



# Intertwined epidemics: progress, gaps, and opportunities to address intimate partner violence and HIV among key populations of women

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The intersection of intimate partner violence and HIV is a public health problem, particularly among key populations of women, including female sex workers, women who use drugs, and transgender women, and adolescent girls and young women (aged 15–24 years). Intimate partner violence results in greater risk of HIV acquisition and creates barriers to HIV prevention, testing, treatment, and care for key populations of women. Socioecological models can be used to explain the unique multilevel mechanisms linking intimate partner violence and HIV. Few interventions, modelling studies, and economic evaluations that concurrently address both intimate partner violence and HIV exist, with no interventions tailored for transgender populations. Most combination interventions target individual-level risk factors, and rarely consider community or structural factors, or evaluate cost-efficacy. Addressing intimate partner violence is crucial to ending the HIV epidemic; this Review highlights the gaps and opportunities for future research to address the intertwined epidemics of intimate partner violence and HIV among key populations of women

## Introduction

More than 40 years into the HIV/AIDS epidemic, more than half of all new HIV infections occur among women who fall into one or more key populations: female sex workers, women who use drugs, transgender women, and adolescent girls and young women (aged 15–25 years).<sup>1</sup> Compared with the general population of women of reproductive age, the relative risk of acquiring HIV is 30 times greater among female sex workers, 29 times

greater among people who inject drugs, and 13 times greater among transgender people, and 20% of all new HIV infections are among adolescent girls and young women.<sup>1</sup> Extensive research has shown that HIV and intimate partner violence are inexorably linked, particularly among these key populations of women.<sup>2</sup> Women who experience intimate partner violence have a greater risk of HIV acquisition and limited access to HIV prevention, testing, treatment, and care.<sup>3</sup> Common

## Lancet HIV 2022

Published Online  
February 10, 2022  
[https://doi.org/10.1016/S2352-3018\(21\)00325-8](https://doi.org/10.1016/S2352-3018(21)00325-8)  
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## Key messages

- Intimate partner violence estimates among key populations of women are prone to under-reporting and measurement error due to gaps in surveillance, criminalisation of risk behaviours, stigmatisation, homicides, non-representative data collection methods, publication bias, and poor reliability of intimate partner violence measurement tools
- Unique mechanisms and risk factors for intimate partner violence at multiple levels of the socioecological model contribute to increasing HIV risk for female sex workers, women who use drugs, transgender women, and adolescent girls and young women (aged 15–24 years)
- Across key populations, the primary biological mechanism linking intimate partner violence to HIV infection is sexual intimate partner violence and the primary behavioural mechanisms are sexual-related or drug-related risk behaviours, often fuelled by community-level risk factors and gender power imbalances
- Combination multilevel interventions that co-target risk factors for both HIV and intimate partner violence (eg, improving access to and utilisation of services, economic and social empowerment, and community mobilisation) can avert HIV infections and prevent intimate partner violence across diverse settings
- Accumulating intervention research has identified a range of multilevel evidence-based interventions that are efficacious in reducing intimate partner violence and HIV among key populations; to date, no interventions have been developed specifically for transgender women, and considerable geographical variability exists, with no interventions developed and evaluated for key populations of women in South America, central America, the Caribbean, and east Asia
- There remains an absence of implementation research and of service integration that are necessary to promote a coordinated community response to address intimate partner violence among female key populations at risk for HIV
- Current literature on the economic implications of interventions to reduce intimate partner violence and HIV incidence among key populations is insufficient to inform evidence-based decision making
- More implementation science research funding is urgently needed to evaluate the efficacy, scaleup, and cost-effectiveness of novel combination intimate partner violence and HIV interventions for key populations of women, as well as greater investment in community-based organisations and other service settings to implement intimate partner violence and HIV evidence-based interventions in real-world settings

**Panel 1: Definitions of intimate partner violence<sup>4,5</sup>**

Intimate partner violence refers to any behaviour within an intimate relationship that causes physical, psychological, or sexual harm to those in the relationship. This can include acts of:

- Physical violence (eg, slaps, punches, kicks, assaults with a weapon, or homicide)
- Sexual violence (eg, rape, coercion, and abuse including use of physical force, verbal threats, and harassment to have sex, unwanted touching or physical advances, forced participation in pornography, or other degrading acts that often persist over time and are accompanied by threats on part of the perpetrator)
- Emotional abuse
- Emotional violence (eg, undermining a person's sense of self-worth through constant criticism, belittling one's abilities, name calling or other verbal abuse, damaging a partner's relationship with their children, preventing one from seeing family and friends, and intimidation)
- Economic violence (eg, making or attempting to make a person financially dependent by maintaining total control over financial resources, withholding access to money, forbidding attendance at school or employment, or confiscating earnings)

definitions of intimate partner violence have been developed by WHO and UN Women (panel 1).<sup>4,5</sup> Definitions of what constitutes as intimate partner violence, however, can vary by context, culture, and the unique experiences of intimate partner violence among key populations (eg, being forced to exchange sex for money or drugs, or preventing women from getting HIV care). These factors are often not considered by intimate partner violence researchers or programme staff.

Representative, population-level estimates of intimate partner violence are scarce for both male and female key populations. However, many non-random, and thereby non-representative, cross-sectional studies and meta-analyses have shown that the prevalence of intimate partner violence is much greater among female sex workers, women who use drugs, transgender women, and adolescent girls and young women, when compared with women in the general population (panel 2).<sup>5-18</sup>

Intimate partner violence prevalence estimates among key populations are frequently based on studies with small samples, non-representative data collection methods, and incomplete or limited generalisability of results. Furthermore, intimate partner violence is often under-reported, especially among marginalised populations. High rates of homicide, suicide, all-cause mortality, and the legal consequences of intimate partner violence can also obscure the true prevalence of intimate partner violence, and subsequently, its impact on HIV. Homicide represents the most extreme form of intimate partner

violence. Among female sex workers, the rate of homicide is more than 17 times greater than that in the general population,<sup>19</sup> and criminalisation of sex work means that intimate partner violence often goes undocumented.<sup>20</sup> Among Black or Latinx transgender women, the estimated homicide rate is 1.4–14.2 times greater than in cisgender populations of the same ethnicities.<sup>21</sup> Results from a longitudinal study in Canada revealed that severe intimate partner violence significantly contributed to an increased odds of all-cause mortality (odds ratio [OR] 2.42; 95% CI 1.03–5.70),<sup>22</sup> and globally, intimate partner violence represents the fifth leading cause of death among adolescent girls and young women.<sup>6</sup> Thus, marginalisation, criminalisation, stigmatisation, gaps in surveillance, the high proportion (40%) of female homicides perpetrated by intimate partners,<sup>23</sup> mortality, and variations in the legal reporting of intimate partner violence all result in under-reporting of the true prevalence of intimate partner violence, and underestimate its effect on HIV among key populations. The lack of population-level and real-time surveillance data on intimate partner violence, particularly among key populations, remains a major barrier to implementing targeted interventions against it.

Systematic reviews that examined interventions addressing both intimate partner violence and HIV have noted that multipronged and multilevel approaches are needed to achieve broader population-level effects.<sup>24,25</sup> However, most interventions focus on risk factors at the individual level, and neglect to consider the environments and conditions in which women live. Integrated approaches that address both intimate partner violence and HIV simultaneously are more likely to be effective at reducing the risk factors that contribute to intimate partner violence perpetration and HIV transmission, improving related health outcomes, and providing cost savings.<sup>25</sup> Also, earlier reviews do not examine combination intimate partner violence and HIV interventions among key populations, despite key populations of women bearing a disproportionate burden of both intimate partner violence and HIV. For these reasons, our understanding of interventions and their cost-effectiveness in reducing intimate partner violence remains inadequate.<sup>3</sup> Additionally, little attention has been paid to economic evaluations that could support the scaling up and integration of combination intimate partner violence and HIV interventions into routine practice and policy. Although we recognise that intimate partner violence might occur in relationships with members of any gender, we do not include studies of men who have sex with men as we believe that this key population merits a separate review that is beyond of the scope of our Review.

**Biological, behavioural, and social mechanisms linking intimate partner violence and HIV**

The socioecological model (figure)<sup>26</sup> provides a useful framework for understanding how factors at individual,

### Panel 2: Estimated prevalence of intimate partner violence among key populations of women

Global prevalence estimates reveal that nearly one in three women older than 15 years who have ever been in a relationship have experienced physical or sexual violence.<sup>5</sup> In high-income countries, the prevalence of intimate partner violence is 22% (range 17–29%). Across low-income and middle-income regions, the prevalence of intimate partner violence is 37% (33–42%), with south Asia (35%) and sub-Saharan Africa (33%) reporting the highest prevalences.<sup>5</sup> The Global Burden of Disease study<sup>6</sup> and population-level surveys indicate considerable variations in intimate partner violence prevalence by region and age, suggesting that violence is preventable.

#### Female sex workers

Studies of female sex workers show that the prevalence of physical or sexual violence from intimate partners ranges from 4% to 64%, globally.<sup>7</sup> In one study, nearly half (49%; 95% CI 45–53) of female sex workers in India reported emotional intimate partner violence, a third (33%; 30–37) reported physical intimate partner violence, 7% (4.8–8.9) reported sexual intimate partner violence, and nearly a quarter (24%; 21–28) reported severe physical or sexual intimate partner violence in the 6 months before.<sup>8</sup> Consistent with prevalence estimates in India, emotional abuse was the most prevalent form of intimate partner violence among sex workers in Mexico,<sup>9</sup> with more than a third (35%) reporting emotional, physical, or sexual violence.<sup>10</sup> In Canada, a prospective cohort study reveals that 34% of sex workers experienced any form of intimate partner violence, with emotional being the most common (30%), followed by physical (26%), and sexual (9%).<sup>11</sup> In the USA, 24% of LGBT sex workers reported lifetime sexual intimate partner violence and 48% reported physical intimate partner violence, respectively.<sup>12</sup>

#### Women who use drugs

There is considerable overlap between sex work and injection drug use, with approximately 1 million of the 3.5 million women who use drugs also reporting engagement in sex work.<sup>13</sup> A systematic review examining the bidirectional relationship between intimate partner violence and opioid use<sup>14</sup> indicated that nearly 50% of all intimate partner violence victims use

opioids, and that the relative risk of opioid use among people who have experienced intimate partner violence (compared with people who have not experienced intimate partner violence) ranges from 2.37 to 3.11. Lifetime prevalence estimates of intimate partner violence among women with opioid use disorders range from 36% to 94%, while past year prevalence estimates range from 32% to 75%. A longitudinal study by Gilbert and colleagues,<sup>15</sup> also notes that women who used heroin were twice as likely to experience intimate partner violence and 2.7 times more likely to report intimate partner violence-related injury.

#### Transgender women

Intimate partner violence among transgender populations is not well studied globally, with most studies of intimate partner violence among transgender populations originating from the USA. A study of 23 999 transgender adults in the USA revealed similar variability by intimate partner violence subtype: 42% reported psychological intimate partner violence, 40% reported physical intimate partner violence, 30% reported trans-related intimate partner violence, 18% reported stalking, and 22% reported forced sex by an intimate partner, with substantial variations by race or ethnicity, gender identity, and social marginalisation status (ie, incarceration, sex work, and homelessness).<sup>16</sup>

#### Adolescent girls and young women

Most studies examining the relationship between intimate partner violence and HIV among adolescent girls and young women originate from sub-Saharan Africa, and less is known about this key population in other settings. A multicountry study examining the prevalence of past year intimate partner violence among adolescents (aged 15–24 years) in urban environments found that any intimate partner violence ranged from 10% in Shanghai, China to 37% in Johannesburg, South Africa.<sup>17</sup> Similar patterns were observed by physical and sexual intimate partner violence subtype. Data from demographic and health surveys of 25 sub-Saharan African countries also suggest high rates of intimate partner violence among adolescents, with estimates ranging from 8% in Chad to 41% in Gabon, and a pooled prevalence of 19%.<sup>18</sup>

interpersonal, community, and societal levels are additive, reciprocal, and modify or synergistically influence health behaviours and outcomes.<sup>27</sup>

The primary biological mechanism linking intimate partner violence to HIV infection is sexual intimate partner violence (ie, condomless vaginal or anal sex via physical force, coercion, or threat) with a seropositive partner. Genital lacerations or injuries to the vaginal or rectal mucosa can facilitate HIV transmission through a local inflammatory response and impairment of the integrity of the mucosal epithelial barrier.<sup>28</sup> Intimate partner violence can also induce chronic stress, resulting in dysregulation of the hypothalamic–pituitary–adrenal

axis, altered cortisol concentrations, and, ultimately, chronic inflammation, immune dysfunction, and an altered vaginal microenvironment,<sup>26</sup> which can subsequently increase HIV susceptibility.<sup>28</sup>

The primary behavioural mechanisms linking intimate partner violence to HIV infection are sexual and drug-related behaviours, such as, condomless vaginal or anal sex, or needle sharing; these behaviours are often coerced by intimate partners. Intimate partner violence is associated with inconsistent condom use; women who report severe sexual intimate partner violence are less likely to use condoms, fearing that condom negotiation will incite intimate partner violence.<sup>29</sup> Condom

For population-level surveys see <https://www.who.int/data/gho>

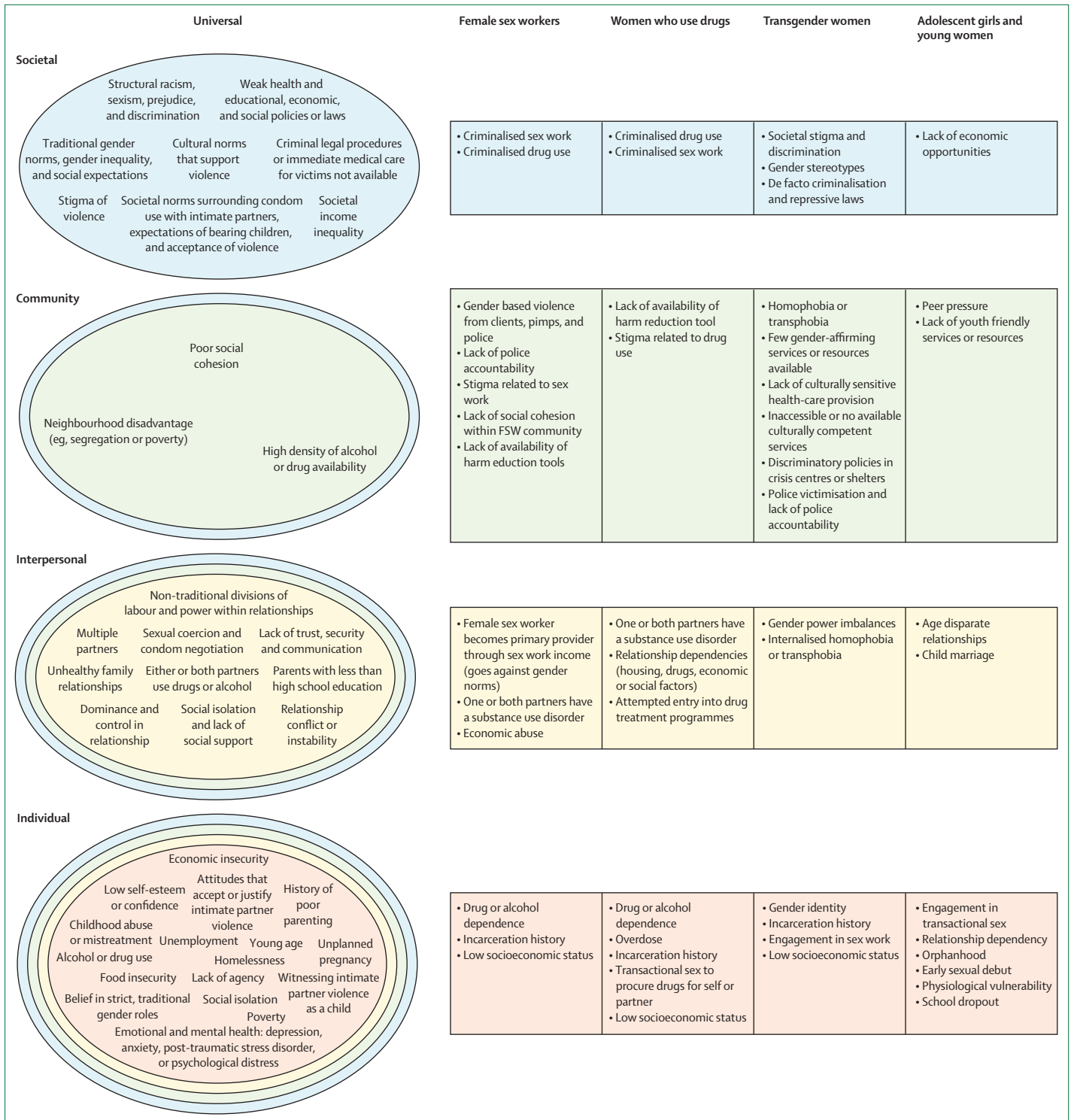


Figure: Mechanisms that link intimate partner violence and HIV among key populations of women across the socioecological model<sup>26</sup>  
 The overlapping circles and colour-coded boxes represent multilevel risk factors within the socioecological model. FSW=female sex worker.

negotiation might be perceived as a sign of infidelity or mistrust, which leads to relationship instability, further perpetuating the cycle of abuse.<sup>30</sup> Sexual coercion and

male dominance in relationships also decreases women’s power to negotiate their sexual health or HIV prevention needs.

At the community level, social norms that tolerate intimate partner violence or stigmatise women increase risk of both intimate partner violence and HIV.<sup>31</sup> Furthermore, these norms could interact in ways that have yet to be documented to increase women's risk of HIV acquisition. Gender power imbalances, interpersonal issues related to love, trust, and sexual pleasure, social expectations to bear children, and drug and alcohol use also contribute to intimate partner violence and inconsistent condom use, thereby elevating the risk of HIV.<sup>32</sup> Finally, men who perpetrate intimate partner violence, and their sexual partners, are more likely to have multiple partners, further increasing the risk of acquiring HIV.<sup>33</sup>

Although these biological and sociobehavioural mechanisms hold true for all women, marginalised women experience unique risk factors that increase susceptibility to both intimate partner violence and HIV. The socioecological model can be used to illustrate mechanisms that link intimate partner violence and HIV, by each key female population (figure). Of note, key female populations often overlap, and it is important to understand that risk factors might be shared across key populations that contribute to multiplicative deleterious effects.

### Female sex workers

The context in which women engage in sex work creates additional risk for intimate partner violence and HIV. Transactional sex that occurs with multiple partners can lead to mistrust and infidelity within intimate partner relationships that exacerbates the risk of intimate partner violence and HIV. Sexual violence against female sex workers directly increases the risk of HIV and other sexually transmitted infections,<sup>34</sup> and leads to long-term lower self esteem, reduced ability to negotiate terms of sex work, and emotional distress. Coercion for condomless sex in exchange for money or other resources exploits sex workers who face economic insecurity, poverty, and homelessness.<sup>35</sup> Women might use drugs or alcohol as a coping mechanism, and female sex workers who use drugs have multiple HIV risk exposures due to unsafe injection practices, condomless sex with clients and intimate partners, and sexual violence.<sup>29</sup> Intimate partner violence, or the threat of it, undermines a woman's ability to practise safe sex or safer drug use during sex work. Female sex workers who experience both client-perpetrated violence and intimate partner violence are at an increased risk of HIV acquisition, due to the greater likelihood of sexually transmitted infections, condom breakage, and condomless sex with multiple partners.<sup>36</sup>

Criminalisation of sex work perpetuates stigma and discrimination, which can increase female sex workers' vulnerability to both intimate partner violence and HIV by compelling them to work in isolated areas that are further from health services.<sup>37</sup> Working in isolated areas exacerbates intimate partner violence through increased

vulnerability to police harassment, which is associated with unsafe injection drug use and inconsistent condom use;<sup>38</sup> fear of police harassment might also indirectly contribute to HIV risk by discouraging women from using HIV or harm reduction services.<sup>39</sup> The power imbalance between female sex workers and police, and insufficient police accountability translates to inadequate protection, which reduces intimate partner violence reporting.<sup>39</sup> Criminalisation of sex work also increases the rates of incarceration, which can further aggravate economic hardships and could force women to engage in riskier sex work (eg, condomless or anal sex, sex with multiple partners, or sex with partners who are known to be violent or living with HIV) to pay fines, or result in homelessness, which further increases vulnerability to violence.<sup>37</sup>

### Women who use drugs

Women who use drugs might be pressured to exchange sex for drugs for themselves or their intimate partners, and risk pathways for women who use drugs overlapping with those of female sex workers (figure). Furthermore, women who depend on their partners to supply drugs, housing, and economic needs might be less likely to use condoms.<sup>30</sup> Sex work to support drug habits explains a link between female sex workers, people who use drugs, clients of sex workers and, subsequently, the general population, and might be associated with transitioning an HIV epidemic that is concentrated among key populations to one that is generalised.<sup>40</sup>

Women are often initiated into drug use by their male sexual partners who exert a substantial amount of control over their drug use and sexual risk practices.<sup>41</sup> Men who use drugs are more likely to have greater HIV risk factors compared with the general population. These risk factors include a history of incarceration, multiple drug injection partners, and the use of syringes obtained from informal sources.<sup>42</sup> Active drug use and drug withdrawal impairs judgement and intensifies feelings of paranoia, distrust, and jealousy. Partners could threaten to disclose a woman's drug use to police or child protective services as a way of exerting control. These psychopharmacological effects increase the chance of intimate partner violence and decrease a woman's ability to practise harm reduction or negotiate safer sex. Compared with women who do not use drugs, women who use drugs are more likely to experience all types of intimate partner violence, and subsequently use drugs or alcohol as a coping mechanism.<sup>14</sup>

Excessive drug or alcohol use limits a woman's ability to recognise violent cues,<sup>43</sup> which increases their risk of sexual intimate partner violence, and can exacerbate adverse mental health conditions; these factors all increase the risk of HIV acquisition. Substance use by intimate partners contributes to intimate partner violence perpetration and the exertion of power and control, consequently shaping women's sexual risk behaviours.<sup>44</sup>

Drug use can reduce sexual desire among women, but increase it among men, further contributing to sexual coercion, violence, and impaired decision making in men.<sup>29</sup> In relationships where both partners inject drugs, inequality and gender power imbalances often mean that women reuse their partners' needles, and make condom negotiation difficult, which dually increases the risk of HIV transmission through non-sterile injection equipment, and by exacerbating the risk of physical and sexual intimate partner violence.<sup>29</sup> Studies have also reported a high prevalence of intimate partner violence and associations between intimate partner violence and HIV risk behaviours among women who use crack cocaine or other psychostimulants that are not injected.<sup>44</sup>

The context surrounding drug use could also exacerbate intimate partner violence. When women attempt to discontinue drug use or enter drug treatment and recovery support programmes, intimate partners who fear abandonment could retaliate with sexual or physical intimate partner violence, or attempt to limit a woman's access to treatment, services, or informal social support.<sup>29,30,43</sup> Overlapping experiences of substance use and intimate partner violence complicate a woman's ability to discontinue drug use, access and adhere to harm reduction or substance use treatment, and safely disengage from an abusive relationship with an intimate partner.<sup>45</sup> For example, physical intimate partner violence has been attributed to increased substance use, emotional intimate partner violence prevents women from initiating or fully engaging in substance use recovery, and economic abuse prevents women from gaining independence from abusive partners,<sup>45</sup> all of which subsequently increase the risk of HIV acquisition.

Finally, gender norms often stereotype and stigmatise women who use drugs as promiscuous or in some way deserving of abuse, and the unequal distribution of sexual, social, and economic power within interpersonal relationships promotes intimate partner violence. Women who use drugs also face intensified stigma and discrimination, even within their own drug networks, due to gendered social norms that primarily view women as caretakers and mothers, which limits a woman's accessibility to harm reduction.<sup>42</sup>

### Transgender women

Young transgender women (aged 15–24 years) can have an increased HIV risk due to psychological distress, polysubstance use, violence from their partners or communities, social and economic marginalisation due to identity, homelessness, incarceration, and have overlapping risk factors with sex workers from engagement in sex work and condomless receptive anal intercourse with multiple partners.<sup>46</sup> Transgender women who experience housing and employment discrimination are more likely to engage in sex work for financial support, which places them at an increased risk for HIV acquisition. Negotiating sexual safety can be difficult, especially if

complicated by drug and excessive alcohol use. Such multiplicative effects increase susceptibility to HIV and intimate partner violence among this key population.<sup>47</sup> Intimate partner violence has also been correlated with low self-esteem, gender discrimination, and HIV seropositivity.<sup>46</sup> Finally, intimate partner violence among transgender women is associated with difficulties in negotiating safer sex behaviours, and attempts to negotiate sexual health were found to increase the risk of verbal, physical, and sexual intimate partner violence.<sup>48</sup>

### Adolescent girls and young women

Adolescent girls have unique biological vulnerabilities that compound HIV risk such as, immature genital tracts, incomplete development of the vaginal, ectocervical and cervical epithelia, and greater genital inflammation and proportion of genital mucosa compared with adult women.<sup>49</sup> Early sexual debut, multiple partners, and transactional sex for material goods with older men often involves sexual risk behaviours and inconsistent condom use, due to gendered expectations and societal norms. Studies from sub-Saharan Africa indicate that relationships with older men increase the odds of HIV seropositivity by 60%, and physical and sexual intimate partner violence by 50% compared with adolescent girls with partners of similar age.<sup>50</sup> Older men also exert a substantial amount of control over condom or contraceptive use through the use of violence, and have a higher prevalence of HIV infection and lower retention in HIV care than women of all ages, which translates to low viral suppression and high viral load.<sup>51</sup> These factors further facilitate HIV acquisition among this key population. Orphanhood, especially due to the HIV epidemic, is also associated with riskier sexual behaviours (eg, condomless sex) because of poverty, and engagement in transactional sex.<sup>52</sup> At the structural level, consent laws, stigma, and health-care provider bias are barriers to health and social services,<sup>53</sup> including HIV testing, care, and counselling after intimate partner violence. Finally, child marriage disrupts retention in schooling, limits social and economic capital, and increases the risk of intimate partner violence.<sup>54</sup> Child marriage is exceedingly common in some cultures, with only 16 countries explicitly prohibiting the marriage of girls younger than 18 years.<sup>55</sup>

### Interventions addressing intimate partner violence and HIV

Through a rapid review of peer-reviewed studies (table; appendix pp 1–2),<sup>56,57</sup> we identified 25 (described in 26 papers) promising interventions that address both intimate partner violence and prevention of HIV acquisition among key populations of women (appendix pp 3–18).<sup>58–83</sup> Most studies used randomised, controlled, non-experimental designs (eg, before and after assessment, longitudinal cohorts, and ecological

See Online for appendix

studies), with a few using a quasiexperimental design with a comparison group. Most interventions were tailored for women who use drugs, female sex workers, or adolescent girls and young women, with some interventions addressing risk factors present across multiple key populations (eg, women who use drugs and engage in sex work). Of importance, we identified no combination intimate partner violence and HIV interventions for transgender women or other gender-diverse people. In terms of region, most interventions were implemented and evaluated in sub-Saharan Africa and North America, with a few done in central and south Asia leaving out entire continents and regions such as South America, central America, the Caribbean, and east Asia, despite these regions having high rates of intimate partner violence.<sup>5</sup> Of the 25 interventions included, more than half reported statistically significant reductions in both intimate partner violence and HIV risk behaviours; however, null results were inconsistently reported across studies.

Intervention components mainly addressed primary prevention of HIV acquisition, and secondary prevention of intimate partner violence (ie, prevent the re-occurrence of intimate partner violence, or risk factors for intimate partner violence). Multilevel risk and protective factors and risk environments that increase a marginalised woman's risk of intimate partner violence and HIV acquisition, including communication with intimate partners, trauma, and excessive drug or alcohol use, were also addressed. To a lesser extent, interventions also targeted sociostructural factors, social determinants of health, and other mediators that put women at greater risk of intimate partner violence and HIV acquisition. Most interventions targeted individual-level risk factors, including intimate partner violence or HIV knowledge; skills building related to condom use, safer sex negotiation, risk reduction for drug use, intimate partner violence screening and risk identification, safety planning, and social support; service referral and linkage related to intimate partner violence and HIV, trauma, and drug dependence counselling, and motivational interviewing. No studies examined interventions at the interpersonal level. Couple-based biobehavioural HIV interventions included knowledge and skills building about HIV and other STIs, condom use, negotiation skills, and couples communication, which have also been found to address risk factors for intimate partner violence through enhanced communication and condom negotiation skills, and reduced alcohol use within couples.<sup>84</sup> However, given the challenges associated with evaluating intimate partner violence reduction interventions among couples (eg, victim blaming and risk of further retribution)<sup>85</sup>, couple-based HIV interventions have not examined intimate partner violence outcomes. Future studies should examine whether couple-based interventions that address overlapping intimate partner violence and HIV risk factors can dually reduce intimate

	Modelling the effect of intimate partner violence interventions on HIV incidence <sup>56</sup>	Economic evaluation of intimate partner violence and HIV interventions among key populations of women <sup>57</sup>
Intervention name	The Goals HIV Impact Model	Avahan
Method	Modelled a hypothetical decrease in the population prevalence of violence against female sex workers, and estimated its effect on the reduction in HIV transmission through a reduction in condomless vaginal and anal sex	A multilayered violence reduction intervention as part of a wider HIV prevention programme, which consisted of community mobilisation and peer-mediated outreach; increased access to and utilisation of sexual health services; and enhanced the enabling environment to support programme activities (appendix pp 3-17)
Countries	Kenya and Ukraine	India
Sample	Population-level female sex workers in Kenya and Ukraine	9860 female sex workers served in two districts in Karnataka (Belgaum and Bellary)
Design and costing scope and methods	Model constructed with meta-analysis and RR calculations; assumptions: association of violence with condomless vaginal sex, RR=1.69; association of violence with condomless anal intercourse, RR=3.11; 5-year time horizon	Incremental costs and cost-effectiveness with empirical data and compartmental model: comparison is a base case of providing core HIV prevention activities for female sex workers only; provider perspective; 7-year time horizon; 3% discount (2011 US\$)
Outcomes and results	Kenya: 30% reduction in violence prevalence among female sex workers to 2.4% equated to 21 200 HIV infections averted among female sex workers (27% reduction); adding ART expansion (85% coverage) to 30% violence reduction equated to 18 200 HIV infections averted among female sex workers (26% reduction); Ukraine: 30% reduction in violence prevalence among female sex workers to 9% equated to 4700 HIV infections averted among female sex workers (25% reduction); adding ART expansion (25% coverage) to 30% violence reduction equated to 4400 HIV infections averted among female sex workers (25% reduction); decreasing violence prevalence among female sex workers to 9% plus ART expansion at 25% coverage (12% improvement) equated to 4400 HIV infections averted among female sex workers (25% reduction)	Incremental cost per female sex worker reached is \$11-39; incremental cost per HIV infection averted is \$224-238; incremental cost per disability-adjusted life-year averted (ART unavailable) is \$13.48-14.12; incremental
Findings: interpretation and limitations	Interventions that decrease violence prevalence among female sex workers by 30% can reduce new HIV infections by 25-27%; similar reductions in HIV incidence were observed when ART expansion was added compared with reducing intimate partner violence among female sex workers alone	Community mobilisation and empowerment added to HIV prevention for female sex workers is cost-effective in India and might be highly cost saving when accounting for ART coverage; cost-effectiveness not reported for intimate partner violence outcomes
IPV=intimate partner violence. RR=risk ratio. ART=antiretroviral therapy.		
<b>Table: Cost, cost-effectiveness, and modelling the effect of evidence-based interventions to reduce IPV and HIV among key populations of women</b>		

partner violence and HIV. Three studies, originating from India and Mozambique, targeted intimate partner violence and HIV risk separately at the community level. Efficacious community intervention components included improving access to and utilisation of services through enhanced referral and social support, targeted peer outreach, and clinical services through community-based organisations.<sup>61,66</sup> Few intervention studies targeted

structural factors. The studies that did targeted multiple factors across the socioecological model; addressed gender equity; social norms; poverty; changes in policy, programme structure, or aid given to women impacted by intimate partner violence; and social empowerment through income generation and microfinance interventions that included savings accounts, cash transfers, and microloans.<sup>64,75,76,78</sup> Some of these studies also considered school-based health promotion and violence prevention programming in high gender-based violence and HIV-prevalent areas;<sup>75</sup> and focused on changing social norms by training male champions, building alliances with other networks, and community mobilisation.<sup>58,60,61</sup>

### Modelling and cost-effectiveness of interventions

Through a rapid review of peer-reviewed studies (appendix pp 1–2), we identified one mathematical modelling study that focused on key populations of women.<sup>86</sup> Decker and colleagues<sup>86</sup> model showed a 25–27% reduction in HIV incidence among female sex workers in Kenya and Ukraine through a 30% reduction in intimate partner violence. 30% intimate partner violence reduction plus expanded antiretroviral therapy (ART) coverage resulted in a 25–26% reduction in HIV incidence. Further study is required to understand the effect of intimate partner violence reduction on HIV incidence among specific populations where HIV positivity rates differ.

There are few studies evaluating the economic implications of intimate partner violence and HIV interventions among key populations of women. We identified no studies that examine how cost-effectiveness intimate partner violence and HIV interventions by use of measures of effectiveness such as intimate partner violence risk incidence or risk reduction. The Avahan<sup>60</sup> intervention published an economic evaluation that focused solely on HIV outcomes among female sex workers, despite this intervention corresponding to an evaluation of both intimate partner violence and HIV outcomes (appendix p 3).<sup>87</sup> This evaluation found that, in 2020, community mobilisation and peer outreach targeting intimate partner violence reduction within an HIV prevention programme for female sex workers had an added cost of approximately US\$258–274 per HIV incident averted, compared with HIV prevention services alone. The cost-effectiveness ratio was approximately \$16 per disability-adjusted life-year (DALY) averted, which is less than the threshold of 1–3 times gross domestic product per capita in India, as recommended by WHO.<sup>87</sup> However, DALYs were calculated as a function of HIV-related morbidity, without considering the health status effects of experiencing intimate partner violence, thus potentially underestimating cost-effectiveness. Further research is needed to assess how much combination intimate partner violence and HIV interventions cost to

reduce intimate partner violence and intimate partner violence related morbidity and mortality among key populations who experience intimate partner violence.

Although economic evaluations examining the incremental cost of combination intimate partner violence and HIV interventions in the context of cases of intimate partner violence prevented among women in the general population have been published,<sup>56,57,88,89</sup> to our knowledge none have focused on key populations, which is probably due to few interventions targeting combination intimate partner violence and HIV among key populations existing (appendix pp 3–18). In general populations of women, microfinance and community mobilisation interventions<sup>56,57</sup> and community-wide skills building and educational activities for intimate partner violence and HIV reduction<sup>88,89</sup> show cost-effectiveness ratios within the WHO-recommended willingness-to-pay threshold. However, these interventions have not been evaluated among key populations, which could yield different findings due to the higher incidence of intimate partner violence and HIV. Therefore, we cannot identify whether interventions to reduce combination intimate partner violence and HIV risk among key populations are comparably cost-effective to community-wide interventions. We also identified no studies on women who use drugs or transgender women in our search. Economic evaluation of interventions targeting these groups, and particularly in areas where HIV is concentrated among key populations, should be prioritised to inform scale up and intervention implementation.

### Gaps and opportunities for future research

Experiencing intimate partner violence is a known barrier to HIV prevention, testing, ART adherence, and retention in care;<sup>3</sup> therefore, intimate partner violence prevention is crucial to curbing the HIV epidemic. A meta-analysis by Li and colleagues<sup>90</sup> suggests that physical intimate partner violence contributes disproportionately more to HIV acquisition among women who experience intimate partner violence in the general population. Key populations of women have a disproportionately higher risk of both physical and sexual violence compared with women in the general community; however, how intimate partner violence subtypes influence HIV risk and HIV acquisition among key populations is unclear. Future meta-analyses should examine the effect of intimate partner violence subtypes among key populations to inform which subtype of violence should be prioritised for an intervention. Mechanisms that link intimate partner violence and HIV among key populations are complex and influenced by multilevel factors across the socioecological model. The primary biological mechanism linking intimate partner violence and HIV infection among all populations of women is sexual intimate partner violence; however, little is known about the health impact of emotional or economic intimate partner violence.<sup>91</sup> Individual-level risk is shaped by sociostructural and community-level factors such as



criminalisation, stigmatisation, discrimination, and availability of harm reduction services, which often vary by key population. Therefore, a single intervention cannot be applied to all key populations, and attention must be paid to unique risk factors and contexts across multiple, intersecting levels of the socioecological model when developing and implementing combination intimate partner violence and HIV interventions for key populations, to achieve population-level impact. Although understanding the degree to which interventions diverge for various key populations would be beneficial, the numerous study designs, comparison groups, and study settings make it difficult to compare intervention outcomes. Instead, understanding the efficacy of interventions that target common or overlapping risk factors that are present among multiple key populations (eg, the effect of decriminalising sex work or drug use on intimate partner violence among women who use drugs or sex workers) is important. When intervention components do overlap, there is a need to do meta-analyses to identify the most effective interventions among the different subgroups of key populations.

The number of interventions adapted and evaluated specifically for key populations remains scarce, particularly among transgender women, and in several geographical regions with high burdens of HIV and intimate partner violence, such as, central and southeast Asia, central America, and South America.<sup>1</sup> Existing combination intimate partner violence and HIV interventions targeting key populations of women primarily address individual-level factors, including communication, trauma, and drug or excessive drug and alcohol use. To a lesser extent, interventions target societal conditions, economic empowerment models, and policy issues that result from criminalisation and other structural factors.<sup>25</sup> Overall, future investment in this area of research must focus on the development and evaluation of interventions that address risk factors for intimate partner violence within the context of HIV research at the community, structural, and policy level, with an emphasis on improving the methodology and scientific rigor.

Despite more than two decades of intervention research in this area, most combination intimate partner violence and HIV interventions have not been scaled up into service delivery settings. To end the HIV epidemic, there is an urgent need to promote the transportability and uptake of interventions to reduce the intertwined epidemics of intimate partner violence and HIV among key populations into routine service. This uptake should be coupled with evaluation of the intervention's effectiveness in real-world settings in diverse settings with rigorous implementation research designs. Implementation science research provides a framework to support the adaptation, adoption, and integration of interventions into policy and practice by identifying multilevel barriers and facilitators and considering organisational capacity, leadership commitment, and identifying opportunities for provider

training. There is also a crucial need to evaluate the extent to which marginalised women can access mainstream intimate partner violence services and identify multilevel protective factors that could facilitate access to and retention in these services. Community-engaged, data-driven approaches to selecting, adapting, and implementing a range of multilevel combination intimate partner violence and HIV interventions for key populations are needed to achieve this.

Our results and conclusions could be limited by the rapid review search strategy, which might not be as comprehensive as a systematic review. More specifically, the search was restricted to one database, inclusion criteria were limited by date and language, and the appraisal and selection of studies could have been subject to some bias. Furthermore, interventions that produce null findings are less likely to be published (ie, publication bias), and because they are often excluded from literature, we do not know what does not work.<sup>25</sup> There is a need to harmonise measures and timeframes to be able to understand and compare the scope of intimate partner violence across populations and settings. Most interventions used the Conflict Tactics Scale (CTS) or CTS2 to measure intimate partner violence,<sup>32</sup> with follow-up times ranging from 30 days to 12 months. These measures might not reliably capture the different types of intimate partner violence that are specific for key populations (eg, withholding finances for gender-affirming services among transgender women, or threatening to disclose a woman's drug use to child protective services as a way of exerting control). Such intimate partner violence measures should be adapted to assess the fuller range of intimate partner violence that women in key populations are likely to experience and consider the cultural context of intimate partner violence. The way intimate partner violence outcomes are measured and coded might also affect whether an intervention has a statistically significant effect.<sup>33</sup> Outcomes can measure experience of any intimate partner violence, each intimate partner violence subtype, and the frequency or severity of intimate partner violence; however, this measurement diminishes our understanding of how patterns and subtypes of intimate partner violence co-occur to influence HIV risk. Given that experiencing and perpetrating intimate partner violence are often mutual, it is also important to assess perpetration of different types of intimate partner violence among key populations of women and understand how perpetration is associated with HIV risk. Latent class modelling could be used to better understand the impact of exposure to different types of intimate partner violence, the extent to which perpetrating and being subjected to intimate partner violence is mutual, and patterns of multiple risks, as well as the antecedents and consequences of complex behaviours, so that interventions can be better tailored for subpopulations.<sup>34</sup>

Intervention research on combination intimate partner violence and HIV has paid little attention to

### Search strategy and selection criteria

References for this Review were identified through searches of PubMed with the search terms “intervention”, “cost”, “modeling”, “HIV/AIDS”, “intimate partner violence”, and “domestic violence” up until June 2, 2021. We also identified additional relevant studies using the reference lists of identified articles. Studies related to interventions, cost-effectiveness, and modelling among key populations of women were included if they described intimate partner violence and HIV risk reduction outcomes, were peer-reviewed, and written in English. The final reference list was generated on the basis of relevance to the broad scope of this Review.

health economics research, including cost, cost-effectiveness, and cost-benefit studies.<sup>95</sup> Economic evaluations are important for the implementation of combined intimate partner violence and HIV interventions globally. Understanding how much an intervention costs for each incidence of intimate partner violence or HIV averted can help organisations, communities, and governments prioritise resources by using data on which interventions provide the greatest health impact with the fewest resources.<sup>96</sup> More research on the cost-effectiveness of combination intimate partner violence and HIV interventions for key populations is urgently needed, and should use new and emerging guidelines and funding announcements to signify higher prioritisation of economic evaluations. Protocols for the interventions cited in the appendix (pp 3–18) state that cost-effectiveness analyses will be done alongside trials, but economic findings have not yet been published. Although the limited available evidence suggests that combination intimate partner violence and HIV interventions have attractive cost-effectiveness ratios, more effort must be devoted to integrating high-quality economic evaluations into intervention trials and simulation modelling studies to inform policy making.

The intertwined epidemics of intimate partner violence and HIV must be addressed among key populations, to achieve the UNAIDS 95–95–95 targets. This requires greater investment to support research that includes intimate partner violence surveillance and evaluates the efficacy, implementation, and cost-effectiveness of novel combination interventions tailored for key populations of women, as well as funding for community based organisations to implement evidence-based interventions for key populations in real-world settings.

#### Contributors

All authors contributed to the conceptualisation of the paper and the writing of the manuscript and provided critical feedback and give final approval of the version to be published.

#### Declaration of interests

We declare no competing interests.

#### Acknowledgments

We thank Shoshana Benjamin, Sneha Kunwar, and Julia Rennert for their assistance with the literature review, Bruce Schackman for his review of

the economic and modelling content, and Daniel Greenspan for his assistance with figure conceptualisation. Our Review was supported by the National Institutes of Health through the HEAL Initiative, under award number UM1DA049415; (NE-B, TIM, LG), the National Institute of Drug Abuse (K01DA051348; LES), the Canadian Institutes of Health Research (MFE171297; CS), the San Diego Center for AIDS Research (P30 AI036214; JKS), and the California HIV/AIDS Research Program (H21PC3466; JKS).

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