbitrary boundaries that serve as nests for social hierarchies. In this study, we have treated the terms *Kothi*, *Panthi,* and *Double-Decker* as if they had a categorical structure. *Kothis* are not easily grouped based on a single attribute. Even after grouping *Kothis* into only receptive partners, many of them are likely to marry females, even if their sexual orientation is toward males. There is large heterogeneity within this group. Even if the participants in our study share allegedly similar attributes (MSM), we lack fundamental data to understand their sexuality, their motivations, their fears, their happiness, their suffering, their exploitation, their marginalization, their oppression, and their healthcare needs.

Future directions

Complex constructs: In terms of complex constructs, research on cultural constructions of masculinity and femininity is needed to understand overt and covert motivations for behavior, wellbeing and fulfillment.

Intersectionality: In terms of intersectionality, research is needed to understand the interaction between gender identity and common population stratifies such as sex,

age, race, class, education, occupation, socioeconomic position, socioeconomic status, power, and religion.

Privilege: Research is needed to understand how the lack of privileges given only to heteronormative gendered identities (***marriage, adoption and foster care, the formation of families, next-of-kin rights, insurance, taxation, property, inheritance***) affect individuals, communities and partnerships.

Relationships: Research will be needed to understand relationship dynamics and role negotiation between sexual partners of diverse identities including sexual domination, violence, negotiation of pleasure, equality, authority, hierarchy. Research on relationships will be key to understand the interaction with healthcare providers, government, law enforcement, employers, educators, and other branches of public service.

Multi-disciplinary collaborations: Finally, more interdisciplinary collaborations are needed to enhance the quantity and quality of today's public health research vocabulary. More nuance is needed, not less. Tact and sensitivity play a larger role in advocacy than the illusion of perfect measurement.

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Appendix A

Sensitivity analysis using conditional models:

Like marginal models, conditional models also include a random intercept for site. Unlike marginal models, however, conditional models should be interpreted as the sample-specific prediction of the association between the exposure (gender/sexual identity) and the outcome, ***for a site with average odds of the outcome***. Therefore, conditional models do not reflect the overall pooled estimate of the OR across India, but rather, they predict what would happen if the exposure were present (as operationalized) in a site where the odds of an outcome is equal to the average odds across sites.

A website describing the differences between marginal and conditional models for binary (such as HIV) outcomes is:

http://data.princeton.edu/wws509/notes/fixedRandom.pdf

Most differences between *Kothis* and *Panthis* are highly statistically significant. Differences between *Kothis* and *Double-Deckers* are less pronounced. In general, our marginal models have smaller confidence intervals since the estimate is computed based on the grand average of the sample. In addition, Odds Ratios in marginal models are slightly larger in magnitude compared to conditional models. Conditional models have larger standard errors (and confidence intervals) because the estimates are averaged over each site and subsequently integrated across sites to produce the final estimates for the OR and 95% CI. *Note*: Given the similarities between conditional and marginal models, subsequent analysis will only show marginal models.

Table 14 Multivariable predictors of HIV, HSV-2 and syphilis. Conditional Random Effects.

	HIV		HSV-2		Syphilis	
	OR	95% CI	OR	95% CI	OR	95% CI
Main predictor						
Gender/Sexual Identity						
Panthi	*Ref -1*		*Ref -1*		*Ref -1*	
DD	1.37	0.68 - 2.79	1.43	0.91 - 2.25	1.45	0.73 - 2.88
Kothi	2.74**	1.75 - 4.30	2.57**	1.86 - 3.54	1.65	0.82 - 3.31
Behavioral practices						
Type of sexual practice with males						
Insertive only	*Ref -1*		*Ref -1*		*Ref -1*	
Receptive only	0.70	0.35 - 1.41	0.62	0.37 - 1.03	1.77	0.87 - 3.59
Insertive/receptive situationally	1.03	0.66 - 1.59	0.80	0.53 - 1.19	1.22	0.69 - 2.14
Lifetime male sexual partnerships						
<5	*Ref -1*		*Ref -1*		*Ref -1*	
6-15	0.98	0.58 - 1.66	1.24**	1.06 - 1.44	1.59	0.90 - 2.79
16-60	1.24	0.65 - 2.35	1.53**	1.18 - 1.98	2.80**	1.88 - 4.16
61-300	2.22*	1.19 - 4.14	2.43**	1.98 - 2.98	2.73**	1.40 - 5.35
300 or +	2.91**	1.50 - 5.67	2.06**	1.38 - 3.07	4.13**	2.45 - 6.97
Sexual or drug-related behavior						
Sex work vs. no sex work	1.92*	1.11 - 3.31	2.45**	1.84 - 3.27	0.6	0.36 - 1.01
History of IDU vs. no history	4.37	0.80 - 23.89	1.03	0.41 - 2.55	1.12	0.33 - 3.76
High vs. low risk drinking	0.56*	0.35 - 0.88	0.76**	0.63 - 0.93	0.81	0.56 - 1.17
Circumcised vs. not	0.73*	0.53 - 1.00	0.90	0.64 - 1.27	1.19	0.59 - 2.41
Demographic characteristics						
Age						
10-year increase	1.66**	1.39 - 2.00	1.90**	1.73 - 2.08	1.36**	1.14 - 1.63
Education						
None	*Ref -1*		*Ref -1*		*Ref -1*	
Primary	0.68*	0.50 - 0.93	1.00	0.80 - 1.25	0.57**	0.41 - 0.79
High school	0.44**	0.26 - 0.75	0.74**	0.59 - 0.92	0.56*	0.33 - 0.96
College or beyond	0.53*	0.33 - 0.86	0.81	0.62 - 1.06	0.71	0.37 - 1.35
Household Poverty						
CHI < Federal Poverty Line	1.28*	1.02 - 1.61	1.10	0.83 - 1.48	0.64	0.29 - 1.38
Marriage and civil partnerships						
Never married	*Ref -1*		*Ref -1*		*Ref -1*	
Long term male partner	1.15	0.83 - 1.60	1.14	0.91 - 1.42	0.96	0.54 - 1.70
Married or long term female partner	1.68*	1.06 - 2.69	1.47**	1.14 - 1.91	1.13	0.84 - 1.51
Long term transgender partner	1.78	0.51 - 6.20	1.57	0.98 - 2.51	0.15	0.01 - 2.04
Not married or in a relationship	2.99	0.87 - 10.32	2.39**	1.25 - 4.55	0.99	0.47 - 2.11

Odds Ratios and 95% confidence intervals. All estimates are conditional on a random intercept of the outcome to account for significant clustering effects by site. Confidence intervals are built with robust standard errors. All models are conditional models. The interpretation of conditional models differs from that of marginal models for binary outcomes such as HIV, HSV2 and syphilis. The estimates should be interpreted for a site with average odds of the outcome; only under this assumption does the definition of the odds ratio become similar to that of a marginal model. In a previous paper, our colleagues have shown that not all sites have average odds of HIV. (*See* Chapter 3 for interpretation of Conditional Models).

Appendix B

Table 15 State specific Poverty Lines (Indian rupees per capita per month)

Site Number	Site Name	States	Rural			Urban		
			2004-05	2009-10	2011-12	2004-05	2009-10	2011-12
1	Hyderabad	Andhra Pradesh	433	694	860	563	926	1009
2	Vijaywada							
3	Vishakhapatnam							
4	Bengaluru	Karnataka	418	629	902	588	908	1089
5	Belgaum							
6	Mangalore							
7	Chennai	Tamil Nadu	442	639	880	560	801	937
8	Coimbatore							
9	Madurai							
10	Bhopal	Madhya Pradesh	408	632	771	532	772	897
11	New Delhi	Delhi	541	748	1145	642	1040	1134
12	Lucknow	Uttar Pradesh	435	664	768	532	800	941
All India	N.A.	All States	447	673	816	579	860	1000

Note: population as on 1st March 2012 has been used for estimating number of persons below poverty line. (2011 Census population extrapolated). Adapted from: http://planningcommission.nic.in/reports/genrep/pov_rep0707.pdf. Accessed on 4/28/2016.[125]

Curriculum Vitae

Education

- Johns Hopkins University Bloomberg School of Public Health
  August 2012 – May 2017
  Degree expected: Doctor of Philosophy (PhD)
  Department of Epidemiology
  Concentration: General Epidemiology
  Baltimore, MD, USA

- Johns Hopkins University School of Medicine
  August 2009 – May 2016
  Doctor of Medicine (MD)
  Baltimore, MD, USA

- Johns Hopkins University Bloomberg School of Public Health
  June 2011 – May 2012
  Master of Public Health (MPH)
  Concentration: Epidemiologic & Biostatistical Methods
  Baltimore, MD, USA

- Pennsylvania State University
  Schreyer Honors College & Eberly College of Science
  June 2011 – May 2012
  Bachelor of Science (BS)
  Honors in Agricultural Economics and Rural Sociology
  Concentration: Pre-medicine/Science
  Minors: Psychology & Italian
  University Park, PA, USA

Medical training:

- Yale University School of Medicine & Yale-New Haven Hospital
  2016-present
  Department of Psychiatry
  New Haven, CT, USA

Academic Honors, Scholarships, Fellowships, and Awards

- Johns Hopkins University Bloomberg School of Public Health

    - Sexually Transmitted Infections T32 grant fellow (2012-2014)
    - Tuition scholarship from the Department of Epidemiology (2012-2017)
    - J. Howard Beard Fellowship (2011 – 2012)
    - The Dr. Cynthia Maung Endowed Scholarship (2011 – 2012)
    - Allen Scholarship (2010 – 2011)
    - Medical Student Scholarship - Year 2 (2010 – 2011)
    - Wing Scholarship (2009 – 2010)
    - Medical Student Scholarship - Year 1 (2009 – 2010)
    - Dean's Travel Grant (2009 – 2010)

- Howard University College of Medicine & the Robert Wood Johnson Foundation

    - Summer Medical & Dental Education Program Scholar (2008 – 2009)

- Pennsylvania State University
  Schreyer Honors College & Eberly College of Science

    - University-wide distinction (2009)
    - Honors in Rural Sociology & Agricultural Economics (2009)
    - Eberly College of Science Dean's list (2005 – 2009)
    - Duffy Pre-medicine Endowment (2008 – 2009)
    - Gelet Trustee Scholarship in Science (2007 – 2008)
    - Mahle Trustee Scholarship in Science (2006 – 2007)
    - Volpi Science Scholarship (2006 – 2007)
    - Bunton Waller Scholarship (2005 – 2006)
    - Selembo Trustee Scholarship (2005 – 2006)

Employment

- Teaching Assistantships (graduate school):
    - Statistical Computing: STATA programing (2012-2013)
      Department: Epidemiology
    - Biostatics 621-623 (2012-2013)
      Department: Biostatistics
    - Environmental Health (Summers 2011-2013)
      Department: Environmental Health Sciences
    - Principles of Epidemiology (Summer 2012)
      Department: Epidemiology

- Research Assistantships (graduate school)
    - Preventing HIV among MSM in India (June 2012 – present)
      Two-arm cluster randomized trial conducted in 12 Indian cities.
      ClinicalTrials.gov ID: NCT01686750
      Principal investigator: David Celentano, ScD-MHS
    - Rural Thai Methamphetamine Abuse, HIV & Community Mobilization (June 2012 – May 2014)
      Two-arm cluster randomized trial conducted in Chiang Mai Province, Northern Thailand
      Principal investigator: David Celentano, ScD-MHS

Leadership & Volunteering

- Johns Hopkins University School of Medicine
  Health Professions Recruitment & Exposure Program (January 2010)
  Description: Sponsored by the Office of Diversity and the Student National Medical Association, we coordinated the 2010 HPREP program at Johns Hopkins. High school students accepted into the program obtained exposure to different health professions, guides for college success, as well as personalized help with college application requirements.

- Johns Hopkins University Bloomberg School of Public Health Student Assembly (May 2012 – Present)
  http://www.jhsph.edu/assembly
  Position: President 2012-2013
  Description: The Student Assembly is the official student government organization that represents and promotes the interests of all students at the Bloomberg School of Public Health.

- The Latino Public Health Network (July 2011 – Present)
  www.jhsph.edu/offices-and-services/student-assembly/student-groups/latino-public-health-network/officers-and-advisors
  Position: President and Co-founder
  Description: LPHN is a network of students, faculty, and alumni with roots or interests in the Latino and Latin American cultural identities, healthcare issues, and research.

Publications

Yang Z, Flores JM, Katz S, Nathan CA, Mehta V. 2017. Comparison of survival outcomes following post-surgical radioactive iodine versus external beam radiation in stage IV differentiated thyroid carcinoma. In review.

Cosetti MK, Pinkston JB, Flores JM, Friedmann DR, Jones CB, Roland JT Jr, Waltzman SB. Neurocognitive testing and cochlear implantation: insights into performance in older adults. Clin Interv Aging. 2016 May 12;11:603-13. doi: 10.2147/CIA.S100255. PMID: 27274210

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Flores, J; Gordon, J; Luloff, A.E. 2009. Latino Perceptions of the availability, quality, and provision of healthcare in Pennsylvania. Pennsylvania State University Libraries.

Presentation:

Flores, JM; Solomon, S; Mehta, S; Srikrishnan, K; McFall, A; Solomon, S; Celentano, D. "The Heterogeneity of Indian Men Who Have Sex with Men [MSM]: The Epidemiological Association Between Local Sexual Identity and HSV-2 Prevalence"

- Podium presentation at 2014 STD Prevention Conference in Atalanta, GA. Forthcoming June, 2014.

Flores JM, Anderson G, Bellamy J, Baltodano P, Cooney CM, Sarhane KA, Lucas R, and Rosson GD. Ethnic Disparities Persist in the Field of Plastic and Reconstructive Surgery: an analysis of a large post-mastectomy prospective cohort.

- Poster Presentation at the American Association of Plastic Surgeons 92nd Annual Meeting. New Orleans, LA, April 20-23, 2013.
- Poster Presentation at the Plastic Surgery Research Council 58th Annual Meeting. Los Angeles, CA, May 2-4, 2013.

Sarhane KA, Flores JM, Cooney CM, Abreu F, Lacayo Baez M, Baltodano PA, Ibrahim Z, Alrakan M, Brandacher G, Rosson GD. Preoperative anemia and postoperative outcomes in Immediate breast reconstruction surgery: a critical analysis of 10,958 patients from the ACS NSQIP database.

- Poster Presentation at the American Association of Plastic Surgeons 92nd Annual Meeting. New Orleans, LA, April 20-23, 2013.
- Poster Presentation at the Johns Hopkins Department of Surgery Poster Session. Baltimore, MD, February 21, 2013.
- Poster Presentation at the Plastic Surgery Research Council 58th Annual Meeting. Los Angeles, CA, May 2-4, 2013.
- Podium presentation at the 5th Annual Johns Hopkins/University of Maryland Plastic and Reconstructive Surgery Research Symposium, Baltimore, MD, June 20, 2013.
- Podium Presentation at The annual American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP®) conference. San Diego, CA, July 13-16, 2013.

Abt NB, Baltodano PA, Flores JM, Sarhane KA, Tong AR, Lacayo M, Abreu FM, Cooney CM, Cooney DS, Rosson GD. Morbidity Profiles of Current Breast Reconstruction Techniques in Anemic Women.

- Podium presentation at the 5th Annual Johns Hopkins/University of Maryland Plastic and Reconstructive Surgery Research Symposium, Baltimore, MD, June 20, 2013.

Melendez MM, Flores JM, Baltodano P, Sarhane KA, Abreu F, and Rosson GD. Perioperative Transfusions and postoperative outcomes in free flap reconstructive surgery: A critical analysis of 6,132 patients from the ACS-NSQIP database.

- Poster Presentation at the Johns Hopkins Department of Surgery Poster Session. Baltimore, MD, February 21, 2013.
- Podium presentation at the 5th Annual Johns Hopkins/University of Maryland Plastic and Reconstructive Surgery Research Symposium, Baltimore, MD, June 20, 2013.

- Podium Presentation at The World Society For Reconstructive Microsurgery 2013 World Congress and ASRM Pre-Symposium. Chicago, IL, July 11-14, 2013.

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- Podium presentation at the 5th Annual Johns Hopkins/University of Maryland Plastic and Reconstructive Surgery Research Symposium, Baltimore, MD, June 20, 2013.

Reddy SK, Flores JM, Baltodano PA, Rosson GD. Preoperative Anemia Increases The Risk Of Adverse Outcomes In Patients Undergoing Free Tissue Transfer: A Critical Analysis Of 2135 Patients From The ACS-NSQIP Database.

- Podium presentation at the 5th Annual Johns Hopkins/University of Maryland Plastic and Reconstructive Surgery Research Symposium, Baltimore, MD, June 20, 2013.
- Recipient of the best clinical paper award at the 2012 Annual Hopkins-Maryland Research Symposium; June 21, 2012

Sarhane KA, Flores JM, Shore AD, Abreu FM, Ibrahim Z, Alrakan M, Cooney CM, Baltodano PA, Drogt C, Makary MA, Brandacher G, Rosson GD. A Validated, Risk Assessment Model For Predicting Morbidity After Breast Surgery.

- Poster presentation at the 5th Annual Johns Hopkins/University of Maryland Plastic and Reconstructive Surgery Research Symposium, Baltimore, MD, June 20, 2013.
- Podium presentation at The American College of Surgeons 2013 Clinical Congress. Washington, DC, October 6-10, 2013.

Bellamy B, Mundinger G, Flores JM, Kelamis J, Mithani S, Christy M, Rodriguez E, Dorafshar A. Blunt-Mechanism Facial Fracture Patterns Associated With Intracranial Injury, Brainstem Injury, And Mortality: Analysis Of 4,540 Patients.

Poster presentation 57th Annual Meeting of the Plastic Surgery Research Council, June 15th, 2012, Ann Arbor, Michigan.

Certificates

- Center for Surgical Trials and Outcomes Research (May 2011)
  Surgical Faculty Mentoring Program
  Johns Hopkins Medicine

- National Cognitive and Skills Evaluations (May 2016)
  American Heart Association
  Basic Life Support for Healthcare Providers (CPR & AED) Program
  Johns Hopkins University School of Medicine

Memberships in Professional Societies

- American College of Physicians (November 2012)
- American Psychiatric Association (November 2012)