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Impact of migration on HIV/AIDS in South Africa

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Abstract

This study investigated the impact of migration on HIV/AIDS in South Africa, focusing on the period from 2000 to 2020. The objective is to analyse the relationship between net migration, urbanization, with children living with HIV and HIV prevalence, using net migration as a proxy for international migration and urban population growth as a measure of internal migration. The study employed data sourced from the World Development Indicators (WDI) by the World Bank. Findings revealed that while increased net migration and urbanization initially contributed to higher HIV prevalence, in the later year, there was an observed decline in HIV prevalence following a fall in net migration and urbanization which show a possible direct relationship between migration and HIV/AIDS in South Africa. The study emphasizes the need for targeted healthcare policies that enhance service delivery, prevention programs, and social support, particularly in rapidly urbanizing regions and among migrant populations, to mitigate the ongoing HIV burden. *(Afr J Reprod Health 2025; 29 [4]: 28-36).*

Keywords: Net migration; urbanization, HIV; South Africa

Résumé

Cette étude a examiné l'impact de la migration sur le VIH/sida en Afrique du Sud, en se concentrant sur la période 2000-2020. L'objectif est d'analyser la relation entre la migration nette, l'urbanisation, les enfants vivant avec le VIH et la prévalence du VIH, en utilisant la migration nette comme indicateur de la migration internationale et la croissance démographique urbaine comme mesure de la migration interne. L'étude a utilisé des données issues des Indicateurs du développement dans le monde (IDM) de la Banque mondiale. Les résultats ont révélé que, si l'augmentation de la migration nette et de l'urbanisation a initialement contribué à une prévalence plus élevée du VIH, une baisse de la prévalence du VIH a été observée l'année suivante, ce qui suggère une possible relation directe entre la migration et le VIH/sida en Afrique du Sud. L'étude souligne la nécessité de politiques de santé ciblées qui améliorent la prestation de services, les programmes de prévention et le soutien social, en particulier dans les régions en urbanisation rapide et parmi les populations migrantes, afin d'atténuer le fardeau actuel du VIH. *(Afr J Reprod Health 2025; 29 [4]: 28-36).*

Mots-clés: Migration nette, urbanisation, VIH, Afrique du Sud

Introduction

The spread of the human immunodeficiency virus (HIV), which progresses into the acquired immunodeficiency syndrome (AIDS), has emerged as a significant global health challenge, with approximately 37.7 million people worldwide living with the virus[1,2]. South Africa bears a disproportionate share of this burden, with an estimated 8 million adults and children with HIV, which is nearly a fifth of the world population with the virus. Alarmingly, a high proportion of those newly diagnosed in the country are at an advanced stage of HIV infection (CD4 count <200cells/mm³), leaving their immune systems critically compromised[3-5].

The high presence of HIV in South Africa can be attributed to an interaction of biological, socio-behavioural, contextual, and structural drivers[6,7]. Despite the country's remarkable efforts to combat the epidemic, HIV prevalence remains high and is distributed unevenly across different regions and populations[8,2]. One critical factor that has been linked to the spread of HIV is migration, a phenomenon that facilitates the transmission of epidemics worldwide, including HIV and AIDS. Migrants, by engaging in new social and sexual networks upon moving to another country, may

increase their risk of exposure to HIV[9,1].

Understanding how migration and health work, both regionally and globally, is a critical public health priority[10]. To achieve universal health coverage, it is essential that mobile populations are included in health policy and planning[11,12]. South Africa, as a major destination for both internal and international migrants, displays some of the highest stages of movement within in the Southern African region, driven largely by urbanization and economic opportunities[13,12]. The global increase in international migration is similarly reflected in SA, where a large amount of migrants are within the age group (15–49 years) of reproduction , with an average age of 39 years. This trend has important implications for public health, as the migration of people in this age group has been associated with increased vulnerability to HIV[14].

South Africa's HIV burden is compounded by its high levels of mobility. The country is home to the largest HIV epidemic globally, with nearly 8 million people living with the virus[12,15]. Numerous studies have examined the interplay between migration and HIV, ranging from mathematical modelling to exploring factors that influence HIV/AIDS transmission and how migration affects these dynamics[11,12,1,15,7,16].

However, despite extensive research, there remains a lack of recent studies that comprehensively explore migration and HIV/AIDS' association in South Africa. There are certain gaps related to visual analysis, drawing on data sources outlining trends and patterns concerning association existing between migration and HIV prevalence. The addressing of the particular gap is of extreme importance for interventions and policies toward the specific needs of mobile population's special vulnerabilities. It, therefore, seeks to fill this gap through a clear analysis of how migration has contributed to the state of HIV/AIDS in South Africa. Graphically, the study attempts to indicate the association of migration patterns with the prevalence rate of HIV so as to proffer new knowledge useful for the public health response.

Literature review

Dzomba *et al.*[17] conducted a systematic review and meta-analysis of the association between migration, risky sexual behaviour, and HIV acquisition in South Africa. The review included 29 publications, between 2000 and 2017, investigating the ways in which migration influences HIV risk. A meta-analysis of four empirical articles that measured HIV incidence specifically showed that migration significantly increased the odds of acquiring HIV, with an aOR of 1.69 (95% CI: 1.33–2.14) and moderate heterogeneity (I^2 = 35.0%). The systematic review showed that male and female migrants were more likely to engage in risky sexual behaviors, including multiple sexual partnerships and inconsistent use of condoms, compared to non-migrants. These behaviors made them more vulnerable to HIV infection. The findings pressed on migration as a critical driver of HIV risk, where prevention strategies urgently need to focus. The authors stressed the importance of combination prevention approaches that integrate biomedical, behavioral, and structural interventions targeting migrant populations. They concluded that addressing migration-specific vulnerabilities is essential to mitigate HIV transmission and promote equitable health outcomes in South Africa, where mobility significantly influences the dynamics of the epidemic.

Low *et al.*[18] leveraged data from Namibia Population-based HIV Impact Assessment (NAMPHIA-2017) to assess how migration relates with HIV-related outcomes in Namibia. The participants were a nationally representative sample of adults aged 15–64 who underwent interviews and home-based HIV testing. Recent infections were ascertained using the HIV-1 LAg avidity assay combined with viral load and antiretroviral analyte data. Key outcomes of interest were HIV positivity awareness, antiretroviral use, and viral load suppression (VLS). Migration was defined as either important (lived outside of their current region or away from home for more than a month in the past three years) or recent cross-community in-migration (moved into the community in the last two years). Among 18,765 eligible adults, 83.9% of women and 73.0% of men provided data on HIV status and migration. Of the participants, 62.5% reported significant migration, and 15.3% were recent cross-community in-migrants. HIV prevalence was 12.6%, with little variation by migration status. Population VLS was 77.4%.

Recent cross-community in-migration was associated with increased risk of recent infection (aOR: 4.01, 95% CI: 0.99–16.22). In contrast, significant migration was associated with reduced odds of recent infection (aOR: 0.73, 95% CI: 0.55–0.97). This probably reflects the diverse ways migration influences the transmission and outcomes of treatment regarding HIV infection.

Ginsburg *et al.*[12] examined healthcare utilization and its determinants among internal migrants and permanent residents in South Africa's rural Agincourt sub-district. The study followed a cohort of 3,800 individuals aged 18–40 over five years, from 2017. Data were collected from 1,764 non-migrant residents and 1,334 temporary, mostly urban-based migrants. The authors employed bivariate analyses, logistic and multinomial regression models, and propensity score matching. The findings revealed significant differences in healthcare utilization by migration status and sex. Migrants with chronic conditions were 0.33 times less likely to use healthcare services compared to non-migrants, while males were 0.32 times less likely than females to seek care. Migrants also differed in their choice of healthcare providers; 97% of non-migrants accessed government facilities, whereas 31% of migrants used private healthcare, and 25% consulted traditional healers. Regression analyses showed that migrants had 8.12 times the relative risk of non-migrants for utilizing private healthcare and 2.40 times the risk for using both public and private facilities. These disparities persisted even after adjusting for relevant controls and migration propensity, highlighting the need for targeted interventions to improve healthcare access for internal migrants, especially males and those with chronic conditions.

In this regard, Apenteng *et al.*1 conducted an epidemiological model-based analysis on the impact of migration on the spread of HIV and AIDS. The authors formulated a simple model of HIV/AIDS that incorporated migration to study its impact on disease spread. Available HIV/AIDS incidence data in Malaysia was used to calibrate the model. The Markov chain Monte Carlo method was used to handle the uncertainty of unknown parameters. The analysis revealed that 15.6% of the migrant population, or 67,801 individuals, were susceptible to HIV, while 0.064%, or 278 migrants, were infected with HIV. It was estimated that 72 out of every 10,000 migrants accounted for 0.0000017% of the population. The R_0 estimate for the model without migration was 2.0906, while the R_0 for the model with migration was calculated as 2.3322, indicating unstable DFSS. This finding suggested that migration contributed to the spread of HIV and AIDS, leading to a 12% increase in the infection rate. The introduction of migration validated the true R_0 and transmission rate bb for the epidemic in Malaysia. The study underscored the need for targeted public health interventions to stabilize the epidemic and reduce HIV transmission among migrant populations.

Manji et al.[10] analyzed South African government policy documents to assess how migration and health are addressed in national and subnational policies. The study, conducted between 2019 and 2021, reviewed 227 documents spanning 2002 to 2019, focusing on whether migration-related policies align with South Africa's commitments to migrant inclusion. The findings revealed that fewer than half (101) of the documents directly engaged with migration, indicating its low prioritization in policy discourse. The analysis highlighted that migration was predominantly framed in a negative light, with policies often associating cross-border migration with disease transmission, security risks, and increased strain on health systems and resources. Such narratives tended to attribute blame to migrant populations, which could reinforce nationalist and anti-migrant sentiments. Furthermore, the focus on cross-border migration largely ignored the challenges of internal mobility, thereby limiting the scope of policy responses to migration and health. The authors argued that these framing practices undermine efforts to foster migrant-inclusive policies and hinder equitable health service access for mobile populations. They called for a shift towards constructive engagement, emphasizing the need for inclusive, equity-driven policies to address migration and health effectively in South Africa and similar contexts.

Method

This study utilized a descriptive analysis approach to explore the association between migration and HIV/AIDS in South Africa. Drawing on five-year

interval data from 2000 to 2020, sourced from the World Development Indicators (WDI) by the World Bank[19], the research examined the relationships between net migration, urbanization and the number of children living with HIV, as well as between net migration, urbanization and the overall HIV prevalence in South Africa.

Estimation procedures

This study analysed the relationship between migrations, children living with HIV, and the prevalence of HIV in South Africa. Net migration was used as a proxy for international migration, while urban population growth represented urbanization. Children living with HIV and total HIV prevalence served as indicators for HIV/AIDS. These measurement choices are consistent with previous research, including studies by Low *et al*.[18], Ginsburg *et al*.[12], Zuma *et al*.[7], Makwembere *et al*.[20] and Chang *et al*.[21]. To facilitate a comprehensive analysis, graphical methods were employed, offering a clear and detailed understanding of the topic.

Data analysis

To achieve the objective of this study, graphical analysis was employed as the primary data analysis technique. Graphs were utilized to assess and identify patterns, trends, and changes in the data over time, providing a clear and comprehensive understanding of the subject matter.

Ethical considerations

This research utilized statistical data from the World Development Indicators (WDI), which are made anonymous and aggregated to ensure that no identifiable information is exposed or at risk. No personal data were included, and the authors adhered strictly to the usage guidelines set by the data providers. The analysis was conducted using a clear and rigorous methodology, with results presented clearly and objectively. Ethical approval was not necessary, as the study did not involve human or animal subjects.

Results

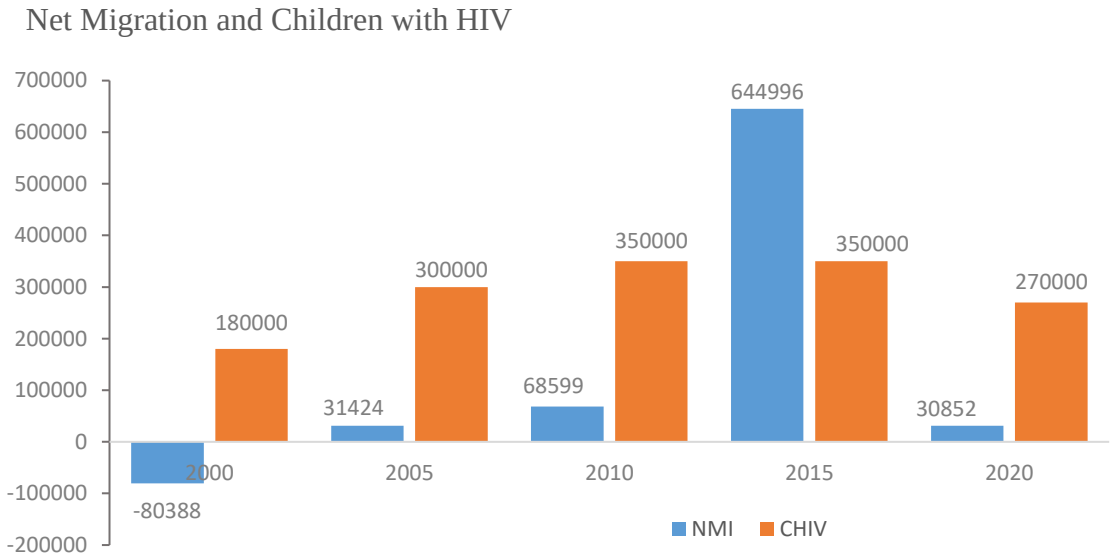
Figure 1 shows the relationship between net migration and the number of children living with HIV in South Africa between 2000 and 2020, with some notable trends. In the year 2000, net migration was negative, which means a higher number of emigrants compared to immigrants, and at this time, there were an estimated 180,000 children living with HIV. In 2005, net migration was positive at 31,424 and thus had more immigrants than emigrants, while children living with HIV surged to 300,000. The rate of net migration and the number of children living with HIV has continued to be upward as in the year 2010; net migration reached 68,599 as the number of children living with HIV moved to 350,000. Between 2010 and 2015, net migration surged dramatically, peaking at 644,996, while the number of children living with HIV remained constant at 350,000. However, by 2020, net migration had sharply declined to 30,852, accompanied by a substantial reduction in the number of children living with HIV, which dropped to 270,000.

The line graph of figure 2 shows data from 2000 to 2020 of the association among net migration (NMI) and prevalence of HIV (PHIV) in South Africa. In 2000, net migration was negative at -80,388, with HIV prevalence at 13%. By 2005, net migration turned positive at 31,424, marking a shift toward more people migrating into South Africa, while HIV prevalence increased to 15.8%. In 2010, net migration further increased to 68,599, with HIV prevalence climbing to 17.5%. The most notable surge in net migration occurred between 2010 and 2015, with net migration peaking at 644,996, while HIV prevalence reached 18.7%. By 2020, net migration decreased significantly to 30,852, while HIV prevalence slightly declined to 18.5%.

The data in Figure 3 illustrates the relationship between urbanization (URB) and the number of children living with HIV (CHIV) in South Africa from 2000 to 2020.

Table 1: Measurement of variables

Variable	Code	Measurement	Source
Net migration	NMI	Net migration is the number of immigrants minus the number of emigrants, including citizens and noncitizens.	WDI
Urbanization	URB	Urban population growth (annual %)	WDI
Children living with HIV	CHIV	Children (0-14) living with HIV	WDI
Prevalence of HIV	PHIV	Prevalence of HIV, total (% of population ages 15-49)	WDI

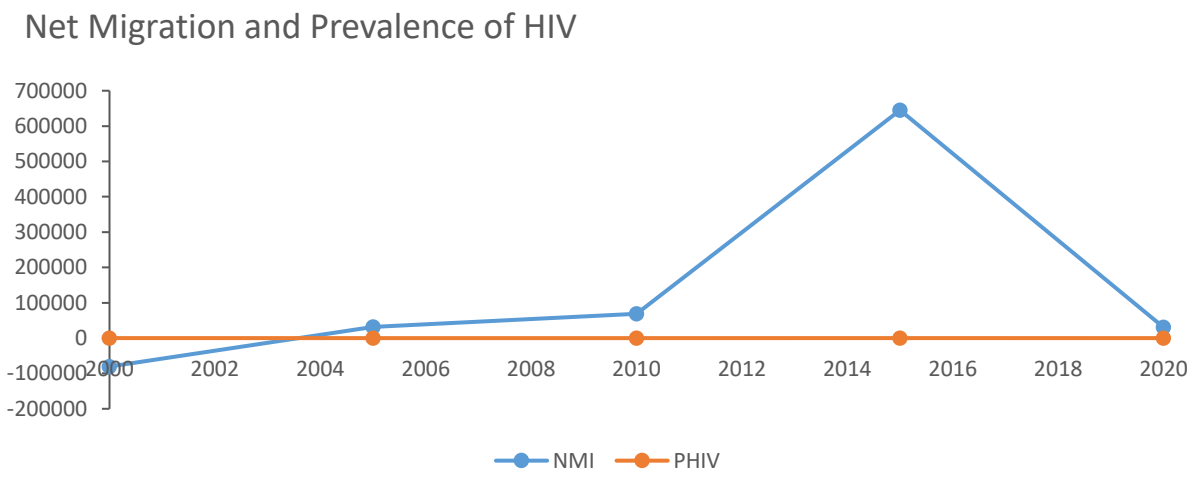


Source: Authors` Computation

Figure 1: Net migration and children living with HIV in South Africa

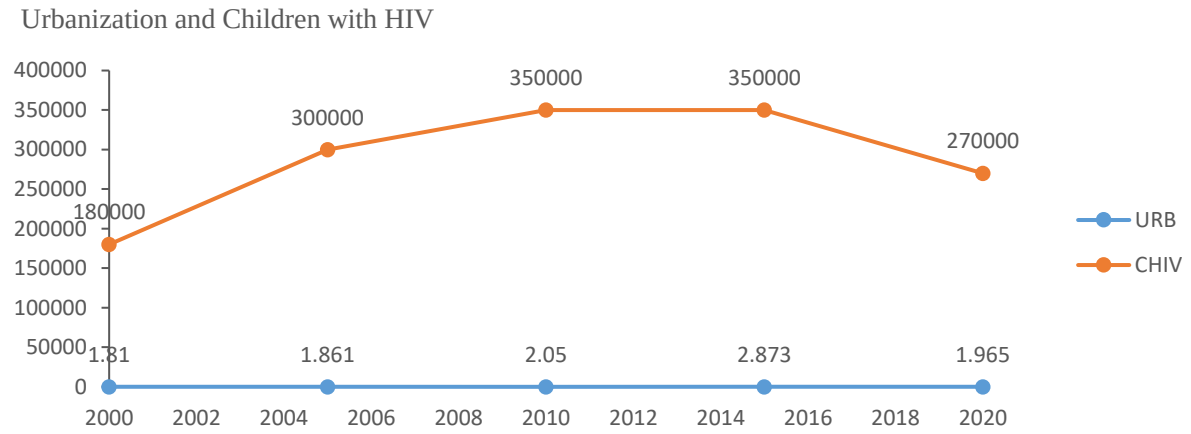
In 2000, the urbanization rate was 1.81, and 180,000 children were living with HIV. By 2005, urbanization increased slightly to 1.861, accompanied by a significant rise in CHIV to 300,000. In 2010, urbanization went up to 2.05, and CHIV reached its peak of 350,000. In 2015, at the peak of urbanization, which was at 2.873, CHIV remained the same, 350,000. By 2020, urbanization fell to 1.965 and also CHIV significantly went down to 270,000, showing progress in combating HIV among children. This decline was probably characterized by improved healthcare infrastructure, access to antiretroviral therapy, and better prevention.

Figure 4 illustrates the association between urbanization (URB) and the prevalence of HIV (PHIV) in South Africa from 2000 to 2020. In 2000, urbanization was relatively low at 1.81, and the HIV prevalence stood at 13%. By 2005, urbanization increased slightly to 1.861, accompanied by a substantial rise in HIV prevalence to 15.8%. In 2010, an upward trend is observed. Urbanization reached 2.05, and HIV prevalence rose further to 17.5%. By 2015, urbanization peaked at 2.873, with HIV prevalence at its highest, 18.7%. Interestingly, in 2020, urbanization declined to 1.965, while HIV prevalence slightly decreased to 18.5%.



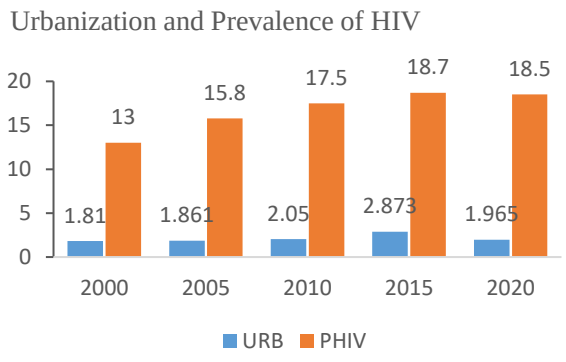
Source: Authors` Computation

Figure 2: Net migration and prevalence of HIV in South Africa



Source: Authors` Computation

Figure 3: Urbanization and children living with HIV in South Africa



Source: Authors` Computation

Figure 4: Urbanization and prevalence of HIV in South Africa

Discussion

The result of the analysis of the relationship between net migration and children living with HIV showed a continuous upward trend in both factors until 2015 in which a surge in net migration was met by an unchanged number of children living with HIV. The period of high net migration coinciding with a stabilization in the amount of children affected by HIV, potentially reflects the impact of the implementation of Option B+ since 2013 in South Africa and improved access to healthcare services for both migrant and non-migrant populations. These general trends suggest that

while migration patterns may not directly determine HIV among children, they are likely interconnected through various factors, including healthcare access, socioeconomic conditions, and public health interventions. The significant decline in children living with HIV by 2020 may reflect advancements in prevention strategies, including the prevention of mother-to-child transmission (PMTCT) programs, which likely benefited both migrant and local populations. Additionally, the decline in net migration during this period may have reduced exposure to high-risk environments or enhanced the stability of healthcare services in specific regions.

About the association between net migration and prevalence of HIV in South Africa, negative net migration and positive prevalence of HIV in 2000 are indicative of coexistence of challenges that emigration poses to South Africa, along with a moderate yet alarming burden of HIV. In 2005, increased net migration along with HIV prevalence could suggest that migration can result in vulnerabilities and may contribute to the spread of HIV owing to altered population dynamics. In 2010, the continued rise in both indicators reflected the interaction of migration and HIV risk, whereby urbanization and mobility may have fostered new sexual networks and reduced healthcare access for migrants. The peak of migration in 2015 may have set up conditions that were ripe for higher rates of HIV transmission, straining already inadequate public health resources and further limiting the effectiveness of prevention programs, as reflected in the increase in HIV prevalence. By 2020, declines in both migration and prevalence suggest a possible influence of net migration on prevalence of HIV. Overall, the data shows that there is indeed a relationship between net migration and the prevalence of HIV, where migration indirectly influences access to health care, socioeconomic conditions, and social networks.

The increase in urbanization followed by a surge in children living with HIV suggests that the early stages of urbanization might have been linked to increased HIV vulnerability among children, possibly due to limited healthcare access, poverty, or overcrowded living conditions in urban areas. The trend continued in 2010 revealing continued correlation between increased urbanization and higher numbers of HIV-affected children. The sustained high numbers of children living with HIV during periods of rapid urbanization in 2015 may point to challenges in adapting healthcare systems to urban population growth, such as limited prevention and treatment services for vulnerable populations, including children. Finally, in 2020, there was a drop in urbanization which was followed by a drop in children living with HIV in the same year. This proposes a possible direct association between the two factors indicating that though urbanization can offer economic opportunities, it may also expose vulnerable populations to greater health risks without adequate healthcare infrastructure.

In figure 4, the association between urbanization and prevalence of HIV, in the early period reflects a moderately high HIV prevalence rate, which may have been influenced by factors such as limited healthcare access for the increasing population of the urban areas and inadequate HIV awareness among the rural population moving to the urban areas. The rise of both urbanization and prevalence of HIV in 2005 suggests that early urbanization may have played a role in the spread of HIV, possibly due to increased social interactions, migration to urban centres, and challenges in delivering effective healthcare services in rapidly expanding urban areas. The upward trend of both indicators in 2010 likely reflects the complex interplay between urban growth, social dynamics, and healthcare access. The sustained increase in prevalence in 2015 indicates that urbanization may have exacerbated existing vulnerabilities, such as overcrowding, limited healthcare resources, and high-risk behaviours. Then the reduction in 2020 may suggest improvements in healthcare delivery, access to antiretroviral therapy (ART), and enhanced HIV prevention campaigns targeting already reduced urban populations. Generally, this reveals a close relationship between urbanization and HIV prevalence, where urban growth initially coincided with increased HIV rates. However, the slight decline in prevalence by 2020 may indicate that urban health interventions have begun to address the challenges posed by rapid urbanization.

Strengths and limitations

Therefore, the limitations of this study have outweighed its value in analyzing the relationship existing between migration and HIV/AIDS in South Africa, providing useful insights to help improve public health strategies. Graphical methods are employed with ease to bring out the trends and make it easy on the policy interpreter to interpret the data. The reliability of the findings is ensured by relying more on the more reliable World Development Indicators. The study's use of anonymized data avoids ethical concerns, further strengthening its methodology. However, the study has limitations.

It leverages only two proxies-net migration and growth in urban population-for simplifying complex migration operations. Qualitative data on socioeconomic and cultural factors affecting HIV transmission, or structural drivers of it, will not be possible. Potential confounding variables include socioeconomic status and health care access. Similarly, five-year intervals may miss any short-term changes. Last but not least, the study identifies associations, not causation, which may affect its policy impact.

Policy implications

Policy measures aiming at the casual effect of migration on HIV/AIDS infection rates in South Africa should focus on improvement in access to healthcare for both migrants and urban citizens. Firstly, reinforcement of services on HIV prevention and treatment would include expansion of antiretroviral therapy, scaling up PMTCT, and reduction of HIV infection, especially among children, to a greater extent. First, targeted interventions in rapidly growing urban areas will ensure health infrastructure scales with the population growth. Second, public awareness campaigns targeted at migrant and urban communities will help in promoting safe sexual practices and reduce stigma in accessing HIV-related services. Third, the integration of health services into urban planning and reaching the unreached through mobile clinics will facilitate healthcare delivery. Social protection policies should also aim at reducing socioeconomic vulnerabilities among migrants and urban poor, reducing exposure to high-risk environments, increasing stability, and, in so doing, support HIV prevention. These will contribute to reducing the public health challenges presented by migration and urbanization.

Conclusion

This study explored the relationship between migration and HIV/AIDS in South Africa. Results are indicative that while migration and urbanization have played their role in the shift of HIV patterns, health-seeking behaviors, socioeconomic factors, and public health interventions remain important factors. Despite the potential of migration to improve the transmission of HIV, increased access to health care, prevention strategies, and targeted interventions for migrants and urban populations have contributed to declines in HIV prevalence, especially among children. The way forward lies in better healthcare structures and policies to address urban and migrant populations if HIV/AIDS is to be further contained in South Africa.

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