

Published in final edited form as:

Curr Opin HIV AIDS. 2014 March ; 9(2): 174–182. doi:10.1097/COH.0000000000000042.

HIV INFECTION AMONG FEMALE SEX WORKERS IN CONCENTRATED AND HIGH PREVALENCE EPIDEMICS: WHY A STRUCTURAL DETERMINANTS FRAMEWORK IS NEEDED

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Abstract

Purpose of review—This article reviews the current state of the epidemiological literature on female sex work and HIV from the past 18 months. We offer a conceptual framework for structural HIV determinants and sex work that unpacks intersecting structural, interpersonal, and individual biological and behavioural factors.

Recent findings—Our review suggests that despite the heavy HIV burden among female sex workers (FSWs) globally, data on the structural determinants shaping HIV transmission dynamics have only begun to emerge. Emerging research suggests that factors operating at macrostructural (e.g., migration, stigma, criminalized laws), community organization (e.g., empowerment) and work environment levels (e.g., violence, policing, access to condoms HIV testing, HAART) act dynamically with interpersonal (e.g., dyad factors, sexual networks) and individual biological and behavioural factors to confer risks or protections for HIV transmission in female sex work.

Summary—Future research should be guided by a Structural HIV Determinants Framework to better elucidate the complex and iterative effects of structural determinants with interpersonal and individual biological and behavioural factors on HIV transmission pathways among FSWs, and meet critical gaps in optimal access to HIV prevention, treatment, and care for FSWs globally.

Keywords

HIV epidemiology; sex work; structural determinants; theoretical framework

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CONFLICTS OF INTEREST

The views in this article are solely those of the authors and do not necessarily reflect the view of funding bodies. This work is partially supported by funding from the National Institutes of Health (R01DA028648 and R01DA033147), Canadian Institutes of Health Research and Michael Smith Foundation for Health Research.

The authors have no conflicts of interest to declare.

INTRODUCTION

Over three decades into the global HIV epidemic, female sex workers (FSWs) continue to experience a heavy HIV burden. Globally, efforts to expand optimal access to HIV prevention, treatment, and care to sex workers remain elusive in many regions globally [1]. In a recent review and meta-analyses of HIV epidemics in low- and middle-income countries (LMIC) [2], among the 26 countries with medium and high background HIV prevalence, 30.7% of FSWs were HIV-positive. Two-thirds of LMIC had no available data on estimates of HIV burden among FSWs, largely attributed to many of the same structural constraints that often pose barriers to HIV prevention, treatment and care (e.g., criminalization, stigma, restrictive funding policies) [2].

Early epidemiological sciences primarily focused on individual biological and behavioural mechanisms for HIV transmission alone, which fail to account for the full heterogeneity of HIV epidemics among FSWs. In the last decade, there have been growing calls globally to adopt multicomponent and socioecological approaches that account for structural factors in shaping HIV epidemics trajectories among FSWs and clients both at a dyadic and population-level. New international guidelines launched in 2012 on HIV prevention, treatment, and care among sex workers marked significant progress in the international policy arena towards framing comprehensive, multipronged HIV interventions among sex workers that incorporate a structural determinants approach alongside biomedical and behavioural strategies [1].

We review the global epidemiological literature regarding FSWs and HIV infection over the last 18 months (2012–2013) that characterizes the increasing shift to incorporate a structural determinants approach and intersections with established interpersonal and individual biological and behavioural risks. We draw on the epidemiological and social science literature to offer a conceptual framework to unpack intersecting structural determinants, as well as interpersonal and individual factors and guide future epidemiological research among sex workers in both concentrated and high prevalence settings. Although our review focuses on HIV research among FSWs, there are sizable numbers of male and transgender sex workers in a number of settings, and we suggest that our framework could be extended to incorporate the gender and sexual diversity and transmission dynamics of male and transgender sex workers.

THEORETICAL AND SOCIAL SCIENCE CONTRIBUTIONS TO HIV EPIDEMIOLOGY OF SEX WORK

Although the infectious disease epidemiology field has made important progress in incorporating structural determinants, much of this work has been guided by the social science literature [3–5]. Structural determinants are factors that are external to the individual and operate outside the locus of control of individuals. Among key theorists in HIV and structural research, Diez Roux [5] examined the tensions of social–biology interactions and the complex interplay and dynamic feedback loops that shape risks, whereas Rhodes [6] outlined a heuristic of intersecting social, physical, economic, and policy factors at macro-levels and micro-levels to examine drug-related harms. There have also been some seminal

contributions within sex work and HIV/sexually transmitted infection (STI) research. For example, Overs [7] considered how macrostructural and community organization factors intersect with behavioural factors, whereas Blanchard and Aral [3] have extended work by Diez Roux and colleagues [3,5,8] to consider sexual networks as structural properties and their social contexts together with individual factors. Theoretical and implementation sciences have also increasingly articulated the need to consider structural determinants and HIV as complex adaptive systems, where structural properties are dynamic and interactive processes within social systems [3].

Critiques of biomedical and behavioural approaches to the study of HIV epidemics highlight how traditional epidemiological research has largely focused on linear cause- and-effect pathways between individuals and their environment, which fail to account for the agency-structure dynamics in which structural factors constrain and enable agency [3,9]. As an example, male condom use continues to be conceptualized as an individual behaviour or action in a number of earlier frameworks, despite the clearly gendered power dynamics in negotiation of condom use at the interpersonal (e.g., partner) level [10]. Understanding these complex relationships requires an iterative and multifaceted approach in which social science can help to map conceptions of structural determinants of HIV transmission and inform more complex modelling of casual pathways with interpersonal, behavioural, and biological factors. Previous frameworks have also been critiqued for an over reliance on 'risk', with much less attention paid to factors that may confer protection against HIV (e.g., community empowerment, supportive venue-based policies, HAART), and have rarely considered the crucial levels of community organization and interpersonal/dyad risks in shaping HIV epidemiology in female sex work.

STRUCTURAL HIV DETERMINANTS FRAMEWORK

Drawing on recent literature on HIV transmission dynamics in female sex work, we offer a conceptual framework (Fig. 1) to help unpack various domains of structural drivers of HIV and the pathways through which they interact with interpersonal and individual behavioural and biological factors, and guide future research. Our structural HIV determinants framework is a heuristic that incorporates the theory of gender, power, and HIV [11] to the sex work context. The framework depicts how structural HIV determinants in sex work are produced through a dynamic interplay of macrostructural factors (e.g., social, economic and health policies, and laws governing sex work, mobility and migration of sex workers and clients, geography and sociopolitical transitions, stigma, cultural norms on gender and sexuality); the community organization of sex work (e.g., community empowerment, sex work collectivization); and the physical, social, economic, and policy features of work environments (e.g., venue-based characteristics, managerial practices, local policing, coverage and access of condoms, HIV/STI testing, HAART). These structural HIV determinants can promote or reduce interpersonal factors (e.g., partner-level/dyad-level risks and protections, such as condom negotiation, sexual networks, and patterning) and interact with individual factors of sex workers, their clients and their intimate, nonpaying partners, including behavioural (e.g., drug use, duration in sex work), biological (e.g., age, sex, race, HIV characteristics, STI co-infection), and host genotypic factors (e.g., host immunity) to

shape HIV acquisition and transmission dynamics and epidemic trajectories at the individual and population levels.

The framework consists of multilevel structural determinants, organized with relative proximity to HIV transmission dynamics and interacting with interpersonal and individual behavioural and biological factors. Consistent with Blanchard and Aral [3], we have included a community organization level; defined in structural HIV research as systems of organization that link and interplay with macrostructural factors and more downstream factors [8]. Moving beyond linear approaches, our framework maps a dynamic approach, allowing for positive and negative feedback loops and iterative and duplicative effects of various structural determinants [3,8,12]. Importantly, this framework emphasizes the ways in which structural influences can play out at various levels, for example, economic influences can manifest as macrostructural determinants (e.g., socioeconomic policies on welfare affecting marginalized women) as well as within the work environment (e.g., venue-based fee structures), just as macrostructural gender inequities can fuel gender-based power dynamics in condom negotiation at the interpersonal level (e.g., by commercial or nonpaying partners).

Although this conceptual framework maps risk and protective factors for HIV transmission among sex workers, their clients and intimate, nonpaying partners, it also considers the epidemic phase and stages at the population level, including potential overlap with other key affected populations (e.g., people who inject drugs, MSM).

EPIDEMIOLOGY OF BEHAVIOURAL AND BIOLOGICAL FACTORS

The risk of HIV and other STI acquisition through heterosexual transmission – the primary transmission pathway among FSWs, clients, and nonpaying partners – is determined by a complex interplay of individual biological, behavioural, and host genotypic and partner-level factors; namely, the average rate of partner contacts, probability of transmission (e.g., per unprotected sex act), and duration of infection [13,14].

At the biological level, high prevalence of bacterial STI infections, synergistic relationships between HIV and STIs [15,16], HAART use and virological suppression among the index partner, and incidence of pregnancy shape HIV transmission dynamics in female sex work. Despite significant advancements in biomedical interventions related to the protective effects of HAART (e.g., treatment as prevention, pre-exposure prophylaxis), biological data indicating population-level impacts of HAART (e.g., community viral load) among sex workers and their clients is limited. Host genotypic factors have also been shown to confer risk or protections (e.g., CCR5 mutation) in female sex work [17]. In Kenya and Thailand, host immune factors (e.g., lower state of CD4+ T cell, mucosal immune system) have helped explain why populations of highly HIV exposed FSWs remain persistently HIV-seronegative [17,18]. At the behavioural level, individual factors such as early age of sex work initiation and duration of time in sex work have been shown to shape sexual networks and risk patterning [19,20]. Injection drug use among sex workers, their clients and nonpaying partners exacerbate risks through parenteral transmission of syringe sharing at the partner-level and increased biological risks for hepatitis C virus [21,22]. Injection and

noninjection illicit drug use (e.g., amphetamines) as well as alcohol use have also been shown to heighten partner-level sexual risks (e.g., higher number and more risky sexual exchanges, noncondom use) and STI acquisition [23,24,25].

EPIDEMIOLOGY OF INTERPERSONAL HIV FACTORS

Interpersonal risks and protective factors operate at the partner level within sexual networks and patterning that shape the efficacy of transmission between sex worker–client and sex worker–partner dyads and epidemic trajectories. Recent studies of interpersonal factors associated with HIV infection include number [26], frequency or type of commercial/partnership dyads (e.g., clients, intimate, or causal nonpaying partners) [26–28], types of sex acts or exchanges [26], and negotiation of male or female condom use (including, client condom refusal, or condom breakage). Studies of interpersonal HIV factors have also begun to identify how types and characteristics of sex worker–client and intimate or other nonpaying partner relationships shape sexual patterning and HIV transmission dynamics. For example, condoms are less likely to be used in transactions with regular clients as compared one-time clients [29], and even less so within the context of intimate partnerships [27,30]. Whereas some novel qualitative and epidemiological research outcomes have recently emerged to shed light on the gendered complexities and challenges related to HIV prevention within sexual partnerships and networks [31–34], further studies incorporating data from sex workers, their clients and nonpaying partners remains critical.

At a population level, sexual patterning, including partner concurrency [31], sexual networks (e.g., density of sex worker–client networks) and distribution of sex worker–client transactions (e.g., clients visiting many sex workers, or large number of client encounters occurring within a small number of sex workers) are key factors shaping epidemic trajectories [35–37].

EPIDEMIOLOGY OF STRUCTURAL DETERMINANTS

Despite the established individual and interpersonal-level factors that shape HIV acquisition and transmission dynamics in female sex work, research has just begun to map causal pathways of structural determinants and their impact on risk patterning and HIV acquisition dynamics [38].

Macrostructural factors include legal, sociopolitical, cultural, economic, and geographic contexts that may be proximal or distal factors, and operate in iterative pathways with other structural determinants, interpersonal, and individual behavioural and biological factors to shape HIV acquisition and transmission risk among FSWs. A growing number of studies of macrostructural factors have focused on laws and policies governing sex work and HIV (e.g., criminalization, incarceration, regulation, and mandatory registration) as key factors linked to reduced condom use and HIV infection among FSWs. In Tijuana, Mexico, a study of mandatory registration of sex workers suggests that while registration was associated with increased condom access and HIV testing, regulation excluded more marginalized sex workers and those in more ‘hidden’ venues (e.g., lower income sex workers, or those who inject drugs) [39]. Beyond legislation, other key macrostructural factors linked to HIV risks (or protections) among FSWs include migration and mobility (e.g., among both sex workers

and clients) [40–44], other geographic influences (e.g., residing in high HIV burden setting) [42,45–48], stigma [49], education and literacy [42,47,50–52], gender inequities [48,49,53], and history of forced labour or sex trafficking [21,44,48,54–57].

Migration and other forms of mobility illustrate the nonlinear and dynamic effects of structural determinants on casual HIV risk pathways. For example, internal mobility and circular migration for sex work (e.g., between districts, travel to religious festivals) [40,41,43] and venue instability (e.g., mobility between different sex work venues) [27,42,58] have been linked to elevated HIV prevalence in a number of settings whereas migration to higher-income settings has been shown to be protective against HIV infection [59]. Variation in HIV transmission risks among migrant sex workers have been increasingly shown to be a product of intersecting macrostructural factors (e.g., political and economic instability and HIV burden of place of origin, immigration policies, language, and cultural contexts of host-setting) and the work environment features they engender (e.g., economic opportunities and social mobility, violence and policing, health access) [40,41,60,61]. For example, in South Africa, cross-border migration facilitated increased social and economic opportunities (e.g., higher sex work income, access to indoor venues) among sex workers, but reduced contact with health providers and lower condom use as compared with internal migrants [60].

Community organization has been considered as a broad process of community empowerment or elements of community organization such as social cohesion among sex workers, peer or sex work-led programming, or formation of sex work collectives [62,63]. The majority of this work has been drawn from the Songachi and Avahan programs in India [64,65], with a smaller number of studies emerging from Latin America and the Caribbean [63]. The dynamic nature of community empowerment remains a methodological challenge for researchers and an area in need of more rigorous measurement and evaluation, in partnership with sex work communities [63]. In China, increased social cohesion between ethnic minority workers was reported in lower-paying venues, whereas moderate-to-high paying venues had more formal structures that discouraged peer network and informal support [66].

Work environment consists of intersecting physical, social, economic, and policy features of the sex work environment. As these factors are more downstream products and interactions with macrostructural factors (e.g., laws, stigma), the work environment is often measured as a proxy for more distal factors. For example, local policing practices (e.g., fines, bribes, confiscation of condoms or syringes), arrest, police abuse, and sexual coercion by police of sex workers have been examined in a number of settings as a proxy for enforcement of criminalized sex work laws, often acting dynamically with client violence, in reducing condom use [49,67] and elevating HIV prevalence or incidence [45,67,68].

A large number of studies have examined types of venues and their relationships with HIV risks or protections among FSWs, underscoring the heterogeneous and context-specific nature of work environments [39,42,46,47,50,54,58,65,67,69–76]. Only a handful of studies have started to disentangle the complexities and unique and iterative effects of policy, physical, social, and economic features of work environments that are specific to local sex

industries and shape HIV prevention, treatment, and care [54,77,78,79,80,81]. Studies of brothels or other in-call venues in China, Philippines, Indonesia, Dominican Republic, Brazil, USA, and Canada have documented how supportive venue-based policies and managerial practices (e.g., sexual health policies, condom promotion, removal of violent clients) [54,78,79,80,81], sex worker/peer supports [54,70,76,78,82], and physical venue features (e.g., layout of venues, access to condoms, surveillance cameras) [80] can promote reduced HIV transmission risk.

Studies of the physical features of the work environment have demonstrated how good coverage to condoms, HIV/STI testing and HAART, and contraceptives among sex workers are directly associated with reduced HIV prevalence [83,84], though suboptimal access is reported in a high number of settings as compared with the general population of women of reproductive age [1]. Studies of social features of the work environment have primarily focused on the relationship of physical and/or sexual violence (by clients, intimate partners, police, pimps, strangers, or other third parties) to HIV infection [22,40,55,68] and risk among FSWs, either directly through increased risk of transmission (e.g., tearing, forced sex, condom breakage) or indirectly through reduced odds of condom use [26,28,40,41,45,49,79,85–87]. Although recognition of intimate partner violence as a global human rights and public health priority has led to standardized measurements and assessments, measurements, and methods related to violence perpetrated against sex workers in the workplace have received limited attention [88].

Within the economic features of the work environment, economic pressures [65,89] and client financial incentives for unprotected sex [23,48,82] have been linked to reduced condom use, whereas higher income [70,79,82,90] and reduced economic dependence on sex work [87,91] are associated with more consistent condom use and greater condom negotiation in sex work.

CONCLUSION

Our review of the recent epidemiological literature reveals important progress in considering structural determinants of HIV transmission in female sex work, alongside studies of interpersonal, individual behavioural, and biological factors. Employing a Structural HIV Determinants Framework brings a myriad of opportunities and challenges in epidemiological research, including the development of appropriate methods and measurement, ethical considerations, and adaptation to implementation science and intervention design and evaluation.

Much epidemiological research to date has considered structural determinants as static or linear cause-and-effect in their relationship to HIV risk. Traditional epidemiological regression methods have been criticized as being too simplistic to capture these dynamic and iterative pathways, underscoring the need for methodological innovation in epidemiological research, including adoption of multilevel and mixed methods research. The development and articulation of more rigorous measures of structural factors will require epidemiological research to better capture both the complexity and iterative effects of structural determinants and the inherently context-specific nature within which structural properties and HIV

epidemics are embedded. More substantive dialogue between social sciences and epidemiological research remains crucial.

Future research should consider how changes in structural factors across various domains of the framework may act dynamically to shift both HIV risk among sex workers, clients, and noncommercial partners at an individual level and epidemic trajectories at a population level. For example, mathematical modelling [36] has consistently demonstrated that patterns of sex worker–client contacts play a critical role in sustaining and expanding HIV prevalence, regardless of rates of sex worker–client contacts or population size; yet we know very little about how various structural factors (e.g., sociopolitical transitions or legal shifts at the macrolevel, changing features of work environments) may act dynamically to change partner-level risks (e.g., rates of condom use, sex workers primary seeing regular/repeat clients) and moderate epidemic trajectories among sex workers and clients at a population level.

The complex and broad nature of structural interventions have led to substantive debate in design and evaluation in public health, with growing recognition that traditional intervention designs fall short of more complex and dynamic effects of multilevel interventions (e.g., venue and community levels). Alternative designs should take into account qualitative and observational research, crossover studies, comprehensive dynamic trials [8], and stepped-wedge and longitudinal study designs. There is also increasing need to recognize that many structural interventions operate outside the locus of control of scientists (e.g., legislative changes, sex work organizing, municipal changes to venue-based policies) and require both methodological and ethical considerations associated with engaging with a diversity of stakeholders, including sex workers, clients, police, managers, and government officials.

Ultimately, in a landscape where international HIV guidelines among FSWs have directly called on scientists, public health, and community to embrace multicomponent, structural, sex work-led and biomedical interventions [1], and science has articulated a clear need, a structural HIV determinants framework is both timely and of urgent priority to addressing the heavy HIV burden among FSWs globally.

Acknowledgments

None.

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KEY POINTS

Despite consistent evidence that biological and behavioural factors alone fail to account for the heterogeneity of HIV infection among FSWs globally, epidemiological data on structural determinants of HIV in female sex work are still in its relative infancy.

We review the recent epidemiological literature and offer a structural HIV determinants framework to help unpack how macrostructural, community organization and work environment factors act iteratively and dynamically with established interpersonal/dyad, biological, and behavioural factors to shape HIV transmission dynamics in female sex work.

More attention is needed to the development of methods and measures that ‘unpack’ the complexities and interactions of multilayered structural determinants and pathways with interpersonal, biological and behavioural mechanisms in conferring both HIV risks and protections among FSWs, clients and intimate, nonpaying partners.

Given the heavy HIV burden among FSWs globally, a structural HIV determinants approach is of urgent priority towards a better response to substantial gaps in optimal access to HIV prevention, treatment, and care.

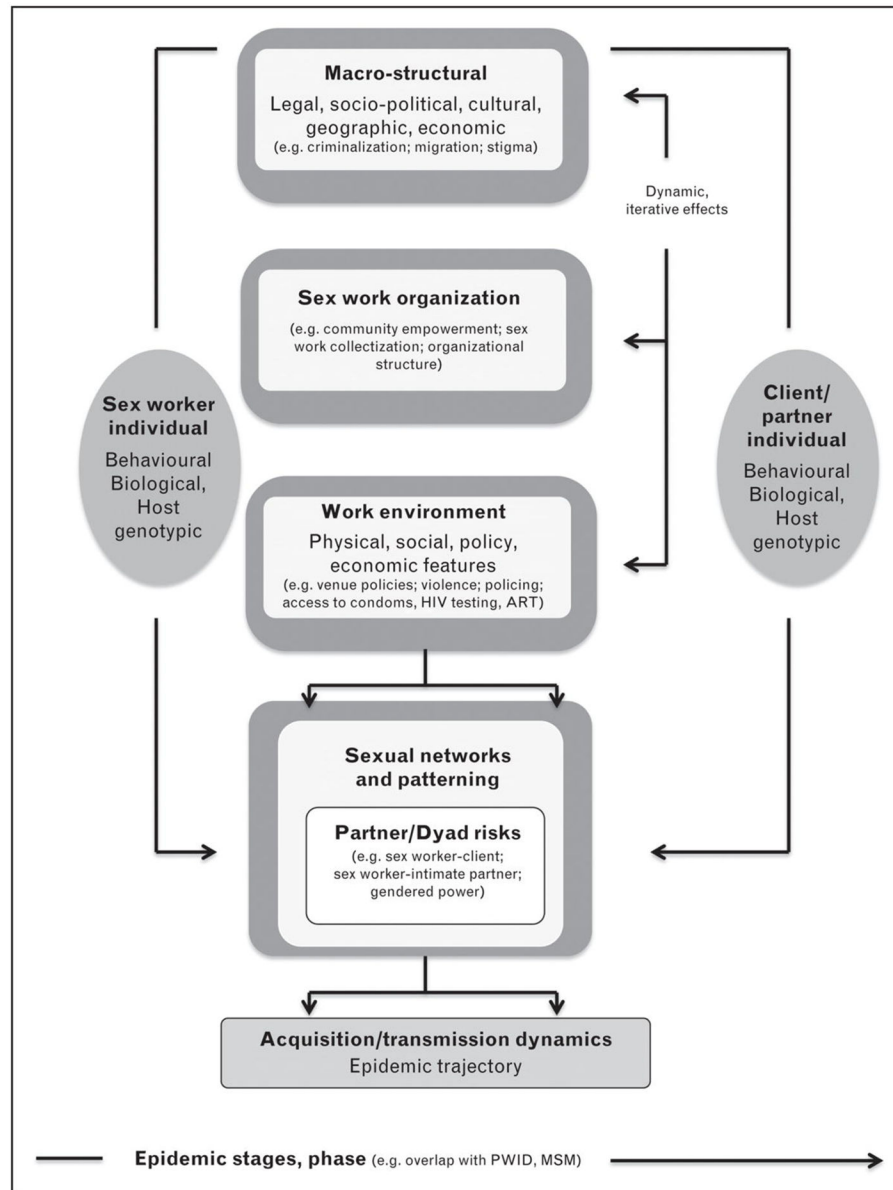


FIGURE 1. Structural HIV Determinants Framework

Conceptual Framework adapted from Blanchard and Aral [3,17], Connell [11], Diez Roux [5], Overs [7], Rhodes [6,9]. The framework consists of multilevel structural determinants, interpersonal and individual risks, organized with relative proximity to HIV transmission dynamics and acting iteratively and dynamically to produce HIV risks or protections among sex workers.