International Journal for Equity in Health

RESEARCH

Open Access

Structural conditions, social networks, and the HIV vulnerability among Indonesian male labour migrants and motorbike taxi drivers

Paul Russell Ward[1] and Nelsensius Klau Fauk[1,2*]

Abstract

Background The Indonesian National AIDS report reveals that the percentage of HIV cases in the country is significantly higher in men compared to women, which is contrary to global AIDS data. Using a conceptual model of how social networks impact health, this paper describes how structural conditions, such as poverty, lack of job opportunities, and lack of income shaped the social networks of Indonesian men. It also describes how these social networks created opportunities for various social mechanisms, including social influence, peer pressure, and intimate contact, that facilitated HIV infection through different behavioural pathways, such as unprotected sex with multiple partners and injecting drug use (IDU) practices.

Methods A qualitative design using face-to-face in-depth interviews was employed to collect data from heterosexual male participants ($n=25$) in Yogyakarta municipality and Belu district, Indonesia. Participants were former labour migrants and previously or currently (at the time of the study) motorbike taxi (ojek) drivers. They were recruited using the snowball sampling technique, starting from two HIV clinics in the study settings. Data were analysed thematically guided by a qualitative data analysis framework.

Results The findings highlight the significance of structural conditions, such as poverty, poor family conditions, precarious employment, and lack of income, which contributed to shaping the men's social networks through their occupations as labour migrants and ojekdrivers. Involvement in these occupations allowed them to become acquainted with fellow labour migrants and ojek drivers, leading to cohabitation in the same shelters or areas and daily interactions, which fostered the development of social networks among them. These social networks then provided opportunities for various social mechanisms, including social influence through peer pressure and person-to-person contact. The influence and pressure experienced by the participants were reflected in their behaviours related to sex, condom use, and IDU, ultimately contributing to the transmission of HIV among them.

Conclusions The findings underscore the importance of social network peer interventions that consider the dynamics of these networks. Such interventions have been shown to be effective in reducing HIV-risk behaviours and transmission, as well as in promoting HIV prevention and treatment among diverse population groups.

*Correspondence:
Nelsensius Klau Fauk
nelsen_klau@yahoo.com

Full list of author information is available at the end of the article

Keywords Structural conditions, Social networks, HIV transmission, Labour migrants, Motorbike taxi drivers, Men living with HIV

Introduction

Indonesia has experienced a significant increase in the number of HIV infections in just over a decade, from 55,848 cases in 2010 to 191,073 cases in 2015 and 526,841 cases in 2022, and males represent 62% of total cases in the country [1]. This significant increase is reflected in the tens of thousands of newly diagnosed cases each year. For instance, in recent years, the annual number of cases rose from 41,987 in 2020 to 52,955 in 2022 [1]. In 2022 alone, of the total cases, 52.3% were transmitted through heterosexual contact and 84.9% were diagnosed within the sexually active age group of 20 to 49 years, with men accounting for 59% [1]. For heterosexual men (those who are physically or sexually and romantically attracted to women) in Indonesia, sexual contact, and injecting drug use (IDU) have consistently been reported as the main modes of HIV transmission [1–4].

In a large-scale study in Indonesia, we captured the stories of risk factors for HIV transmission among men and women living with HIV [5], how HIV infection impacted them and their families [6–8], and barriers to their access to HIV care services [9]. In addition to these, our analysis revealed that heterosexual men who shared similar structural conditions (poverty, precarious employment, lack of income) exhibited similar social networks and risk behaviours in terms of condom use, number of sexual partners, and IDU practices. Therefore, the purpose of this paper is to understand the links between the structural conditions, social networks, and the risk behaviours of these men. The narratives of structural conditions and social networks arose naturally from the interviews which indicated the significant influence of these factors on HIV transmission among them. In this paper, we used social network analysis based on the conceptual model of how social networks impact health or, in the case of our participants, contribute to HIV transmission [10, 11]. Social network concepts and analysis have been applied in previous studies to understand how social network dynamics contribute to HIV transmission in some population groups. For example, several studies with men who have sex with men (MSM) have reported that individuals within the social and sexual networks of SMS experienced increased HIV vulnerability as they shared similar norms, attitudes, and HIV risk behaviours [12–14]. Some other studies further reported that social networks with more MSM members are strongly associated with increased unsafe sex among them [15–17]. Similarly, studies with people who inject drugs (PWID) have suggested that PWID in social networks with more members (e.g., >10 members) are more likely to have similar risky behaviour of sharing a needle that facilitates HIV transmission among them [18–21]. The association of social networks with HIV risk behaviours have also been reported in studies with teenagers and HIV-at-risk women [22–25]. The literature shows that larger networks provide more opportunities for exposure to risks, social influence through easily passed information, frequent meetings of members, and normalisation of risky behaviours [17, 23, 26].

Despite the association of social networks and HIV risk behaviours in those groups reported in the aforementioned studies, there is a paucity of literature and evidence on such association in heterosexual male labour migration and motorbike taxi driving, who are highly mobile due to the nature of their work. They may be a bridge group for HIV transmission to their partners, spouses, and the general population as they may get the transmission through their frequent engagement in unprotected sex with multiple partners, including with female sex workers (FSWs) and IDU practices [27–29]. A previous review reported on how a social network reinforces its members' behaviours in low- and middle-income countries but did not consider HIV risk behaviours, especially among heterosexual men [30]. In addition, most studies above mainly focused on examining the association of a specific characteristic of social network structure or ties with HIV transmission in MSM [12–15, 17], PWID [18–21], and FSWs or HIV-at-risk women [22, 24], therefore there is still a limited understanding of the complex interplay between various characteristics of social network structure and ties and HIV transmission. Moreover, there is a lack of evidence on the influence of structural conditions in shaping people's social networks and individual ties within the networks.

In the context of Indonesia, previous HIV studies have mainly focused on MSM or men who are sexually and romantically attracted to other men [13, 16, 31, 32], even though HIV transmission through heterosexual contact has been reported to represent over 70% of HIV transmission in the country [33]. In addition, there is a limited qualitative in-depth understanding of how structural conditions, social networks, and various social mechanisms play a role in HIV transmission, especially among heterosexual men [4]. This study aimed to fill in the knowledge and methodological gaps by exploring the views and lived experiences of Indonesian heterosexual males who engaged in labour migration and motorbike taxi driving on how structural conditions shape their social networks and individual ties, which provide opportunities for social influence and person-to-person

contacts or interactions that facilitate HIV transmission among them through various behavioural pathways. They are the priority population groups in this analysis due to their highly mobile characteristics and the high global HIV prevalence among them, both labour migrants [34, 35] and drivers, especially truck and bus drivers [36, 37]. Labour migrants in this study were individuals who previously (before the study) migrated to other places in Indonesia or overseas for several years to work in oil palm plantations. Motorbike taxi (also known as ojek) drivers were individuals who previously or currently (at the time of the study) engaged in motorbike taxi driving. Understanding the links between structural conditions and risk behaviours could be useful in addressing HIV risk factors and supporting future HIV prevention interventions among heterosexual men in Indonesia and beyond.

Methods

Conceptual framework

The conceptual model of social networks [10] was employed as a heuristic tool to guide the conceptualisation and analysis of the findings of this exploratory study. Social network refers to a series of social connections that link individuals (actors) directly to each other and also to other people through them [10, 38]. The individuals or actors are members of the network which could be based on kin, friendship, neighbourhood, and work [10]. In this study, the social networks among the participants were work-related or made up of individuals with the same work as labour migrants or ojek drivers. The network is supported by the network structure and ties among the network members as explained below [10, 38].

The social network concept is applied in this paper as it informs how structural conditions (in the case of the participants in this study: poverty, poor family conditions, economic/financial hardships, precarious employment, lack of income) can play a role in shaping people's social networks (network characteristics and structure, and the characteristics of individual ties) [10]. These structural conditions can contribute to shaping people's social network structure. In this study, the social network structure is characterised or formed by several elements. These include size or the number of labour migrants or ojek drivers in each network, density or the amount of social interaction these individuals have or to what extent they are connected to each other within their networks, and proximity or geographical closeness among them in their daily life which facilitates reachability or the ease of these individuals reaching each other [10, 39, 40]. These structural conditions can also contribute to shaping characteristics of ties of labour migrants and ojek drivers in their social networks. The ties are reflected in the frequency of these individuals meeting each other in the networks (frequency of contact), the types of transactions (work-related or individual or social or intimacy matters) they have in those meetings/contacts (multiplexity), and the length of time they know each other or are the same network (duration) [10]. Such social networks provide opportunities for various social mechanisms that can occur among the members of a network. These may include social interactions and influence among labour migrants or ojek drivers in their networks (e.g., peer pressure, influence on health behaviours, connecting casual sex partners, etc.) and person-to-person contact (e.g., close personal contact, intimate contacts such as sexual, injecting drug use (IDU), etc.) [10, 41, 42]. The social mechanisms can negatively impact health through health-damaging behaviours such as, in the case of our participants, sex with multiple partners, sex without condoms, and engagement in IDU practices, hence increasing their vulnerability to HIV transmission or acquisition [10]. Therefore, social networks and dynamics are very important because they provide identity, social interaction and influence, and person-to-person contact that can have impacts on individuals' health outcomes [10].

Recruitment of the participants

This paper presents part of the data from a large-scale qualitative study exploring the views and experiences of heterosexual PLHIV about HIV risk factors and impacts and their access to HIV healthcare services in Yogyakarta and Belu, Indonesia. The use of qualitative design was considered appropriate and effective when exploring participants' perspectives and deep insight into their real-life experiences [43]. It enabled the researchers to explore the participants' stories, understandings, and interpretations of their structural conditions, social networks, individual ties within their networks and social influences and how these factors contributed to the transmission of HIV among them.

The recruitment of the study participants started with the field researcher (NKF) searching for assistance from the receptionists at HIV clinics in Yogyakarta and Belu to distribute the study information sheets containing the field researcher's contact details to potential participants or HIV patients who used their services. The HIV clinic in Yogyakarta was part of a private hospital called Panti Rapih, while the one in Belu was part of Regional Public Hospital Mgr. Gabriel Manek, Atambua. This was followed by the application of the snowball sampling technique. PLHIV who called and stated their interest to participate in this study were recruited and scheduled for an interview based on their preferred time and place. Initial participants interviewed were also asked to distribute the information sheets to their eligible friends and colleagues who might be willing to be interviewed about the topic being studied. To participate in this study, one had

to be a heterosexual person aged 18 years old or above, self-identified as living with HIV and willing to be interviewed voluntarily. Twenty-five heterosexual male participants (15 from Belu and 10 from Yogyakarta) whose narratives are included in this paper reported having the experience of being labour migrants in other places in Indonesia or overseas ($n = 16$) and previously or currently (at the time of the study) working as motorbike taxi drivers ($n = 9$). These narratives are included as they provide an in-depth understanding of how structural conditions, such as poverty, poor family conditions, precarious employment, and lack of income, facing these men shaped their social networks, sexual networks, and social influences and interactions that facilitated HIV transmission among them. The categorisation of these participants into these two groups, labour migrants and motorbike taxi drivers, was done during the analysis based on their work experiences, narratives of structural conditions, social networks, and risky behaviours that emerged naturally during the interviews or in data collection.

Data collection

Data collection was carried out from June to December 2019 using one-on-one and face-to-face in-depth interviews by NKF. NKF was a PhD student and researcher, who attended formal training on qualitative methods and had many years of research experience on various HIV-related issues and other public health topics. Interviews were conducted in a private room at the HIV clinic in Belu and in a rented house close to the HIV clinic in Yogyakarta where the initial information about the study was distributed. Interviews with the participants were audio recorded using a digital recorder, and field notes were also undertaken by the researcher during each interview. The interview duration varied between 35 and 87 min. With regards to the topic presented in this paper, interviews covered several areas, including participants' views and experiences of their present and previous works as labour migrants or motorbike taxi drivers, factors that supported their decision to take those works, their views and experiences of their social relationships and networks and how they were involved in those networks, views and experiences with social interaction and influences with their friends and colleagues, activities they engaged in together with friends and colleagues within their networks, and their perceptions about factors that facilitated HIV transmission among them.

Recruitment and data collection ceased when the researchers felt that the information provided by the participants had been rich enough to answer the research questions and objectives or data saturation had been reached. Data saturation was reflected in the similarity of information or responses provided by the last few participants. Interviews were conducted in Bahasa Indonesia (Indonesian), the primary language of the field researcher and the participants. No repeated interviews were conducted with any participants. As HIV is a sensitive topic, we decided not to return the transcripts to each participant for comment and/or correction to prevent the possibility of the transcripts being received and read by other family members of the participants who had not disclosed their HIV status.

Data analysis

Before the comprehensive analysis, the audio recordings were transcribed verbatim by the last author (NKF). Transcription was initiated alongside the data collection process, and notes taken during the interviews were integrated into each transcript during the transcription process. The analysis was guided by a framework analysis for qualitative data by Ritchie and Spencer, which suggests several steps of qualitative data analysis [44]. Data analysis was performed in Indonesian, which helped to keep the sociocultural meanings attached to the information provided by the participants [45].

Data analysis began during the transcription process and by reading the transcripts repeatedly which allowed the researchers to become familiar with the data, provide comments on data extracts, and break down the information into small chunks. During the process, key concepts and issues identified from the transcripts were listed and used to form a thematic framework. The identification of the thematic framework was an iterative process that involved changing and refining themes. Next, each transcript was indexed by providing open codes to data extracts, followed by close coding to identify and group similar or redundant codes into the same themes and sub-themes informed by the conceptual model of social networks. For instance, codes assigned to data extracts containing participants' accounts of precarious employment, poverty, poor family conditions, lack of income, financial hardships, difficulties in meeting family needs and children's education fees were collated under the theme "Structural conditions: precarious employment, lack of income, and poverty," reflecting macro-level structural conditions [10]. Codes indicating how social networks among participants were formed were grouped under the theme "The development of social networks among labour migrants and ojek drivers." These codes included participants' experiences of meeting or connecting due to shared occupations, staying in the same shelters and locations, their level of connectedness, frequency of interaction, ease of reaching each other, the members and size of their networks, topics shared, activities conducted together, duration of knowing each other, and the development of their social networks. Lastly, codes illustrating how structural conditions and social

Table 1 Sociodemographic profile of the participants

Characteristics	Men living with HIV	
	Yogyakarta (*N* = 10)	Belu (*N* = 15)
Age		
20–29		4
30–39	5	4
40–49	5	5
50–59		2
Marital status		
Single	3	3
Divorced	2	
Widowed/r		1
(Re)Married	5	11
HIV diagnosis		
1–5 years ago	4	10
6–10 years ago	5	4
11–15 years ago	1	1
Other infections		
Herpes	2	1
Syphilis	2	
Gonorrhoea	2	1
TB	4	9
Education		
Senior High school graduate	8	5
Junior High school graduate	2	4
Elementary school graduate		6
Occupation		
Former labour migrants	9	7
Motorbike taxi driver	1	8

networks facilitated risky behaviours (e.g., unprotected sex, sex with multiple partners, and engagement in IDU practices) were presented under the theme "Social influence, person-to-person contact, and HIV transmission."

Comparison of the findings (codes and themes) within and across interviews was also repeatedly performed throughout data analysis stage. Finally, the entire data were mapped and interpreted as presented in this manuscript. The selected quotes for this publication were translated into English and then checked and rechecked by the authors for clarity. The process of checking and rechecking quotes against the translated interpretations or examination of meaning in both languages was also performed to maintain the accuracy of the translation and credibility of the findings [46]. The authors discussed and provided comments, feedback and revisions during the analysis and writing process and agreed on the final themes and interpretations presented in this paper.

The ethics approvals for this study were obtained from the Social and Behavioural Research Ethics Committee, Flinders University (No. 8286) and the Health Research Ethics Committee, Duta Wacana Christian University (No. 1005/C.16/FK/2019). For de-identification purposes, all personal information was removed from each transcript. Each transcript was given a letter and number, such as PY,… (PY = participant from Yogyakarta) and PB,… (PB = participants from Belu).

Results

Of the 25 participants, sixteen became labour migrants in several places within Indonesia or overseas, with the majority migrating to Malaysia ($n = 7$), Kalimantan ($n = 5$), while the rest migrated to Papua ($n = 3$), Bandung ($n = 1$) and Hongkong ($n = 1$). The majority engaged in labour migration for 1 to 5 years ($n = 12$), while the rest worked as labour migrants for 6 to 10 years ($n = 4$). The nine other participants engaged in motorbike taxi driving in their local areas in Belu ($n = 8$) and Yogyakarta ($n = 1$). The participant's age ranged from 22 to 46 years old. The majority of the men were married ($n = 15$) and the others were unmarried (divorced, widowed or single). The majority ($n = 15$) were diagnosed with HIV within the past 5 years, while the rest had been diagnosed for a longer time, between 6 and 15 years. Most of them ($n = 13$) graduated from senior high school, while the rest graduated from junior high school ($n = 6$) and elementary school ($n = 6$) (see Table 1).

The findings illuminate how macro-level structural conditions, such as poverty, poor family conditions (refer to families with limited financial resources and facing various challenges in fulfilling basic needs), precarious employment, and lack of income or financial hardships, influenced the social networks of labour migrants and ojek drivers. Their networks comprised individuals who engaged in the same work, facilitating regular meetings or contacts and prolonged interactions. These networks provided opportunities for social influence, peer pressure, and person-to-person contact, which contributed to risky behaviours (e.g., unprotected sex, sex with multiple partners, and IDU practices) associated with HIV transmission. The findings were organised into three main themes: (i) Structural conditions: precarious employment, lack of income, and poverty; (ii) The development of social networks among labour migrants and ojek drivers; and (iii) Social influence, person-to-person contact, and HIV transmission. The details of each theme are elaborated below.

Structural conditions: precarious employment, lack of income, and poverty

The participants with labour migration backgrounds and the ojek drivers in this study experienced adverse socioeconomic conditions reflected in precarious employment, lack of income, and poverty. For example, limited employment opportunities in their respective settings created challenging conditions that exerted substantial pressure on them and their families. The challenge is that being unemployed and lacking income hindered

their ability to meet daily basic needs for themselves and their families. Similarly, poverty or poor family conditions were significant structural conditions faced by both groups of participants. For the ojek drivers in Belu who previously worked in the agricultural sector, these hardships were often exacerbated by suboptimal or failed agricultural products due to adverse weather conditions or natural disasters. Additionally, the financial burden of their children's education, including fixed school fees each semester and the costs for school supplies, compounded their precarious employment situations, placing them in even more difficult structural conditions. These are reflected in the narratives of two participants, with one previously working as a labour migrant and the other currently (at the time of the study) being an ojek driver:

> *"I used to work in Kalimantan for two years before moving to Malaysia, where I worked for three and a half years. Now, I am unemployed. It is very difficult to find a permanent job; sometimes I help a friend as a construction labourer to earn a little income. In addition to covering daily family needs of food, I also have the educational needs of my children to consider, which makes things quite challenging" (PY, labour migrant).*
>
> *"Our (family) situation does not seem to be very good. I have been working as a motorbike taxi driver for seven years just to meet our daily needs and also to be able to buy school uniforms, books, and stationery for the children…." (PB, ojek driver).*

Both labour migrants and ojek drivers are characterised by their constant movement, either on a seasonal or daily basis. Labour migrants were frequently required to move from one place to another as their work assignments were completed or as the demand for labour shifted across different areas or districts. For instance, in the oil palm plantations, they were employed for a specific period to carry out tasks such as planting, harvesting, or maintenance. Once these tasks were finished, they were expected to move on to the next plantation where their services were needed. On the other hand, ojek drivers exhibited high mobility on a daily basis as they shuttled between various locations to pick up and transport passengers. Unlike traditional taxi drivers who operate from fixed locations, ojek drivers are highly mobile and can be found at various pick-up points or can be hailed on the streets. They often move from one area to another, strategically positioning themselves in locations with high passenger demand, such as near transportation hubs, markets, or popular tourist destinations. This constant movement allows them to maximise their earnings by serving a larger number of customers:

> *"In oil palm plantations, we always moved from one location to another, depending on the boss. Usually, when the work was done in one location, we moved to another location" (PY, labour migrant).*
>
> *"As a motorbike taxi driver, yes, I drive to various places here (Belu) every day to look for passengers and pick up passengers. All of us (motorbike taxi drivers) do the same, always moving around" (PB, ojek driver).*

The development of social networks among male labour migrants and ojek drivers

The structural conditions reflected in poverty, poor family conditions, precariousness of employment and lack of income or financial difficulties faced by the participants not only contributed to shaping their social networks. The labour migration and motorbike driving jobs determined the social environment, interactions, and connections among labour migrants or ojek drivers, that shaped their networks. For example, participants who worked as labour migrants were required to live together in shelters provided by employers around oil palm plantation locations or in areas around the plantations. Living together reflected the proximity or closeness of the labour migrants to each other, which was a strong element that contributed to shaping their network. This proximity not only facilitated more intense connections, interactions, and meetings among labour migrants compared to ojek drivers who mainly met each other at certain times at motorbike stands, but also made it easier for them to reach each other (reachability) which is another supporting element for their networks. Engagement in the same jobs as migrant workers or ojek drivers, living in the same shelters or locations during the migration, and meeting each other regularly at the motorbike stands also reflected the number of social interactions of these individuals or the extent to which they were connected to each other (density), which was another strong element that shaped their networks. These are reflected in the following narratives of two participants, illustrating how their social networks were established due to being engaged in the same jobs and living in the same shelters or locations, and regular meetings with other fellow migrant workers or ojek drivers:

> *"Tens of us, both men and women (migrant workers), lived in temporary accommodation around the plantation site provided by the boss (employer) so that coordination regarding work was fast and smooth. So, we lived together, close by and were always in contact with each other to coordinate the work that needed to be done every day. Over time we got to know each other well, had close friends*

and groups of friends from different places or countries..... Usually, we went out together on the weekends, shared food, and cigarettes, discussed work, etc. In my group, we are from various regions in Indonesia and other countries. Every time we moved from one location to another, there were always new people we met, both men and women..." (PY, labour migrant).

"Every day I go here and there to pick up and drop off passengers (he was working as a motorbike taxi driver when the interview was conducted), so mobility is very high. But there is always time for a short rest at the motorbike taxi stand where we meet and get to know each other (motorbike taxi drivers). We do the work every day, so after a while, we become close friends..... We are up to 20 or 30 people at one motorbike taxi base. It is good to have these many friends, but every time we meet at a motorbike taxi base, you can hear lots of different stories and jokes. I think that is why we kind of feel close to each other" (PB, ojek driver).

The narratives of the two participants above, not only illustrated the proximity and density of their social network structure but also reflected the number of individuals in the social networks (range or size). These aspects were represented in terms like "20 or 30 people" in a motorbike taxi station-based group or "tens of people" or "we are from various regions in Indonesia and other countries". The narratives were also self-explained regarding the boundedness of members as their group or social networks were defined based on the sameness of the work they engaged in as labour migrant workers or ojek drivers.

The above characteristics of the participants' social networks, especially the proximity to each other due to living in the same shelters or locations and the connectedness among them through tasks and work, also facilitated the formation of strong individual ties among them. The individual ties within their social networks were reflected in high frequencies of face-to-face contacts and interactions or meetings among them daily. Similarly, their engagement in the same job determined the length of time they knew each other and were in the same network (duration). The social contacts and connections among labour migrants or ojek drivers were not only in work-related matters but also in individual and social matters, such as exchanging information about personal and family issues, social and sexual relations, and casual sex partners. These claims are reflected in the following stories of a labour migrant for 3 years and an ojek driver for 6 years:

"We meet every day, either in temporary accommodation or on the oil palm plantation. I worked at oil palm plantations in Malaysia for 3 years, so I had many friends as we worked together during that time. We also lived together so we share lots of things and information regarding work, life, and so on, including intimate relations (sexual relations) with fellow female migrant workers or sex workers...." (PY, labour migrant).

"You know, we are all men so every day we meet there are always various stories and information that we discuss or share. Some talk about work, personal problems, family problems or difficulties, their naughty children, etc. There are also stories about infidelity, and their sexual relations with this or that woman around the town. The topics are varied. There are topics that make us laugh but there are also topics that make us sad" (PB, ojek driver).

The above narratives from both participants also represented the number of types of transactions or topics or information shared among them (multiplexity) and how those aspects were shared in a reciprocal way, reflecting the characteristics of individual ties among them with their social networks. The topic of intimacy illustrated in the terms "sexual relation" or "intimate relation" also characterised individual ties within the social networks of these men.

Social influence, person-to-person contact, and the HIV transmission

Peer influence on sex and condom use practices

The social network structure and the individual ties among the networks' members as described above also provided opportunities for various social mechanisms, such as social influence and person-to-person contact among the members. For example, the high number of contacts or meetings and interactions (density) the labour migrants or ojek drivers had with each other daily and the variety of information regarding sexual-related matters they exchanged (multiplexity), facilitated social influence and peer pressure among them. An area where peer influence and pressure within the participants' social networks occurred was sexual relations/contacts with multiple casual partners, including with fellow female migrant workers and female sex workers (FSWs), a practice that was later self-acknowledged by the participants as a means of transmitted HIV among them. Inviting and persuading each other to hang out and look for FSWs during weekends or after working hours in the evening were the mechanisms of social influence and peer pressure within the networks of the participants. These are illustrated in the following narratives of a married man who lived in various plantation areas together

with other fellow migrant workers from different places or countries for several years and another married ojek driver who had been engaging in the job for many years:

> *"We (the man and his male friends) were from different countries and worked together (he worked in oil palm plantations in Malaysia). Initially, my friends asked me to hang out at the weekend and look for girls (either female migrant workers or FSWs) to have sex with. Finally, I felt like I was accustomed to it and then every weekend we regularly went out to have sex…. I got HIV in Malaysia. I was very sick and decided to come back here. I tested positive with HIV here" (PY, labour migrant).*
> *"Sometimes before returning home in the evening we (Ojek) talk and persuade each other to visit "hutan jati" (brothel location) and we definitely meet (have sex with) the girls there every time we go there. Sometimes some friends don't want to go there but because we meet every day and often invite each other, over time they want to do it (have sex with FSWs) too. I got HIV because I often "jajan" (have sex with FSWs)" (PB, ojek driver).*

The above narratives of both labour migrant and ojek driver participants clearly show the social or peer influence and pressure among them, reflected in the following sentences, "*Finally, I felt like I was accustomed to it and……regularly went out to have sex"* (PB, ojek driver) and *"Some friends don't want to go there (brothel) but because we meet every day and often invite each other, over time they want to do it too"* (PY, labour migrant). The narratives illustrate the strong social influence the labour migrants and ojek drivers had within their social networks on each other's risk behaviours, which they recognised as the means of HIV transmission among them, *"I got HIV because I often "jajan" (have sex with FSWs)* (PB, ojek driver) and "*every weekend we regularly went out to have sex…. I got HIV in Malaysia"* (PY, labour migrant).

Social influence among peers within their social networks also played a significant role in shaping the characteristics of the participants' person-to-person contact (intimate contacts), such as unprotected sexual contacts, that ultimately facilitated the transmission of HIV among them. Participants reported that their peers would discourage the use of condoms by making negative remarks, such as claiming that condoms caused discomfort, pain, and reduced pleasure during sexual intercourse. These discouraging words were often enough to dissuade individuals from practising safe sex. To further illustrate this phenomenon, two narratives from individuals, one married and one non-married, who had prior knowledge of condoms before their HIV diagnosis, are presented. These narratives shed light on the detrimental effects of peer influence on condom use:

> *"I heard about condoms when I was working in Irian (Papua) but I never used them every time I visited those girls (had sex with FSWs) because my friends said that it hurts and makes you feel uncomfortable during sex" (PB, labour migrant).*
> *"I know about condoms (before he was diagnosed with HIV), but I have not started using condoms because my friends said using condoms makes it (sexual intercourse) less pleasurable. I just believed in what they said and never tried to use a condom every time I had sex" (PY, ojek driver).*

In addition to the social influence, it is important to recognise that the structural conditions impacting the participants not only influenced their involvement in labour migration and ojek driving works but also shaped the surroundings they entered. The specific environments in which the participants operated, such as plantation sites for migrant workers and urban areas for ojek drivers, were characterised by the availability and accessibility of casual female partners, brothels, and FSWs. These environments played a significant role in facilitating the participants' engagement in sexual activities with multiple partners, FSWs, and frequent changes in sexual partners over time. Such influence is portrayed in the following narratives of these men:

> *"There were many girls (FSWs) from around the world over there (Thailand. He worked in Thailand for several years). It (Thailand) is like the centre, they (FSWs) were from around the world. So, it was easy for me to find them and I just needed to choose the ones I liked" (PB, labour migrant).*
> *"…There are many prostitutes in this town and at night they usually hang out in front of hotels or at certain points. So, it's not difficult to meet them. We (the man and his fellow Ojek drivers) also go to their locations (brothels). It is not the same as my (remote) village where you can't find any woman (FSW) like them" (PB, ojek driver).*
> *"I often had sex with different women at the workplace (he used to work at oil palm plantations in Malaysia) because there were many female workers, and many were widowed….. I could meet women (female workers) from different countries, and we, both women and men, stayed together in the plantation area" (PY, labour migrant).*

The later participant further described that the basis for sexual relationships among them and other female labour migrants was not for money, but purely for the

fulfilment of sexual needs. He stated, *"I did not pay them (the female labour migrants he had sex with) because they also needed (sex), they wanted it."* This contrasts with the sexual relationships they had with FSWs, where payment was required. Nevertheless, the low prices for sex with FSWs seemed to serve as an additional supporting factor for their engagement in this HIV-risk sexual behaviour. Some remarked::

> *"The prices for sex with them (FSWs) were very cheap" (PY, ojek driver).*
> *"The prices (for sex with FSWs) ranged from IDR 50,000 to IDR 200,000 (approximately US $3 - $13)" (PB, labour migrant).*

Peer influence on injecting drug use practices

The social networks of the participants also provided opportunities for peer influence or pressure for their engagement in injecting drug (e.g., morphine, heroin, cocaine, amphetamine) use (IDU) practices. Yogyakarta participants who reported infection through IDU practices described that they were initially introduced to injecting drugs by their fellow labour migrants or ojek drivers, a factor which was not identified among participants in Belu. The introduction of injecting drugs by peers and peer invitation to use drugs together were some mechanisms through which social factors (e.g., peer influence and pressure) influenced the participants' HIV risk behaviours. Moreover, purchasing and using drugs together with co-workers was not only a mechanism through which peer influence and pressure supported the participants' engagement in IDU use that had facilitated HIV transmission among them but also reflected reciprocity characteristic of individual ties within their networks as it reflected equivalent action or exchange among them. It also seemed to indicate their inadequate financial conditions and reflected a strategy to ease the costs associated with the acquisition of drugs. Such reciprocity of individual ties also seemed to be a common strategy used to support their engagement in IDU practices. In addition, the environment in which they lived and worked, where injecting equipment or syringes were neither available nor accessible, also contributed to the practice of sharing needles among drug users, which was a risk factor for HIV transmission. The following quotes from both labour migrants and ojek driver illustrate peer influence and pressure within their social networks which IDU practices:

> *"I didn't use drugs before. I got to know about drugs for the first time through my friends (other labour migrants) in plantation areas in Malaysia..... We took turns sharing the same needle. It was hard to find a new one in plantation sites" (PY, labour migrant).*
> *"There are friends (fellow migrant workers) who used drugs at oil palm plantations. Initially, I got (drugs) from a friend from Myanmar. He and his two other friends from Myanmar used drugs. After I joined the group, I knew there were several more people, including from Indonesia. We all used drugs together....." (PY, labour migrant).*
> *"…. My friends (other ojek drivers) and I contributed money to buy drugs and use them together. When we met at a motorbike taxi base and sometimes some friend approached each of us to buy it, we bought and used it together. We shared the drugs and needles every time we were together" (PY, ojek driver).*

Furthermore, the engagement of these participants in IDU also seemed to be influenced by the environment where they moved into. The availability and easy accessibility of illicit drugs supported their engagement in IDU practices. The workplace environment which was far away from family was another supporting factor for their use of injecting drugs. This was due to the absence of supervision and restrictions from parents and other family members at the places where the participants worked and lived. Such absence was described as supporting their involvement in the use of illicit or injecting drugs, as they were not being watched by family members or other people around them. These were illustrated in the following quotes from participants who acknowledged acquiring HIV through IDU and living with HIV for more than ten years:

> *"I would say, staying in plantation areas was supportive of drug use because nobody really cared about what you do. In addition, many friends (fellow labour migrants) used (drugs), so that's it. My parents or family were not there. I was not afraid of anybody..... I'm sure I got HIV through the needle we shared once using drugs" (PY, labour migrant).*

The narratives of the participants regarding peer influence on sex, condom use, and IDU practices, as presented above, also show the shared norms, opinions, and interests established among them, which appear to strengthen their networks and drive their HIV-risk behaviours or practices. The shared norms, opinions, and interests among these men are reflected in expressions such as: *"Finally, I felt like I was accustomed to it and then every weekend we regularly went out to have sex...."* (PY, labour migrant), *"Everybody talks about it (sex with sex workers) at the (ojek) station"* (PB, ojek driver), and *"If a friend gives a signal, it means he has (drugs) or is inviting to use together..."* (PY, labour migrant).

Discussion

This study employs the conceptual model of social networks as a heuristic tool to guide the analysis and discussion of how structural conditions contributed to shaping former labour migrants and previously or currently (at the time of the study) ojek drivers' social networks and how the networks provided opportunities for social mechanisms that led to HIV transmission among them through various behavioural pathways. The findings reveal a complex interplay between structural conditions, social networks, and risky behaviours that contribute to HIV transmission among both labour migrants and ojek drivers across the study settings, which have never been reported in previous social network studies involving different groups, including MSM, PWID, and FSWs [13, 14, 21, 24, 25].

This study has suggested that labour migrants and ojek drivers across the study settings faced similar structural conditions, including precarious employment, economic hardship or poor family conditions, and poverty. These structural conditions created significant pressure on the participants and contributed to shaping their social networks [10, 41]. It is evident that the social environments where they worked, interacted, and lived significantly contributed to shaping their social networks and developing strong social ties among them. For example, labour migrant participants living in employer-provided shelters around oil palm plantation sites and ojek drivers frequently meeting at taxi stands developed dense, proximate social networks due to their shared work environments. These networks were characterised by high density, as the members were highly connected through their daily interactions and boundedness, as their networks were defined by their occupational roles and living situations [10]. The current findings also report the high number of members of the participants' networks (range or size). The greater number of network members seemed to be an underlying reason for the intensified various social mechanisms among them, such as social influence on their health behaviours, which is in line with previous findings [10, 17, 26, 42].

The structural conditions not only led to the development of both labour migrants' and ojek drivers' social networks but also contributed to shaping the characteristics of individual ties within their networks. Participants from both groups reported frequent face-to-face contact due to their work and living arrangements, leading to high levels of interaction and intimacy, which also facilitated social influence concerning sexual behaviours and IDU practices among them within their social network members [10, 24, 42]. Such interaction and intimacy among the participants were supported by the duration of knowing each other which was prolonged by their continuous engagement in the same jobs and living in the same locations [10]. Multiplexity was evident in the various types of interactions and transactions among network members, including sharing information about work, social, and sexual matters [10, 26]. These characteristics facilitated the development of strong individual ties among members of their social networks, which played a role in peer influence and risky behaviours.

The findings of this study have also suggested that the social networks of participants played a crucial role in shaping their behaviours, particularly concerning sexual practices and IDU [20, 22]. Consistent with the concept suggesting that social networks (through social influence) can influence health-damaging behaviours [10], our findings suggest that the social networks of labour migrants and ojek drivers provided a fertile ground for various social mechanisms, such as social influence and peer pressure, which significantly impacted their behaviours. Peer influence was particularly evident in encouraging risky sexual behaviours, such as unprotected sex with multiple partners, including FSWs and fellow female labour migrants. Similarly, peer pressure among friends within their social networks facilitated the initiation and continuation of IDU practices. These behaviours were self-acknowledged to significantly facilitate the transmission of HIV among them. The findings support those of previous studies reporting that social networks provide opportunities for members' exposure to social influence and risks as they share similar norms, attitudes, and risky behaviours, hence enhancing HIV transmission among them [12–14, 23, 26]. Several studies involving different groups of men, such as clients of FSWs, motorbike taxi drivers and MSM in Indonesia have reported that peer influence through connecting each other to and sharing information about casual sex partners or FSWs increased the frequency of their engagement in HIV risk sexual behaviours, such as sex with multiple partners and inconsistent condom use practices [13, 47–49].

Furthermore, it is plausible to argue that strong individual ties among social network members could lead to shared norms, attitudes, opinions, and interests among labour migrants and ojek drivers, irrespective of their marital status. In turn, the shared norms, opinions, and interests regarding sex, condom use, and injecting drug use among these men also serve as powerful mechanisms that strengthen their social networks while reinforcing risky behaviours for HIV transmission [10, 50]. It can be argued that shared behaviours appeared to create a sense of belonging and mutual validation, fostering a bond where individuals feel accepted and encouraged by their peers. For instance, expressions such as "*every weekend we regularly went out to have sex*" or "*everybody talks about it at the station*" illustrate how common practices become normalised and collectively reinforced, which may make it increasingly difficult for individuals

to disengage from these behaviours. Shared knowledge or opinion among these men as reflected in recognising signals from others for drug use and sex with sex workers, further solidifies their group cohesion or social networks, as it forms an unspoken agreement among them about engagement in the same risky activities. Therefore, these peer social networks among both male labour migrants and ojek drivers perpetuate high-risk behaviours by making them appear normal, thus amplifying the risk of HIV transmission [20, 50]. Additionally, it should be noted that the free-of-charge sex with fellow female labour migrants, low prices of sex with FSWs and the shared purchasing of drugs, which appeared to have minimal financial consequences for them, were also supporting factors for their engagement in these risky behaviours. Consistent with previous findings, this study has suggested that the environments in which participants worked and lived further exacerbated these risks [13, 51]. For instance, the availability of and accessibility to casual sexual partners and illicit drugs in plantation sites and urban areas made it easier for both labour migrants and ojek drivers to engage in HIV risk behaviours, such as unprotected sex and IDU practices. Similarly, the unavailability and inaccessibility of injecting equipment led to their engagement in HIV-risk practices of sharing needles among them for illicit drug use. The unavailability and inaccessibility of new needles can also be exacerbated by regulatory or legal issues that do not permit access to or possession of needles. Previous studies in various settings have reported that legal concerns related to the possession of needles and the refusal of pharmacists to sell needles to the public or non-healthcare professionals have resulted in individuals being arrested by the police, creating a barrier to accessing new needles and contributing to the practice of needle sharing among drug users [52–54]. The lack of family supervision in these work environments further exacerbated these risks or increased engagement in IDU and sex with multiple casual partners, as participants felt less constrained by social norms and familial expectations or acted without fear of social repercussions. These support previous findings reporting cultural differences concerning sexual behaviours, a lack of social control within host communities concerning sexual relationships and IDU, and being separated from families and spouses as key drivers for HIV-risk sexual behaviours and IDU practices among heterosexual men [55, 56]. These environmental factors, combined with the social network dynamics, significantly contributed to the participants' vulnerability to HIV transmission, which are in line with the previous findings [13, 51].

Limitations and strengths of the study

The findings of this study should be interpreted with caution due to several limitations. Firstly, the results reflect the views and experiences of the specific participants in the study settings, which may differ from those of labour migrants and ojek drivers in other contexts with varying characteristics and backgrounds. The use of snowball sampling for participant recruitment may have introduced bias, as it relied on participants referring to others who may share similar characteristics. Additionally, the reliance on self-reported data from one-on-one interviews may have introduced social desirability bias, with participants potentially providing responses they perceived as socially acceptable. The negative psychological effects of being labour migrants, such as loneliness and depression stemming from separation from their homes, wives, families, and friends, which may lead to HIV-risk behaviours among them, were not explored. This could have offered different perspectives for comparison between the two groups of participants. Finally, while the authors acknowledge that social networks can also serve as a protective factor against the transmission of HIV within these networks, this aspect was not explored in our study and thus represents another limitation. Despite these limitations, the study's strengths include the application of a conceptual model that offers a theoretical framework for understanding the relationship between structural conditions, social networks, social mechanisms, and HIV infection among these participants. Furthermore, the in-depth interviews facilitated a thorough exploration of the participants' views and experiences. The findings underscore the need for targeted interventions for Indonesian male labour migrants and ojek drivers in the study settings. Lastly, as is the case with many qualitative studies, the findings of this research do not intend to claim generalisability to other population groups of heterosexual men in the study settings and beyond. However, we acknowledge that it is possible for the findings of this study to be relevant to similar mobile populations elsewhere. For instance, men deployed in the military, construction workers who move from one location to another for new projects, and touring celebrity groups likely share many of these same occupational bonding experiences.

Conclusions

This study highlights how structural conditions shaped the social network characteristics and individual ties of labour migrants and ojek drivers, and the social influence on their health-damaging behaviours and HIV transmission among them. It also highlights environmental factors such as the availability and accessibility of brothels, FSWs, and illicit drugs, as well as the separation from family and spouses, and the lack of availability

and accessibility of injecting equipment in communities or migration sites. These elements also serve as additional supporting factors for the engagement of these heterosexual men in HIV-risk behaviours. Addressing the socioeconomic challenges and risky social environments to reduce risky behaviours is crucial for mitigating HIV transmission among these populations. The findings highlight the significance of peer interventions within social networks that consider the dynamics of these networks. Such interventions have been shown to be effective in reducing HIV-risk behaviours and transmission, as well as in promoting HIV prevention and treatment among diverse population groups [57, 58].

Abbreviations

AIDS	Acquired immune deficiency syndrome
FSW	Female sex workers
HIV	Human immunodeficiency virus
IDU	Injecting drug use
MSM	Men who have sex with men
PLHIV	People living with HIV
PWID	People who inject drugs

Acknowledgements
We would like to thank the participants who voluntarily spent their time to take part in the interview and provided us with valuable information.

Author contributions
P.R.W., and N.K.F. contributed to the conceptualisation of the study, study design, data analysis process, and drafting, editing, and reviewing the manuscript for intellectual content. P.R.W. supervised the project, and N.K.F collected the data. All authors reviewed the manuscript.

Funding
The research received no external findings.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethical approval and consent to participate
The study was conducted according to the guidelines of the Declaration of Helsinki and was approved by the Institutional Review Board (or Ethics Committee) of Flinders University (No. 8286, 27 March 2019) and Duta Wacana Christian University (No. 1005/C.16/FK/2019, 26 June 2019). Written informed consent was obtained from all individual participants included in the study.

Consent for publication
All authors give consent for the publication of the findings of this study.

Competing interests
The authors declare no competing interests.

Author details
[1]Centre for Public Health, Equity and Human Flourishing, Torrens University Australia, Adelaide, South Australia, Australia
[2]Institute of Resource Governance and Social Change, Kupang, Nusa Tenggara Timur, Indonesia

Received: 22 August 2024 / Accepted: 19 February 2025
Published online: 03 March 2025

References

1. Kementerian Kesehatan RI. Laporan situasi Perkembangan HIV/AIDS Dan PIMS Triwulan IV Tahun 2022. Indonesia: Kementerian Kesehatan Republik Indonesia; 2023. p. 9788578110796. Report No.
2. Fauk NK. Risk factors and the impact of HIV among women living with HIV and their families in Yogyakarta and Belu district, Indonesia. Australia: Flinders University; 2022.
3. Blogg S, Utomo B, Silitonga N, Ayu N, Hidayati D, Sattler G. Indonesian National inmate Bio-Behavioral survey for HIV and syphilis prevalence and risk behaviors in prisons and detention centers, 2010. Sage Open. 2014;4(1):2158244013518924.
4. Sudewo A. Understanding HIV risk and engagement with harm reduction and HIV services: the lived experiences of women and men who inject drugs in Jakarta, Indonesia (Doctoral dissertation). Sydney, Australia: UNSW. Available at: https://unsworks.unsw.edu.au/entities/publication/1caa99ae-556d-42d3-810b-eb4163b17d69; 2022.
5. Fauk NK, Ward PR, Hawke K, Mwanri L. Cultural and religious determinants of HIV transmission: A qualitative study with people living with HIV in Belu and Yogyakarta, Indonesia. PLoS ONE. 2021;16(11):e0257906.
6. Fauk NK, Gesesew HA, Mwanri L, Hawke K, Ward PR. HIV-related challenges and women's self-response: A qualitative study with women living with HIV in Indonesia. PLoS ONE. 2022;17(10):e0275390.
7. Fauk NK, Hawke K, Mwanri L, Ward PR. Stigma and discrimination towards people living with HIV in the context of families, communities, and healthcare settings: A qualitative study in Indonesia. Int J Environ Res Public Health. 2021;18(10):5424.
8. Fauk NK, Ward PR, Hawke K, Mwanr L. HIV stigma and discrimination: perspectives and personal experiences of healthcare providers in Yogyakarta and Belu, Indonesia. Front Med. 2021;8:625.
9. Fauk NK, Mwanri L, Hawke K, Ward PR. Traditional human immunodeficiency virus treatment and family and social influence as barriers to accessing HIV care services in Belu, Indonesia. PLoS ONE. 2022;17(7):e0264462.
10. Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. Soc Sci Med. 2000;51(6):843–57.
11. Périssé AR, Costa Nery JA. The relevance of social network analysis on the epidemiology and prevention of sexually transmitted diseases. Cadernos De Saude Publica. 2007;23(Suppl 3):S361–9.
12. Amirkhanian YA. Social networks, sexual networks and HIV risk in men who have sex with men. Curr HIV/AIDS Rep. 2014;11(1):81–92.
13. Fauk NK, Merry MS, Sigilipoe MA, Putra S, Mwanri L. Culture, social networks and HIV vulnerability among men who have sex with men in Indonesia. PLoS ONE. 2017;12(6):e0178736.
14. Öze N, Sayan M, editors. Social Network Dynamics in Transmission of HIV by Sexual Contact. 5th Interenational Conference on Gender Research; 2022 28–29 April; Portugal: University of Aveiro.
15. Choi KH, Gibson DR, Han L, Guo Y. High levels of unprotected sex with men and women among men who have sex with men: a potential Bridge of HIV transmission in Beijing, China. AIDS Educ Prevention: Official Publication Int Soc AIDS Educ. 2004;16(1):19–30.
16. Fauk NK, Crutzen R, Merry MS, Putra S, Sigilipoe MA, Mwanri L. Exploring determinants of unprotected sexual behaviours favouring HIV transmission among men who have sex with men in Yogyakarta, Indonesia. Global J Health Sci. 2017;9(8):47–56.
17. Smith AM, Grierson J, Wain D, Pitts M, Pattison P. Associations between the sexual behaviour of men who have sex with men and the structure and composition of their social networks. Sex Transm Infect. 2004;80(6):455–8.
18. Cepeda JA, Solomon SS, Srikrishnan AK, McFall AM, Kumar MS, Vasudevan CK et al. Injection Drug Network Characteristics Are Important Markers of HIV Risk Behavior and Lack of Viral Suppression. Journal of acquired immune deficiency syndromes (1999). 2017;75(3):257– 64.
19. Costenbader EC, Astone NM, Latkin CA. The dynamics of injection drug users' personal networks and HIV risk behaviors. Addiction (Abingdon England). 2006;101(7):1003–13.
20. Latkin CA, Kuramoto SJ, Davey-Rothwell MA, Tobin KE. Social norms, social networks, and HIV risk behavior among injection drug users. AIDS Behav. 2010;14(5):1159–68.
21. Young AM, Jonas AB, Mullins UL, Halgin DS, Havens JR. Network structure and the risk for HIV transmission among rural drug users. AIDS Behav. 2013;17(7):2341–51.
22. Neblett RC, Davey-Rothwell M, Chander G, Latkin CA. Social network characteristics and HIV sexual risk behavior among urban African American women. J Urban Health: Bull New York Acad Med. 2011;88(1):54–65.

23. Rothenberg R, Dan My Hoang T, Muth SQ, Crosby R. The Atlanta urban adolescent network study: a network view of STD prevalence. Sex Transm Dis. 2007;34(8):525–31.
24. Shushtari ZJ, Hosseini SA, Sajjadi H, Salimi Y, Latkin C, Snijders TAB. Social network and HIV risk behaviors in female sex workers: a systematic review. BMC Public Health. 2018;18(1):1020.
25. Januraga PP, Mooney-Somers J, Ward PR. Newcomers in a hazardous environment: a qualitative inquiry into sex worker vulnerability to HIV in Bali, Indonesia. BMC Public Health. 2014;14(1):832.
26. Felsher M, Koku E, Explaining. HIV risk multiplexity: A social network analysis. AIDS Behav. 2018;22(11):3500–7.
27. Alary M, Lowndes CM. The central role of clients of female sex workers in the dynamics of heterosexual HIV transmission in sub-Saharan Africa. AIDS. 2004;18(6):945–7.
28. Aral SO. Behavioral aspects of sexually transmitted diseases: core groups and Bridge populations. Sex Transm Dis. 2000;27(6):327–8.
29. Patterson TL, Volkmann T, Gallardo M, Goldenberg S, Lozada R, Semple SJ, et al. Identifying the HIV transmission Bridge: which men are having unsafe sex with female sex workers and with their own wives or steady partners? J Acquir Immune Defic Syndr. 2012;60(4):414–20.
30. Perkins JM, Subramanian SV, Christakis NA. Social networks and health: a systematic review of sociocentric network studies in low- and middle-income countries. Soc Sci Med. 2015;125:60–78.
31. Morineau G, Nugrahini N, Riono P, Nurhayati, Girault P, Mustikawati DE, et al. Sexual risk taking, STI and HIV prevalence among men who have sex with men in six Indonesian cities. AIDS Behav. 2011;5:1033–44.
32. Pisani E, Girault P, Gultom M, Sukartini N, Kumalawati J, Jazan S, et al. HIV, syphilis infection, and sexual practices among transgenders, male sex workers, and other men who have sex with men in Jakarta, Indonesia. Sex Transm Infect. 2004;80:536–40.
33. Kementerian Kesehatan RI. Laporan Situasi Perkembangan HIV/AIDS dan PIMS di Indonesia, Triwulan I1 Tahun 2021. Jakarta, Indonesia: Kementerina Kesehatan Republik Indonesia. Available at: https://siha.kemkes.go.id/portal/perkembangan-kasus-hiv-aids_pims#. (Accessed on 31 May 2022); 2021.
34. Santoso D, Asfia SKBM, Mello MB, Baggaley RC, Johnson CC, Chow EPF, et al. HIV prevalence ratio of international migrants compared to their native-born counterparts: A systematic review and meta-analysis. eClinicalMedicine. 2022;53. https://doi.org/10.1016/j.eclinm.2022.101661
35. Weine SM, Kashuba AB. Labor migration and HIV risk: a systematic review of the literature. AIDS Behav. 2012;16(6):1605–21.
36. Karimi A, Ghanei Gheshlagh R, Afkhamzadeh A, Faraji O, Rahmani K. Prevalence of HIV infection and high-risk behaviors in truck and bus drivers in Kurdistan Province. BMC Infect Dis. 2021;21(1):1198. https://doi.org/10.1186/s12879-021-06903-0.
37. Mutie C, Otieno B, Mwangi E, Kawira R, Mutisya A, Gachohi J et al. The global burden of HIV among Long-distance truck drivers: A systematic review and meta-analysis. MedRxiv. 2023:2023.12.18.23300177.
38. Pescosolido BA. The Sociology of Social Networks. In: Bryant CD, Peck DI, editors. 21st Century Sociology. USA: Sage Publication. Available at: https://edge.sagepub.com/system/files/Ballantine5e_5.1SK_0.pdf; 2007. pp. 208– 17.
39. Hirsch BJ. Psychological dimensions of social networks: A multimethod analysis. Am J Community Psychol. 1979;7(3):263–77.
40. Stokes JP. The relation of social network and individual difference variables to loneliness. J Personal Soc Psychol. 1985;48(4):981–90.
41. Laumann EO, Gagnon JH, Michaels S, Michael RT, Coleman JS. Monitoring the AIDS epidemic in the united States: a network approach. Volume 244. New York, NY: Science; 1989. pp. 1186–9. 4909.
42. Marsden PV, Friedkin NE. Network studies of social influence. Advances in social network analysis: Research in the social and behavioral sciences. Sage focus editions, Vol. 171. Thousand Oaks, CA, US: Sage Publications, Inc; 1994. pp. 3–25.
43. Ezzy D, Rice PL. Theory in qualitative research: traditions and innovations in qualitative research. qualitative research.Method: A health focus. Melbourne: Oxford University Press; 2005.
44. Ritchie J, Spencer L. In: Bryman A, Burgess RG, editors. Qualitative data analysis for applied policy research. London: Routledge; 1994. pp. 173–94.
45. Temple B, Young A. Qualitative research and translation dilemmas. Qualitative Res. 2004;4:161–78.
46. Regmi K, Naidoo J, Pilkington P. Understanding the processes of translation and transliteration in qualitative research. Int J Qualitative Methods. 2010;9(1):15–26.
47. Fauk NK, Kustanti CY, Wulandari R, Damayani AD, Mwanri L. Societal determinants of HIV vulnerability among clients of female commercial sex workers in Indonesia. PLoS ONE. 2018;13(11):e0207647.
48. Fauk NK, Mwanri L. Inequalities in addressing the HIV epidemic: the story of the Indonesian Ojek community. Int J Hum Rights Healthc. 2015;8(3):144–59.
49. Fauk NK, Mwanri L. Economic and environmental determinants of Ojek's susceptibility to HIV infection. Int J Pharma Bio Sci. 2014;3(1):291–300.
50. Latkin C, Donnell D, Celentano DD, Aramrattna A, Liu TY, Vongchak T, et al. Relationships between social norms, social network characteristics, and HIV risk behaviors in Thailand and the united States. Health Psychology: Official J Div Health Psychol Am Psychol Association. 2009;28(3):323–9.
51. Fauk NK, Merry MS, Siri TA, Mwanri L, Ward PR. Structural, personal and socio-environmental determinants of HIV transmission among transgender women in Indonesia. Int J Environ Res Public Health. 2021;18(11). https://doi.org/10.3390/ijerph18115814
52. Carpenter DM, Zule WA, Hennessy CM, Evon DM, Hurt CB, Ostrach B. Factors associated with perceived ease of access to syringes in Appalachian North Carolina. JRural Health. 2023;39(1):212–22.
53. Phillips KT. Barriers to practicing risk reduction strategies among people who inject drugs. Addict Res Theory. 2016;24(1):62–8.
54. Wood E, Tyndall MW, Spittal PM, Li K, Hogg RS, O'Shaughnessy MV, et al. Needle exchange and difficulty with needle access during an ongoing HIV epidemic. Int J Drug Policy. 2002;13(2):95–102.
55. Roy T, Anderson C, Evans C, Rahman MS. Sexual risk behaviour of rural-to-urban migrant taxi drivers in Dhaka, Bangladesh: a cross-sectional behavioural survey. Public Health. 2010;124(11):648–58.
56. Wolffers I, Fernandez I, Verghis S, Vink M. Sexual behaviour and vulnerability of migrant workers for HIV infection. Cult Health Sex. 2002;4(4):459–73.
57. Pagkas-Bather J, Young LE, Chen YT, Schneider JA. Social network interventions for HIV transmission elimination. Curr HIV/AIDS Rep. 2020;17(5):450–7.
58. Ghosh D, Krishnan A, Gibson B, Brown SE, Latkin CA, Altice FL. Social network strategies to address HIV prevention and treatment continuum of care among At-risk and HIV-infected substance users: A systematic scoping review. AIDS Behav. 2017;21(4):1183–207.

Publisher's note