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Towards 'reflexive epidemiology': Conflation of cisgender male and transgender women sex workers and implications for global understandings of HIV prevalence

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ABSTRACT

The HIV epidemic has had a widespread impact on global scientific and cultural discourses related to gender, sexuality, and identity. 'Male sex workers' have been identified as a 'key population' in the global HIV epidemic; however, there are methodological and conceptual challenges for defining inclusion and exclusion of transgender women within this group. To assess these potential implications, this study employs self-critique and reflection to grapple with the empiric and conceptual implications of shifting understandings of sexuality and gender within the externally re-created etic category of 'MSM' and 'transgender women' in epidemiologic HIV research. We conducted a sensitivity analysis of our previously published meta-analysis which aimed to identify the scope of peer-reviewed articles assessing HIV prevalence among male sex workers globally between 2004 and 2013. The inclusion of four studies previously excluded due to non-differentiation of cisgender male from transgender women participants (studies from Spain, Thailand, India, and Brazil: 421 total participants) increased the overall estimate of global HIV prevalence among 'men' who engage in sex work from 10.5% (95% CI 9.4–11.5%) to 10.8% (95% CI 9.8–11.8%). The combination of social science critique with empiric epidemiologic analysis represents a first step in defining and operationalising 'reflexive epidemiology'. Grounded in the context of sex work and HIV prevention, this paper highlights the multiplicity of genders and sexualities across a range of social and cultural settings, limitations of existing categories (i.e. 'MSM', 'transgender'), and their global implications for epidemiologic estimates of HIV prevalence.

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Introduction

Globally, results from meta-analyses have provided a necessary synthesis of existing empirical evidence for the identification of groups of people made vulnerable to HIV based on epidemiological trends. For example, the available literature estimates that men who have sex with men (MSM) have a 19-fold and transgender women a 49-fold increased odds of HIV infection compared to the general population (Baral et al., 2013; Beyrer et al., 2012). Additionally, female sex workers have a nearly 14-fold increased odds of HIV infection compared to women of reproductive age, and male sex workers have a nearly 21-fold increased odds of HIV infection compared to the general male population (Baral et al., 2012; Oldenburg et al., 2014). However, meta-analysis as a tool to synthesise descriptive epidemiology for key populations should be understood as a double-edged sword. On the one hand, meta-analytic methods are often considered to be at the top of the hierarchy of evidence in evidence-based medicine (Haidich, 2010), and can ground claims to support research agendas, strategic initiatives, and policies to reduce health disparities borne by key populations. Meta-analyses are particularly important for standardising characteristics that define membership within key populations that are typically excluded from routine country surveillance, despite their association with vulnerability to HIV infection. In particular, the un-reflexive exclusion of stigmatised behaviours, identities, and practices from epidemiologic estimates further promotes invisibility of key populations and makes it difficult to design effective HIV prevention programming and care.

Nonetheless, meta-analyses synthesising descriptive epidemiology carry a number of problematic implications. While meta-analyses provide standardised, globally replicable categories to better understand typologies of risk associated with epidemiological trends, such understandings become both simplified and reified in the context of meta-analyses. This is particularly problematic due to the intertwined social, biological, and behavioural drivers of the HIV epidemic and the complexity of the identities and behaviours integral to defining 'key populations' in HIV research. Furthermore, an understanding of what defines membership within a specific population is constructed through the use and re-use of common epidemiologic categories, and often reduced to a methodological description of the study's inclusion and exclusion criteria. Given the disproportionate HIV burden faced by those with alternative or non-normative genders and sexualities, critical engagement and continual reflection on the construction, use, and meanings of dominant categories in meta-analysis and quantitative research methods is imperative.

While there exists critical scholarship (primarily within the social sciences) assessing the limitations of categories based on sex and gender paradigms in existing HIV research and the subsequent impact on the production of scientific knowledge, there are few studies that pair a social science critique with empiric epidemiologic analysis to support the argument. Uniquely positioned to fill this gap and assess the potential implications of boundary construction within key population categories, here we return to our original meta-analysis (Oldenburg et al., 2014) to reframe the methodological definition of 'male sex workers', revise the population estimate of HIV prevalence, and argue for scientific reflection and reflexivity that moves beyond risk-factor ('black-box') epidemiology (Greenland, Gago-Dominguez, & Castela, 2004). In the course of the systematic review, which informed data for our original meta-analysis, four studies were excluded due to conflated HIV

prevalence among cisgender male and male-to-female (MTF) transgender women sex workers. The inclusion of these studies drove our sensitivity analysis and provided us a jumping-off point to critically engage with potential weaknesses of quantitative methods that replicate dominant classification categories related to sex and gender, and illustrate how redefining categories may impact the empirical and conceptual evidence which informs global understandings of HIV infection prevalence estimates. Building towards ‘reflexive epidemiology’, meaning active engagement in the complexity of categorisation, this article seeks to generate conversation and provide space for participation and reflection by researchers on the choices and implications of data coding, construction, and usage.

The legacy of categorisation of gender and sexuality in HIV epidemiology

The politics shaping scientific knowledge about HIV infection and contemporary understandings of key populations can be traced to the early years of the HIV epidemic. The acronym ‘MSM’ was created by activists for the purpose of drawing attention to a group in need of HIV prevention messaging and outreach: men who have sex with men who do not necessarily identify as gay (Aggleton & Parker, 2015). As the epidemic evolved so did the category, and within the epidemiology and global public health literature, MSM grew to encompass all homosexually active men (Boellstroff, 2011; Young & Meyer, 2005). In medical research, the category ‘MSM’ has been effective in detailing patterns of HIV and STI risk according to sexual practices that are described by biological anatomy. For that reason, ‘MSM’ has been important to furthering understandings of common patterns of HIV risk due to receptive anal intercourse among cisgender males, transgender women, and other individuals assigned a male sex at birth. However, scholars have argued that the construction of ‘MSM’ as a population category based on behaviours not only fails to account for the nuances of sexual diversities but also for the social identities critical to community organisation, thereby weakening the implications of the evidence that can be drawn from the use of this category (Boellstroff, 2011; Muñoz-Laboy, 2004; Young & Meyer, 2005). Furthermore, boundary setting around what it means to be classified as MSM may valorise one point of view while silencing others (Bowker & Star, 1999). To this point, Boellstroff calls attention to ‘biological essentialism’ rooted in the definition of ‘man’ within the MSM category (i.e. an anatomical male having sex with another anatomical male) and its direct implication for public health, principally the invisibility of transgender individuals’ particular needs in early HIV epidemic response efforts (Boellstroff, 2011). Critical reflection on MSM as a category highlights how social and behavioural dimensions of gender and sexual identity are eschewed by the continued, dominant use of the term ‘MSM’.

Concurrent with the struggles of identity politics and the use of ‘MSM’ in the late 1980s and early 1990s, ‘transgender’ as an identifiable category also emerged during the early years of the AIDS crisis (Stryker, 2009; Valentine, 2007). Though scholars have researched the history of ‘transsexuality’ (and other linguistic synonyms for gender variance) over 50 years prior to the advent of HIV and AIDS (Meyerowitz, 2009), the overlap, intersection, and conflict between HIV, MSM, and current understandings of transgender as a category have been largely overlooked. For instance, the majority of epidemiologic research interested in the incidence and prevalence of HIV and AIDS among ‘MSM’ has folded transgender and other gender variant populations into this initial population category of

interest. As noted by Hansmann, subsuming transgender health within a larger gay and bisexual men's health agenda assumed the importance of HIV and AIDS as an urgent transgender health concern, for both transgender women and transgender men (Hansmann, 2010). Though more recent research on transgender women who have sex with cisgender males supports this position, for transgender men there are still limited data to support such claims. Furthermore, the limited data on transgender women and the relative invisibility of transgender men have made it exceptionally difficult to highlight other pressing health problems and to develop programmes responsive to their unique needs both related to HIV infection and AIDS, and to holistic health generally.

Through the work of critical scholarship and transgender activism, conceptual and methodological conflation of MSM and transgender people, specifically transgender women, into one category in medical research and health policy is decreasing. For example, the Institute of Medicine's Report on LGBT Health (Institute of Medicine, 2011) and the World Health Organization's HIV guidelines for key populations (World Health Organization, 2014) are among a growing number of scientific publications calling for categorical distinctions between these populations. Yet, the problematic legacy of the term 'MSM' is evident. Notably, the confusion regarding the division between behavioural and social factors (e.g. sexual practices, sexual orientation and gender identity) underscores the stickiness between definitions of sex, gender, and sexuality (Epstein, 2009). Jordan-Young offers a useful metaphor of a three-ply yarn to make sense of the entanglement between sex, gender, and sexuality. This metaphor suggests that though all three are distinct and interrelated, they are also 'somewhat fuzzy around the boundaries' (Jordan-Young, 2011). Due to the importance of bodies, practices, and identities in efforts to understand the disproportionate concentration of HIV infection among MSM and transgender women, there is an urgent need to not only critically assess overlap between population categories but also to question how category construction informs empirical epidemiologic evidence.

This 'fuzziness' surrounding groupings of sexualities and gender identities can be further highlighted when considering MSM and transgender in relation to a third defining category of central interest for HIV prevention research: sex work. Sex work has been consistently associated with high HIV acquisition risks among MSM, transgender women, and cisgender women (Oldenburg et al., 2014; Operario, Soma, & Underhill, 2008). However, transgender women sex workers have been reported to have an even greater risk for HIV acquisition compared to MSM and cisgender women who engage in sex work (Operario et al., 2008). Posited reasons for their elevated risk include economic and social marginalisation resulting from a range of community and societal exclusionary practices (Infante, Sosa-Rubi, & Cuadra, 2009; Nemoto et al., 2012; Silva-Santisteban et al., 2012). The need for a person's gender to be collectively recognised has also been reported as a unique social determinant of health influencing transgender women's engagement in sex work and sexual risk behaviours further heightening HIV vulnerability (Nuttbrock et al., 2012; Reisner et al., 2009; Sevelius, 2013). These differential disparities highlighted within sex work further emphasise how attention to social processes coupled with sexuality and gender performance may provide important insights for understanding HIV vulnerability within the researcher-driven, *etic* category of sex worker.

In the current context of focused attention on key populations in HIV epidemiology, the definitions of and distinctions between gender identity and sexual orientation are of

increasing importance. However, HIV research efforts frequently employ analytic population categories following the same logic and historical precedence of the category MSM, such as male sex worker, without giving due consideration to how the overlap and complexities of conceptual gender and sexuality distinctions and the methodological choices for analyses of data may shape findings and influence policies and programmes. For example, Oldenburg et al. (2014) reported that across 66 studies representing 28 countries, men who engaged in transactional sex practices had an almost 21-fold increased odds of elevated HIV burden compared to the general male population. However, a central question left unanswered in these epidemiologic estimates is: Who is counted, and why? According to the authors, 'in cases in which no delineation was made between reporting HIV prevalence among male and transgender male-to-female sex workers, the study was included if the majority ($\geq 80\%$) of participants in the study were not transgender male-to-female' (Oldenburg et al., 2014). Justification such as this parallels rationalities employed by other meta-analyses that seek to contribute to the scientific understanding of HIV burden among key populations, but often fail to account for the potential implications of such choices.

Methods

This paper is a secondary analysis of a larger study that aimed to identify the scope of peer-reviewed published articles and generate a combined estimate of HIV prevalence among male sex workers globally between 1 January 2004 and 31 July 2013 (Oldenburg et al., 2014). The rationale for this paper is to critically examine this larger study's inclusion criteria by incorporating four studies in which no delineation was made between reported HIV prevalence among cisgender male and transgender woman sex workers, all of which were excluded from the primary meta-analysis. Here, we run sensitivity analyses by including data from the studies excluded from the original study in an updated meta-analysis. Complete methods for the original systematic review and primary meta-analysis have been previously reported (Oldenburg et al., 2014).

Systematic review

For the systematic review, the search strategy included review of seven electronic databases including PubMed, EMBASE, PsycINFO, Sociological Abstracts, POPLINE, CINAHL, and Web of Science using the following search terms: 'commercial sex', 'sex work*', 'male sex worker*', 'prostitution', 'exchange sex', 'transactional sex', 'HIV', and 'men who have sex with men'. To complement a search of published manuscripts, abstract searches were also conducted from the following databases: the International AIDS Society (IAS), the American Public Health Association (APHA), the Conference on Retroviruses and Opportunistic Infections (CROI), and the International Society for Sexually Transmitted Disease Research (ISSTD). HIV surveillance reports including demographic and health surveys (DHS) and integrated biological and behavioural surveillance (IBBS) reports were also searched. Additionally, reference lists of all included articles were reviewed for additional articles.

Meta-analysis and sensitivity analysis

Using the same meta-analytic procedures, here we conducted a sensitivity analyses by including data from the studies excluded from the original study in an updated meta-analysis. The initial meta-analysis reviewed 20,193 titles and abstracts, 547 conference abstracts, and 165 surveillance reports, 446 titles and abstracts. Of these, 89 articles, abstracts, or surveillance reports representing 34,803 individuals in 30 countries were included in the primary review. Among the remaining 89 studies that were eligible for inclusions in systematic review, however, 66 studies met the inclusion criteria for meta-analysis: containing primary, quantitative data on HIV prevalence among males (individuals assigned a male sex at birth and presently identified as a male/man) who reported exchanging any sex act for anything of value, including money, goods, or drugs. The final analysis for the original meta-analysis represented data from 28 countries and included 31,924 men who engaged in transactional sex with other men. Studies were included regardless of whether HIV status was determined by laboratory methods or via self-report. Studies published in English, Spanish, French, or Portuguese, or if enough study information was published in an English-language abstract, were included.

In the course of this systematic review which provided data for our original meta-analysis, four studies were excluded due to conflated HIV prevalence among cisgender male and MTF transgender sex workers: one abstract (Reza-Paul et al., 2008) and three peer-reviewed articles (Chariyalertsak et al., 2011; Gutiérrez et al., 2004; Reza-Paul et al., 2008; Tun, de Mello, Pinho, Chinaglia, & Diaz, 2008). In the present analysis, these four studies were included, contributing an additional 421 participants for a total analytic sample of 32,345 'men' assigned male sex at birth who engage in sex work. Sensitivity analysis used a DerSimonian-Laird random effects model (DerSimonian & Laird, 1986) to assess an overall pooled point estimate and 95% confidence interval for HIV prevalence. Pooled point estimates of HIV prevalence were calculated by country and region. A random effects model was used to account for heterogeneity of studies (Baral, Sifakis, Cleghorn, & Beyrer, 2007; DerSimonian & Laird, 1986). Random effects meta-regression was used to assess differences in HIV prevalence by definition of transactional sex. Publication bias was assessed with Egger's test (Egger, Smith, Schneider, & Minder, 1997) and Begg's test (Begg, 1994). All analyses were conducted in Stata 12.0 (StataCorp, College Station, TX).

Results

The four previously excluded studies which conflated HIV prevalence among cisgender male and MTF transgender sex workers represented data from Thailand, India, Brazil, and Spain and contributed to a total of 32,347 participants included in the analytic sample representing 70 studies and 29 countries. Table 1 shows the pooled HIV prevalence among men assigned male sex at birth who engage in transactional sex (sensitivity analysis) compared to the pooled HIV prevalence among men who engaged in transactional sex (original meta-analysis).

Compared to the meta-analysis by Oldenburg et al. (2014), results from our sensitivity analysis show that the inclusion of four previously excluded studies resulted in

Table 1. Pooled HIV prevalence among ‘men’ assigned male sex at birth who engage in transactional sex (sensitivity analysis) compared to the pooled HIV prevalence among men who engaged in transactional sex (original meta-analysis).

	Sensitivity analysis HIV prevalence (95% CI)	Original meta-analysis HIV prevalence (95% CI)
<i>By country</i>		
Brazil	13.2% (6.8–19.7%)	N/A ^a
India	14.5% (8.6–20.5%)	11.8% (6.0–17.6%)
Spain	15.7% (10.7–20.6%)	14.2% (9.6–18.8%)
Thailand	17.5% (14.1–21.0%)	17.5% (13.7–21.2%)
<i>By regions</i>		
Europe	11.2% (6.3–16.1%)	12.2% (6.0–17.2%)
Latin America	18.7% (15.1–22.3%)	19.3% (15.5–23.1%)
Southeast Asia	13.3% (9.8–11.8%)	12.9% (8.8–17.0%)
South Asia	2.9% (2.0–3.9%)	2.7% (1.7–3.6%)
Overall	10.8% (9.8–11.8%)	10.5% (9.4–11.5%)

^aCountry-specific prevalence data from Brazil were unavailable in original meta-analysis assessing global HIV prevalence.

an increase in the estimated global prevalence of HIV among men assigned male sex at birth who engage in sex work by 0.3%. While a 0.3% change in overall prevalence may seem unimportant, due to a seemingly small fluctuation in the HIV prevalence point estimate, it is important to underscore that a 1% increase in number of individuals led to a 3% relative increase in HIV prevalence. Additionally, the greatest percent change in point estimates reporting pooled HIV prevalence was in India, which rose by 2.7% followed by Spain, which was increased from 1.5%. Inclusion of manuscripts that collapsed MSM and transgender women into one analytic category allowed for the inclusion of country-specific prevalence data from Brazil to our global assessment of HIV prevalence. As such, this entry not only represents a change in country-level information, but additionally influenced regional and global HIV prevalence estimates. While for Thailand, the pooled HIV prevalence stayed the same, regionally, the addition of the four previously excluded studies had mixed-results (see Table 1).

Implications

This study demonstrates the utility of reflexive epidemiology to link a social science critique with empiric epidemiologic analysis in order to assess the complexities of sex, sexuality, and gender-based categories, and to understand how such categories impact global estimates of HIV prevalence. Inclusion and exclusion paradigms, though evolving, are neither simple nor without implications, and carry with them the past and ongoing presence of identity politics. These results present necessary empirical evidence to highlight two key points: (1) the implications of boundary construction around key population categories related to sex and gender, and (2) why it is important to critically reflect on who gets counted within global understandings of HIV prevalence. Our argument is not to conflate important distinctions between cisgender male and transgender women who engage in sex work and their vulnerability to HIV. Rather, this article is meant to offer a case study in reflexive epidemiology, to become a means whereby both the researcher and the reader gain a sharpened understanding of why particular conceptualisations of sexual orientation and gender identity impact medical research, and the potential for porousness and slippage between these categories if they are used uncritically.

The problem of measurement and reporting

Recognising that categories are a necessary aspect of quantitative research, these results suggest the need for more reflexive epidemiology to explore the intended and unintended effects of population category definitions regarding who gets counted and why. Learning from the troubled legacy of 'MSM', scholars have increasingly pushed back on the notion of 'transgender' as a catch-all umbrella category, and instead argue for an understanding of transgender as a dynamic and flexible collection of gender variant identities (Labuski & Keo-Meier, 2015; Singer, 2015). Though problematic for epidemiologic research, challenges to commonly used categories based on evolving understandings of what it means to be transgender, and increased usage of the category 'transgender' within the sphere of public health research, need to be openly acknowledged. This study presents a first step in reflexive epidemiology to underscore the complexities of sex, sexuality, and gender-based categories, and how conceptualisations and operationalisation of such categories potentially impact global estimates of HIV prevalence.

There is no right way to categorically measure the entanglement between cisgender males and transgender women within HIV and AIDS research. However, when possible, more progressive research recommendations (Institute of Medicine, 2011; World Health Organization, 2014) suggest the necessary separation of gender identity and sexual orientation in both measurement and reporting. To both increase visibility and methodologically reduce the potential for misclassification, the two-step method, which asks about natal sex and current gender identity, is a recommended strategy for measurement of both natal sex and current gender identity (Reisner et al., 2014; Singer, 2015). However, these best practices are not always possible, for example, in meta-analyses where conflation or shifting definitions of population categories reported in individual studies cannot be overcome.

As in other syntheses of data collected by disparate research methodologies, nothing could be done to unravel the conflation between MSM and transgender women from the four excluded studies included in the Oldenburg et al.'s (2014) meta-analysis. As a result, efforts to apply current recommendations to previously conducted studies further excluded key vulnerabilities and obscured the complexity within these overlapping population categories. Based on available data, our current analysis highlights that the inclusion of manuscripts that collapse MSM and transgender women into one analytic category allowed for data from Brazil to be included and altered the estimate of global HIV prevalence among men assigned male sex at birth who engage in sex work. Though distinct visibility for vulnerable communities is critical to address the burden of disease among those most affected, this case study illustrates that such rationalities are also not without consequences. In other words, critical reflection of how sex and gender categories are operationalised in both measurement and reporting of HIV outcomes is essential. Meta-analysis as a tool to synthesise descriptive epidemiology for MSM and transgender women relies on the quality of data collected in individual studies. As such, in a call for more transparent quantitative research practices, there is an urgent need for researchers to clearly describe the rationalities that inform category constructions related to sex and gender, including critically reflecting on the politics that inform the selection of criteria for inclusion and exclusion.

Intersections between context and policy

Beyond influencing empiric understandings, reflexive epidemiology is needed to redirect quantitative research from a fixed understanding of risk due to behaviour (e.g. sexual practice) and/or identity (e.g. gender identity) to underscore the relationship between research and social justice. For example, the context of each of the four previously excluded studies highlights conflicting policy initiatives and social environments that may increase the vulnerability of not only transgender women, but also persons who engage in sex work and practice non-heteronormative sexual behaviours. This section focuses on linking results to existing social processes and local realities to underscore the relationship between HIV knowledge production and needed advocacy within the field of global public health.

Existing literature highlights the importance of country-level laws and policies in influencing HIV vulnerability across populations' currently delineated as 'key' (Oldenburg et al., 2016; Shannon et al., 2015). Leveraging the growing interest in structural determinants of health, quantitative research can also promote advocacy by bringing to light important omissions within legislative and policy initiatives seeking to improve the health of vulnerable populations. Though it is important to maintain a distinction between the need for research and the need for advocacy, the politics of dominant frameworks often jeopardise the meaningfulness of scientific inquiry within research related to sex and gender. This paper, for example, highlights how MSM and transgender categories are ones in which sex and gender are variables and efforts to make them seem less variable for the purposes of scholarly research: (1) reflect the institutional power of biomedicine, and (2) can make it difficult to actually capture people's lived experience. Simply put, sex and gender classifications that conflate (e.g. previously excluded studies) or distinguish are neither neutral nor without consequence. Rather, within the biomedical sciences, the power of evidence is a constitutive force shaping understandings of vulnerabilities to health and the need for political actions to ameliorate such health disparities.

Spain can be used as an example to illustrate why it is imperative for researchers to explicitly connect findings to political contexts. In Spain, there exists provisional legislation to protect the rights of those engaged in sex work, but this is explicitly designated for the protection of cisgender women *only* (ILGA, 2013; UNAIDS, 2007). Access to free medical care and legal protections for sex workers in the country is similarly limited to cisgender women. Beyond a more accurate documentation of global HIV prevalence, contextualisation of our results and assessment of why the numbers matter underscore the need for scientists to report evidence in a way that pushes the current boundaries of structural interventions to address all populations in need. The results of our study show a 1.5% increase from the reported HIV prevalence among cisgender men sex workers in Spain when including the previously omitted data that conflated cisgender men and transgender women sex workers. While this increase is vulnerable to misrepresentation when enforcing distinctions between sex and gender paradigms, it does nonetheless raise awareness in relation to both cisgender men who engage in sex work *and* transgender women – who are scarcely represented in the existing Spanish epidemiologic literature.

While, drawing attention to the contextual realities of Spain furthers the reach of our argument for reflexive epidemiology, it is only one illustration of many. Solely highlighting 'MSM' or 'transgender women' as static risk categories without taking into account the effect of unique sociocultural contexts may also erase important social and structural

factors that increase HIV vulnerabilities across populations and geographic contexts and cultures. For example, co-occurring HIV epidemics have been identified not only among MSM, transgender women, and sex workers, but also injecting drug users (van Griensven et al., 2013). Counter to unitary approaches that posit one master category of analysis, the theory of intersectionality (Crenshaw, 1991) is a useful guide to highlight the various axes of race, ethnicity, gender identity, sexual orientation, economic status, ability, and education that intersect to constitute inequality and vulnerability. Quantitative adaptations of intersectionality theory are important next steps for researchers seeking to reframe and complicate the discussion of health disparities beyond limited notions of sexual orientation or gender identity as a single axis (Bauer, 2014; Bowleg, 2012).

Politics of exportation: the persistence of hegemonic understandings of sex and gender

Though not unique to meta-analyses describing HIV trends in key populations, standardised Western models of what it means to be ‘MSM’, ‘transgender’, or even ‘engaged in sex work’ emerge as particularly problematic when grouping data across time, varied geographic and cultural contexts, and social realities. This critique is not meant to deny the potential utility of meta-analytic techniques for describing disease burden, but rather, to challenge researchers to grapple with the complexity of gender and sexuality in order to improve measurement and reporting. Within our analysis, all countries assessed through the additional sensitivity analysis warrant further discussion to highlight the ‘social imaginary’ (Singer, 2015) used by public health and medical sciences to group people based on one master category.

Specific to the Indian context, scholars have highlighted that the broadness of sexualities and genders, such as *hijra*, can be at odds with rigid sex and gender categories that are linked to Western cultural norms (Asthana & Oostvogels, 2001; Lorway & Khan, 2014). Insights from ethnography by Asthana and Oostvogels of MSM and MSM ‘subpopulations’ suggest that the division between sexual orientation and gender identity is an artificial construct serving only the ‘purpose of facilitating an understanding of the public health needs’ (Asthana & Oostvogels, 2001). Contributing to this complexity, the term *kathoe*, unique to the Thai context, further underscores the spectrum of femininity as a fluid identity construct not represented by natal sex or third gender categories such as transgender (Beyrer et al., 2012; Jackson & Cook, 1999). Other examples from Latin America further problematise the application of transgender, as understood within a Global North context, to alternative gender practices elsewhere. Meanings of *travesti* in Brazil, often translated as transgender, are deeply intertwined with sexual practices and local beliefs about desire, gender, and sexuality (Kulick, 1998; Parker, 1999; Silva, 2014). As such, particularities of *hijra*, *kathoe*, *travesti*, and other terms and meanings not included here, are grounded in their own social and cultural context. These complexities have direct implications for understanding the concentration of HIV infection and best practices for prevention and care efforts. Caution should be exercised when aiming to unravel differing risks and service needs based on Western understandings of sex and gender categories.

Challenges and limitations of applying dominant biomedical categories in Western and global North countries also warrant critique. Though the problematic impact of category

exportation is especially clear when looking at North/South dynamics (e.g. *hijra*, *kathoe*, *travesti*), a similar process can also be found in the extension or imposition of categories from a dominant biomedical framing to the lived experience of diverse populations and communities in the global North. For example, scholars have highlighted the relationship between gender migration and increases in medicalisation and institutionalisation of transgender and gender variant individuals in Spain over the past decade (Soley-Beltran & Coll-Planas, 2011). Paralleling similar tensions between the limitations versus utility of categorisation to gain visibility for the needs of transgender persons globally (Thompson & King, 2015), advances in medical awareness of transgender and gender variant people in Spain both allowed for greater access to medical interventions (i.e. surgeries and cross-sex hormones) while simultaneously increasing institutional control over what transgender identity means (Soley-Beltran & Coll-Planas, 2011). Though the exportation of categories from the global North to the global South is often easier to see because of both inequality in global power relations, as well as sharper cultural differences between Western and non-Western societies, as noted in the case of Spain, the same kind of process also frequently happens within Northern/Western societies. These examples underscore how without sufficient reflection on the role of researchers working within the frameworks of biomedicine and epidemiology, unequal power relations and important cultural differences can also allow dominant categories to be imposed on marginalised populations and communities.

The politics of exportation, meaning the replication of standardised Western understandings of ‘key population’ categories, have important implications for the translation of findings from meta-analyses into relevant policies and successful HIV prevention and promotion efforts. To be effective, translation of key findings into policies and programmes necessarily has to be sensitive to the local categories and conditions that are meaningful in terms of lived realities. However, when research outcomes and findings fail to account for emic (i.e. local) categories, it can make it almost impossible to effectively translate evidence-based science into effective practice. Meta-analyses, such as the Oldenburg et al. (2014) and the sensitivity analysis described here, are particularly salient examples of the tensions between externally created etic categories and the fluid, changing, and geographically grounded variability of emic categories. As highlighted, these critiques extend beyond meta-analytic methods to question common conceptualisations and usages of sex, sexuality, and gender-based categories in medical research. Importantly, the problems posed for translation and interpretation are not simply ‘theoretical’ rather, who gets counted and why affects the real lives of people on the ground. To make research *matter* in people’s lives, translational efforts, such as the creation of protective legislation and/or relevant HIV prevention and promotion strategies, etc., must explicitly contend with the relationship between social processes, local realities, global inequities, and HIV vulnerability.

Limitations

There are several limitations to this critical review and sensitivity analysis that should be considered. Most importantly, the scope and generalisability of the arguments presented herein are meant to provoke thoughts related to the production of data, responsibility and reflexivity of the researcher in category construction, and potential systems-level

implications of research findings. The aim of this paper was not to conduct a systematic review of all health-related scientific evidence that conflates gender and sexuality paradigms. Rather, this paper focuses on one example from prior work of some of the co-authors, and is hence a form of self-critique. Importantly, meta-analysis as a tool to synthesise descriptive epidemiology cannot overcome conflation between shifting understandings of population categories as reported in individual studies. As in the case of the Oldenburg et al. (2014) meta-analysis, nothing could have been done to unravel the conflation between MSM and transgender women as reported by the four excluded studies. However, this sensitivity analysis sheds light on the potential porousness between current understandings of sexual orientation and gender identity and illustrates how redefining categories can potentially impact empiric results.

Time is an important variable that was underdeveloped here. At different historical moments, salient categories may be very different. New categories emerge in society and in scientific discourse, just as old ones may be abandoned or re-signified. Categories that are meaningful socially may not be meaningful scientifically, and vice versa; the negotiation of meaning between society and science may be affected by a range of social and political factors. Due to rapidly evolving politics, coverage, and scientific research in and out of the HIV and AIDS context, it is imperative for future researchers to consider how definitions and the usage of categories are both the product of a particular historical time, context, and place. Our analysis has not focused on the historical changes that have taken place in important ways over the three and a half decades of the HIV epidemic. We have simply provided examples in which categories of gender and sexuality were collapsed in studies included in recent meta-analyses of the epidemiology of HIV infection, and of the ways in which failing to recognise this conflation can affect the results of these analyses. Our goal is to highlight the importance of questioning our own assumptions related to the methodological and/or conceptual choices that we make, in order to push quantitative HIV and AIDS research to more deeply engage in greater epidemiological reflexivity.

Conclusions

Through self-critique and reflection, this study grapples with both the empirical and the conceptual implications of shifting understandings of sex and gender within the externally re-created etic category of 'MSM' and 'transgender women' in epidemiologic HIV research. Empirically, our results show how the inclusion of an additional just 1% of individuals led to a disproportionate 3% relative increase in the pooled global HIV infection prevalence among men assigned male sex at birth who engage in transactional sex (sensitivity analysis) compared to the pooled HIV prevalence among men who engaged in transactional sex (original meta-analysis). Yet the implications of these results cannot be fully expressed quantitatively. Rather, the results of our sensitivity analysis provided us a jumping-off point to critically engage with the complexity, and potential implications, of sex, gender, and sexuality-based categorisation in HIV epidemiology focused on 'key populations'. Importantly, through this reflection a space emerged for active and critical reflexivity as researchers concerning the choices and consequences of data coding, construction, and usage.

The combination of social science critique with empiric epidemiologic analysis presented in this manuscript represents a first step in defining and operationalising reflexive epidemiology. The implications of our results centre on the production of knowledge about groupings of individuals (i.e. identification of key populations) and the political and structural determinants inextricably linked to HIV and AIDS research, prevention, and health promotion efforts. Though the majority of recent studies sustain a conceptual and methodological distinction between cisgender male and transgender woman sex workers, conflation of these categories is pervasive in past research and varying definitions of sex and gender paradigms today support the case for a continual re-thinking of how these categories are understood and used in HIV research. Furthermore, these results suggest not only the limitations of categories such as ‘MSM’ and ‘transgender’, but also of binary constructions of both gender and sex that render intersex and non-binary gender identities relatively invisible at this stage in HIV research and response. As such, a call for reflexive epidemiology is not to a push to specify individual characteristics with more precision, but rather to interrogate the role of the research and the researcher in the greater system (Figure 1).

Given the issues with measurement and reporting within and across populations, data transparency and sharing are imperative. Problematic issues that arose with the four case studies at the base of this critical analysis were due to how researchers chose to present HIV infection prevalence, often obscuring information on populations subsumed by larger categories. Self-critique on groupings and cleavages among sexuality and gender categories are needed to flag future work for scholars. However, self-critique is not enough. Due to the shifting dynamics of category definitions and understandings of health-related vulnerabilities intertwined in sex and gender groupings, the authors suggest that, when possible, descriptive characteristics by subpopulations on main

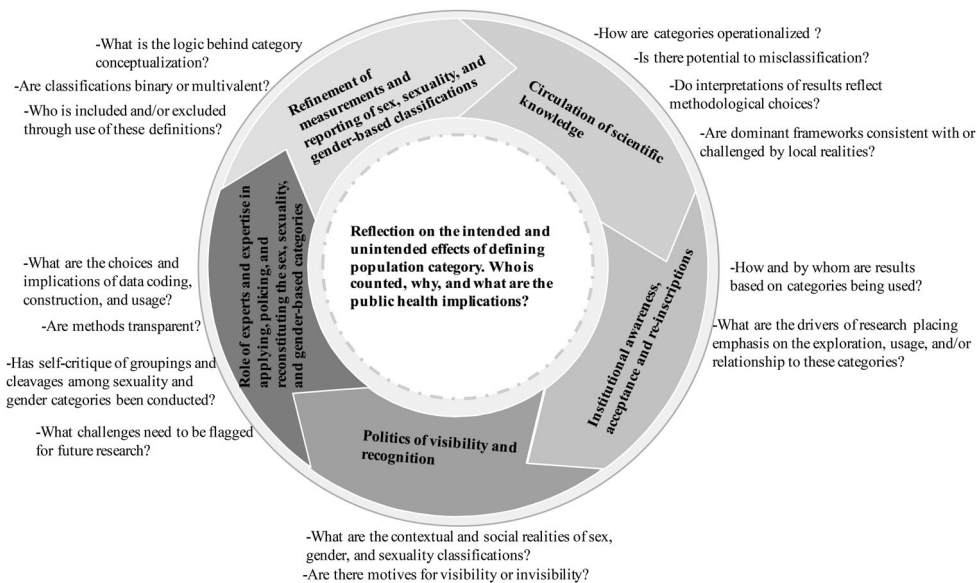


Figure 1. Model for critical engagement with ‘reflexive epidemiology’ to assess the complexities of sex, sexuality, and gender-based categories construction and usage within HIV epidemiology.

outcomes assessed in epidemiologic studies be included in appendices to improve future meta-analytic methods. Furthermore, availability of data and data sharing on MSM, transgender women, sex workers, and other people disproportionately burdened by HIV infection and AIDS is key in countries where country-level surveillance efforts do not report on these characteristics. Within dimensions where multiple risk factors intersect to augment vulnerability to HIV, in and across populations, the friction at the boundaries of categories necessitates further scholarly reflection. Methods seeking to assess these intersections (Bauer, 2014; Crenshaw, 1991) are an important next step in HIV epidemiologic research which seeks to identify pathways and mechanisms which contribute to HIV vulnerability.

Grounded in the context of sex work and HIV prevention, this paper highlights the multiplicity of genders and sexualities across a range of social and cultural settings, and their implications for epidemiologic estimates of HIV infection prevalence. The result is an intricate web highlighting the importance of transparency and reflexivity in category creation and application in public health and epidemiologic research. We must acknowledge that the uncritical use of unquestioned categories can not only be inaccurate, but that in some instances such inaccuracies can be oppressive and damaging to the people who are being categorised. Only by critically interrogating our use of categories will we be able to truly employ them in ways that do justice to the subjects of our research – in ways that will provide more accurate results and that will provide the basis for developing programmes and policies that will truly meet the needs of the populations that they are intended to serve. We urge researchers in the field to join us in further developing ‘reflexive epidemiology’ as a framework within which researchers can self-critique and engage in research transparency related to understandings of sex, sexuality, and gender. Jointly, this process will allow us to more effectively challenge and change existing practices in research and analysis that continue to marginalise and erase diverse sexual practices, sexual orientations, and gender identities in HIV and AIDS research, prevention, and health promotion efforts.

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