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Lancet HIV. Author manuscript; available in PMC 2024 July 01.

Published in final edited form as:

Lancet HIV. 2023 July ; 10(7): e461–e471. doi:10.1016/S2352-3018(23)00085-1.

HIV infection and engagement in the care continuum among migrants and refugees from Venezuela in Colombia: a cross-sectional, biobehavioural survey

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ALW, JRG, MS, KP, RLN, and PBS designed the study protocol and data collection instruments. JRG and MABT led study implementation; JO, JJL, DMP, and JFRC oversaw data collection at study sites and laboratory procedures. RLN and JAFN contributed expertise in public health policy. ALW provided oversight to the overall study with coordination by MS. ALW, MS, JRG, had access to and verified the data. ALW conducted the statistical analysis, wrote the first draft of the manuscript, and had responsibility for the decision to submit for publication. Data were available to all authors. All authors were responsible for the decision to submit the manuscript, reviewed, and approved the manuscript for publication.

Conflicts of Interest:
The authors declare no conflicts of interest.

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Summary

Background: The crisis in Venezuela has produced one of the most significant human displacements in recent history. To inform HIV programming and treatment distribution, we aimed to estimate HIV prevalence and associated indicators among Venezuelan migrants and refugees residing in Colombia, the largest receiving country.

Methods: We conducted a biobehavioral, cross-sectional survey using respondent-driven sampling among Venezuelan adults who arrived in Colombia since 2015 and resided in four cities, Bogotá, Soacha, Soledad, and Barranquilla. Participants completed socio-behavioral questionnaires and rapid HIV and syphilis screening with laboratory-based confirmatory testing, CD4 testing, and viral load quantification. Policies related to legal migration status affect access to insurance and HIV services in Colombia, as in many receiving countries; thus, we provided legal assistance and navigation support to participants with HIV for sustained access to treatment. Population-based estimates were weighted for the complex sampling design. Penalized multivariable logistic regression analysis was used to identify correlates of viral suppression (HIV RNA<1,000 copies/mL).

Findings: Between July 30, 2021–February 5, 2022, 6,221 participants were enrolled. 71 participants (sample estimate: 1.1%) had laboratory-confirmed infection, resulting in a weighted population HIV prevalence of 0·9% (95%CI: 0·6–1·4). Among the sample living with HIV, 47·9% (34/71) were previously diagnosed and 35·2% (25/70) were virally suppressed. Individuals with irregular migration status (reference: regular; aOR:0·3, 95%CI: 0·1–0·9), and with a last HIV test in Colombia (reference: Venezuela; aOR:0·2, 95%CI: 0·1–0.8) were independently less likely to have suppressed viral loads.

Interpretation: HIV prevalence among Venezuelan migrants and refugees in Colombia suggests the epidemic is close to a generalized stage, which may be addressed by inclusion of migrants and refugees in local HIV services, enhanced access to and navigation support for HIV testing and care, and coordination with humanitarian programs. There is a clear link between current legal migration status and viral suppression, conferring both clinical and epidemiological implications; thus, legal aid and access to insurance may support early detection and treatment for people with irregular migration status.

Funding: PEPFAR through the Centers for Disease Control and Prevention

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Resumen

Venezuela ha experimentado un desplazamiento humano significativo desde 2015. Con el fin de informar a los programas de VIH y la distribución del tratamiento, nuestro objetivo fue estimar la prevalencia del VIH y evaluar sus indicadores asociados entre migrantes y refugiados de Venezuela que residen en Colombia, el principal país receptor.

Realizamos una encuesta transversal y bioconductual utilizando un muestreo dirigido por entrevistados (respondent driven sampling [RDS]) entre personas venezolanas de 18 años o más que habían llegado a Colombia desde 2015 y residían en cuatro ciudades (Bogotá, Soacha, Soledad y Barranquilla). Los participantes completaron cuestionarios socio-conductuales y se les realizaron pruebas rápidas de detección del VIH y sífilis, seguidas de pruebas confirmatorias en laboratorio, recuento de células CD4 y cuantificación de la carga viral. Las políticas relacionadas con el estatus migratorio afectan el acceso al seguro y a los servicios de VIH en Colombia, al igual que en muchos países receptores, por lo que proporcionamos asistencia legal y apoyo con orientación sobre las rutas de acceso a los participantes con VIH para garantizar un acceso sostenido al tratamiento. Las estimaciones basadas en la población se ponderaron según el diseño de muestreo complejo. Se utilizó un análisis de regresión logística multivariable penalizada para identificar los factores asociados con la supresión viral (ARN del VIH-1 <1000 copias por mL).

Entre el 30 de julio de 2021 y el 5 de febrero de 2022, reclutamos a 6506 participantes a través del muestreo dirigido por entrevistados, de los cuales se inscribieron 6221. De los 6217 participantes, 4046 (65·1%) eran mujeres cisgénero, 2124 (34·2%) eran hombres cisgénero y 47 (0·8%) eran personas transgénero o no binarias. De los 6221 participantes, 71 (1·1%) tenían una infección por VIH confirmada por laboratorio, lo que resulta en una prevalencia del VIH ponderada en la población del 0·9% (IC del 95%: 0·6–1·4). Entre los participantes que viven con VIH, 34 (47·9%) de los 71 habían sido diagnosticados previamente con VIH y 25 (35·7%) de los 70 tenían supresión viral. Las personas con estatus migratorio irregular en comparación con aquellas con estatus migratorio regular (razón de momios ajustada 0·3, IC del 95%: 0·1–0·9) y aquellas que habían realizado la prueba más reciente de VIH en Colombia en comparación con la prueba más reciente en Venezuela (0·2, 0·1–0·8) tenían menos probabilidades de tener cargas virales suprimidas.

La prevalencia del VIH entre migrantes y refugiados de Venezuela en Colombia sugiere que la epidemia del VIH está cerca de ser generalizada, lo cual podría abordarse mediante la inclusión de migrantes y refugiados de Venezuela en los servicios locales de VIH, mejorando el acceso y la orientación en las rutas para acceder las pruebas y el cuidado del VIH, y coordinando con programas humanitarios. Existe una asociación entre el estatus migratorio y la supresión viral, lo que tiene implicaciones clínicas y epidemiológicas. Por lo tanto, el apoyo legal y el acceso al aseguramiento podrían llevar a la detección temprana del VIH y al tratamiento oportuno para las personas con estatus migratorio irregular.

Background:

Globally, the number of people residing outside of their country of birth has increased by 84% between 1990 to 2020.[1] Health surveillance and research can provide critical information for health programming and policy but are often limited by several logistical

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and ethical challenges. To date, health research among migrant and refugee populations living in urban settings or otherwise dispersed among host communities has been extremely limited with extant research concentrated mostly on high-income or global North receiving countries.[2–4]

In the Americas, the economic crisis and political instability in the Bolivarian Republic of Venezuela, which had an estimated population size of 30·5 million in 2015,[5] has led to mass migration, displacing over 7·1 million Venezuelans as of September 2022.[6] Shortages of goods began in 2014, with crisis-associated displacement – a predominantly South-South displacement - beginning to be observed internationally in 2015. Hyper-inflation led to peak numbers of Venezuelans fleeing to other countries in 2017–19.[7]

The humanitarian emergency has been associated with deteriorating healthcare infrastructure and worsening health outcomes among those who remained in the country, as well as those displaced abroad.[7] Gaps in HIV diagnostics and treatment in Venezuela since 2015, coupled with scarce public health data, have limited the availability of reliable estimates of HIV burden.[7] A coordinated response led by the Pan American Health Organization (PAHO) has improved antiretroviral (ARV) coverage after nationwide drug shortages,[8] although diagnosis, treatment and suppression remain suboptimal and potentially worsened by the COVID-19 pandemic.[9] As of 2021, UNAIDS reported that 98,000 people had been diagnosed with HIV in Venezuela, 58% of whom were estimated to have received ARVs.[10] No recent estimates on virologic suppression have been reported.[10] The HIV epidemiology of Venezuelans living in neighboring receiving countries is largely unknown.

The International Covenant on Economic, Social and Cultural Rights, to which most countries globally are signatory, recognizes the right to health, inclusive of migrants regardless of their legal status.[11] In practice, HIV care and treatment for migrants, including Venezuelan migrants and refugees, is variable and depends on national health programs and policies of the host country.[12] Data from other studies show that migrant populations, regardless of the situation or cause of migration, often face delays in care and have higher risk of AIDS-defining events than non-migrant populations.[13] Diagnostic and treatment delays can also lead to ongoing transmission, while treatment interruptions can lead to virologic rebound, increased risk of onward transmission, and acquired resistance.[7]

Colombia, which had an estimated population of 51.5 million people in 2021,[5] hosts approximately 2·5 million Venezuelans as of September 2022, making it the most significant receiving country in the region.[6] Access to health services for Venezuelan refugees and migrants (regional standards largely refer to Venezuelans as ‘migrants and refugees’, given the complex situation and range of protection statuses)[6] in Colombia is largely dependent on migration status. People with regular migration status, defined as having authorization to enter and stay in a country that is consistent with the laws and regulations in the destination country, are able to gain formal employment and thus enroll in the contributory insurance system or are eligible for services under the subsidized system.[14,15] However, 56% of Venezuelans in Colombia in March 2021 were estimated to have irregular migration status[16] and thus, unable to access the contributory system nor eligible for the subsidized system.[14,15] Although they can access emergency care, as well as some preventive services

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such as vaccinations and prenatal care, care for chronic diseases is limited.[15] Venezuelans with irregular migration status cannot access insurance for HIV services and treatment, though drug donations have made treatment available for Venezuelans in a few cities.[17]

In this context, population-based estimates of HIV are needed to inform service delivery, treatment distribution, and public health and humanitarian programming. Therefore, we aimed to estimate the burden of HIV and investigate factors associated with diagnosis and viral suppression among adult Venezuelan refugees and migrants in Colombia.

Methods

The study was an interdisciplinary collaboration between a community-based organization, *Red Somos,* academic partner, Johns Hopkins University, and the Colombian Ministry of Health and Social Protection. We began with formative, qualitative research to inform the methods, survey measures, and messaging of the biobehavioral survey.[18] Our study methods have been previously described.[19]

Study design and participants

The cross-sectional study was implemented in two sites, encompassing the neighboring cities of 1) Bogotá and Soacha, Cundinamarca Department, and 2) Barranquilla and Soledad, Atlántico Department, which have some of the largest distributions of Venezuelans in the country.[16] Locations were selected for the population distribution, accessibility to humanitarian and health programs, plans for treatment distribution, and lower presence of migrants who were pendular (i.e., live in Venezuela but cross to Colombia regularly for work, services, or goods) or transiting through Colombia to another country. Participants were sampled using respondent-driven sampling (RDS, Supplemental Appendix) from July 30, 2021 through February 5, 2022.

Eligibility criteria included: aged >=18 years; self-reported birth in Venezuela and Venezuelan nationality; migrated to Colombia as of 2015 (corresponding to the year in which Venezuelans began fleeing the country as a result of the crisis) or later; currently resided in a study city; no reported intention to migrate out of Colombia (i.e., transiting); no prior participation; and displayed a valid study coupon at enrollment. Enrollment was restricted to only one member in an immediate family. Eligible participants underwent screening and written consent in private study offices. Participants consented to complete a survey questionnaire, rapid HIV and syphilis testing.

Procedures

Participants identified with low literacy or uncomfortable with technology completed an electronic, staff-administered questionnaire. All others completed electronic, self-administered questionnaires with staff support. We used this multi-modal approach to minimize COVID-19 transmission risk, respect participant literacy and preferences, and followed best-practices in development and implementation of multi-modal survey research.

Survey measures were drawn from existing and validated measures where possible and relevant to the population. Survey modules included the following domains: demographics;

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displacement experiences and migration status; food security; health history including healthcare utilization, chronic disease, mental health, and substance use; sexual health and behaviors; HIV testing, prevention, and care; use of humanitarian services; and social network size questions used for RDS weighting procedures. Migration status was self-reported as regular or irregular based on the participant's status at the time of the study.

Biologic measures included rapid HIV and syphilis screening using Standard Diagnostics (SD) BIOLINE HIV/Syphilis Duo with finger-prick blood specimens. Participants with a reactive result on either or both tests were asked to provide an additional venous specimen for laboratory-based confirmatory testing following national testing guidelines.[20] Confirmatory HIV testing was performed with Western Blot testing and included CD4 testing and HIV RNA quantification. Laboratory-based confirmatory syphilis testing was performed using HUMAN Diagnostics Syphilis RPR test and titer.

All participants with laboratory-confirmed HIV, whether previously or newly diagnosed, and/or with syphilis infection completed a legal triage with staff lawyers during post-test counseling. During this process, their legal status in Colombia was reviewed and staff provided support for any necessary legal registration and care navigation. By completing this paperwork, Venezuelans with irregular stratus are provided a *salvoconducto,* which confers access to national health system while regularization is underway, thus providing sustained access to healthcare services. Except for three participants who decided to return to Venezuela, all participants with HIV were linked to care in Colombia.

Study activities were reviewed and approved by the Ethical Review Committee at the Universidad El Bosque in Bogotá, Colombia, and the Institutional Review Board at Johns Hopkins School of Public Health. The protocol was also reviewed in accordance with CDC human research protection procedures. Participants were provided with referrals as needed for HIV services, mental health, violence, health, and humanitarian services. To mitigate risks associated with the ongoing pandemic, study implementation followed approved biosecurity protocols and local COVID-19 policies.

Statistical analyses

Data management and statistical analyses were performed using Stata (StataCorp, version 17). Descriptive analyses were performed to estimate prevalence of key demographic and health characteristics of the population. Descriptive analyses included unweighted sample and RDS-weighted population-based estimates. The Supplemental Material (page 2) includes a description of RDS diagnostics and analyses.

Our primary analysis focused on estimation of laboratory-confirmed HIV prevalence among the population of Venezuelans residing in Colombia. For all demographic and HIV prevalence estimates, we calculated and report sample (unweighted) and population (weighted) estimates. Among participants living with HIV infection, we conducted descriptive analysis by estimating the proportion previously diagnosed, currently on ARV treatment, and virally suppressed to construct HIV care continuum estimates, following UNAIDS targets.[21] We report sample estimates (unweighted) for the HIV care continuum due to subgroup analysis and small numbers. Status of HIV diagnosis was defined as:

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diagnosed, based on self-report or HIV-1 RNA less than 1,000 copies/mL, or undiagnosed, as no self-reported diagnosis and supported by viral load (HIV-1 RNA>1,000 copies/mL). Viral suppression was defined as HIV-1 RNA<1,000 copies/mL and undetectable as RNA<50 copies/mL.[20]

We used multinomial logistic regression, a technique for a nominal categorical dependent variable, to identify variables associated with diagnosed and undiagnosed HIV infection compared to a base group of no HIV infection. We used this 3-category outcome, as opposed to a binary outcome of HIV infection or no infection, recognizing that diagnosis of HIV may change behaviors and can lead to misinterpretation of variables associated with infection in cross-sectional regression models. We present a multivariable logistic regression model in the Supplemental Material (Table 1).

We used multivariable penalized maximum likelihood logistic regression modeling with the Firth bias adjustment (*firthlogit* in Stata),[22] to identify factors associated with viral suppression. This regression technique reduces bias associated with small denominators that would otherwise be observed in logistic regression models.[22]

Variables were selected for inclusion in regression models based on conceptual relationship and significance at the bivariate level (p<0·10). Site and age were initially included in the multivariable model regardless of the p-value in the bivariate model but removed if they remained non-significant for model parsimony. Final multivariable models were determined by Hosmer-Lemeshow goodness-of-fit test and tests for collinearity, which was evaluated with variance inflation factor (VIF) tests. VIF scores for all variables in the final models were =<1.09. Missingness across study variables was minimal (<10%), thus no imputation methods were performed.

Role of the funding source:

The funders of the study provided limited technical support and had no role in study design, data collection, analysis, interpretation, or writing of the report.

Results

In total, 6,506 participants were recruited through RDS, 6,221 of whom were eligible and enrolled. Supplemental Figures 1–3 (pages 3–5) display the full RDS networks for both sites, as well as an example single RDS network that was responsible for 1,459 participants in Bogotá and Soacha. Table 1 displays characteristics of the study sample (unweighted) and population (RDS-weighted) estimates. Participants were relatively evenly distributed across study cities (sample proportions: 25·8% Bogotá, 24·1% Soacha, 27·6% Barranquilla, 22·5% Soledad), though less evenly distributed across gender (65·6% women and 33·9% men).

Overall, 29·3% had a regular migration status. Over half (51·5%) had arrived between 2018 and 2019 and 61·5% via informal border crossings. Forty percent (40·7%) of migrants and refugees traveled alone to Colombia with the remainder traveling with some combination of family, friends, or other group. Structural vulnerabilities included high unemployment

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(41.9%), low income (76.3% less than minimum wage), and low or very low food security (92.2%; Table 1).

Almost all were sexually active, with a median number of 1 sexual partner (IQR: 1–2) in the past 12 months. Over half reported a lifetime history of HIV testing and 48·2% did not know their sexual partner's HIV status. Awareness and use of antiretrovirals for HIV prevention were low with 17 and 14 participants reporting nPEP and PrEP use, respectively, while residing in Colombia. Key populations, including men who have sex with men (MSM), transgender people who have sex with men, people with lifetime engagement in transactional sex, and people with any lifetime injecting drug use, represented 6·8% of refugees and migrants overall.

Seventy-one participants were identified with laboratory-confirmed HIV. Population HIV prevalence was 0·9% (unweighted sample: 1·1%) overall and higher among men (1·6%) than women (0·6%), but with overlapping confidence intervals (Table 2). HIV prevalence was estimated at 6·4% among the combined group of key populations; however, almost all key population members with HIV were MSM, though several also reported other behaviors (e.g., injecting drug use and/or transactional sex) that also overlapped with other key population groups.

Figure 1 displays the HIV care continuum for participants living with HIV. The largest drop in the HIV care continuum was observed with diagnosis, wherein only 47·9% of the sample with HIV had been aware of their infection. Lack of awareness of one's status then impacted all subsequent stages of the continuum. Almost 80% of those ever diagnosed were on treatment and 92·6% of those on treatment were virally suppressed. However, this represented 35·2% of people living with HIV who were virally suppressed. Twenty-nine percent of participants living with HIV had an undetectable viral load.

Irregular migration status was more common among undiagnosed than diagnosed participants (Supplemental Material Table 1, page 6). Only 43% of participants with a previously undiagnosed HIV infection reported a lifetime HIV test. Ninety percent of those with a past diagnosis were diagnosed in Venezuela. Forty percent of those previously diagnosed still had detectable viral loads. Almost 20% of all participants with HIV had advanced HIV (CD4<200 cells/μL). 24% (17/71) had a syphilis co-infection.

Table 3 displays the results of the adjusted multinomial regression model to compare characteristics associated with diagnosed and undiagnosed HIV infection relative to a base group of no infection. Participants who resided in the Barranquilla and Soledad site, were a man, were transgender or non-binary identified, were a member of a key population, had laboratory-confirmed syphilis infection, or had a history of humanitarian service use were more likely to have a previously diagnosed HIV infection compared to their counterparts. Participants with an irregular migration status at the time of the study were less likely than participants with a regular migration status to have diagnosed HIV infection. Participants who were transgender or non-binary identified, were a member of a key population, or had laboratory-confirmed syphilis infection were more likely to have undiagnosed HIV infection. Men appeared to have a higher adjusted prevalence of undiagnosed infection

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compared to women, though this did not reach statistical significance based on an evaluation of the confidence interval and p-value. Similar patterns were observed in the multivariable model for HIV infection without differentiation by history of diagnosis (Supplemental Table 2, page 7). In that model, sexual exploitation was associated with a 3-fold increased odds of HIV infection (aOR: 3.0, 95CI: 1.2–7.5; p=0.016) and there was no evidence of association between migration status and HIV infection, which was omitted from the final model for model parsimony.

Among 26 participants who reported ever receiving ARV treatment, 35% (9/26) and 73% (19/26) had received ARVs in Venezuela and Colombia, respectively. Among 19 participants who received ARVs in Colombia, sources of ARVs included national insurance (68%; 13/19), humanitarian permits (26%; 5/19), community-based organizations (21%; 4/19), and/or other sources (37%; 7/19).

Table 4 displays correlates of viral suppression among participants living with HIV. In the adjusted model, having an irregular migration status compared to a regular status was associated with 70% reduced odds of viral suppression, while having a last HIV test or diagnosis in Colombia, compared to Venezuela, was associated with 90% reduced odds of viral suppression. Those never tested for HIV had 80% reduced odds of viral suppression, compared to those last tested in Venezuela.

Discussion

We estimated population HIV prevalence at 0·9% (95%CI:0·6–1·4) in our biobehavioral survey among more than 6,200 Venezuelan migrants and refugees residing in four Colombian cities. According to migration estimates, there were 2,477,588 Venezuelans living in Colombia as of September 2022.[6] If HIV prevalence is stable and estimates can be extrapolated to other areas,[6] there may be 22,298 (95%CI: 14,865–34,686) migrants and refugees living with HIV in Colombia and requiring access to treatment. Population HIV prevalence is higher than the 0·5% prevalence estimated among adults in Venezuela[10] and Colombia.[23] Consistent with other studies,[13] engagement across the HIV care continuum was low for Venezuelans living with HIV. This appeared to be driven by low HIV diagnosis (less than 50% of Venezuelans living with HIV), which ultimately impacted subsequent engagement in care and viral suppression (35% of Venezuelans living with HIV). However, viral suppression was 93% among people diagnosed and on treatment, close to UNAIDS 95% target.[21] By comparison, national estimates for Colombia suggest that 78% of people living with HIV are diagnosed, 74% are on treatment, and 66% are virally suppressed.[23] These findings highlight a need for improved access to HIV testing and care for Venezuelans in Colombia. Previous analyses have suggested that Venezuelan migrants and refugees living with HIV in Colombia do not represent a major economic burden to the healthcare system and that expenditures related to HIV treatment for Venezuelan PLHIV is lower than for Colombian people with the same condition.[24] Timely HIV treatment reduces the risk of severe complications and need for emergency services, as well as the risk of ongoing transmission. Therefore, providing access to HIV care to migrants and refugees is not only an ethical imperative, but also cost-effective and good for public health.[24]

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Correlates of diagnosed and undiagnosed infection display clear opportunities for enhanced access and other testing strategies. Our findings suggest potential benefits of several HIV testing strategies, including but not limited to: partner testing strategies, dual HIV/syphilis testing, supporting access to local key population programs for migrants and refugees who are members of key populations, and evaluating other novel strategies to encourage uptake of HIV testing. Completed trials evaluating strategies to improve uptake of HIV testing among migrants and refugees are largely limited to the United States and have shown mixed results.[25] Novel strategies such as self-testing, community-based, and peer-supported testing programs that are provided to all in Colombia, regardless of citizenship and migration status,[26] and may facilitate HIV diagnosis while mitigating stigma of any one subpopulation. HIV self-testing has been recently approved for use in Colombia,[20] and may be an acceptable way to increase uptake of testing for populations who may avoid facilities due to anticipated stigma. Because syphilis was more common among those with HIV, comprehensive services that provide STI and HIV testing may support early identification and treatment for both infections. The association between use of humanitarian services and diagnosed infection suggests that such services may play a direct or indirect role in supporting HIV diagnosis, and ultimately access to care. Ultimately, it is possible that improved access to insurance may increase uptake of HIV testing among migrants and refugees in Colombia.

Correlates of viral suppression demonstrate the confluence of humanitarian, legal, and HIV service needs among Venezuelan migrants and refugees. There was no difference in HIV prevalence by migration status, but Venezuelans with irregular migration status had a 70% lower odds of viral suppression compared to those with regular status. While causality is limited by the cross-sectional design of this study, this shows a clear relationship between the rights and benefits conferred by legal migration status and HIV outcomes. Put simply, without access to the national insurance schemes, access to HIV diagnostics and care is limited. Our data suggest that HIV status upon arrival in Colombia influences clinical outcomes. Individuals who reported their last HIV test was in Colombia had essentially the same odds of viral suppression as those with no lifetime HIV test (i.e., 80–90% lower odds) compared to those last tested in Venezuela. This suggests that individuals who were last tested (presumably diagnosed) in Venezuela are explicitly seeking HIV care; others are not accessing testing with sufficient frequency in Colombia for timely diagnosis or are not appropriately linked to HIV care. Thus, there is a need to support transnational continuity of care for migrants and refugees living with HIV at entry, while expanding access to testing services and facilitating linkages to treatment for those who acquire HIV in Colombia.

The Colombian government’s decision to provide a 10-year Temporary Protection Statute for Venezuelans (ETPV)[27] residing in Colombia is potentially the most significant structural intervention for this group and one that may aid in the realization of the right to health for migrants and refugees and potentially resolve observed gaps in HIV testing and care. The ETPV launched in 2021 and by December 2021, 1.6 million Venezuelans had pre-registered and 12,000 had completed all steps and received their Temporary Protection Permits.[28] Approximately 900,000 Venezuelans were expected to be enrolled in the national health insurance system by the end of 2022.[29] Regularization and access to health insurance for Venezuelan migrants and refugees is an important step for improving the HIV care

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continuum in this population. However, strengthened epidemiologic surveillance and health services will be needed for transiting and pendular migrants who will not be covered by these measures. Ongoing HIV research and surveillance is needed to assess whether potential benefits of ETPV are observed in the HIV care continuum or other barriers persist.

Our findings should be interpreted with an understanding of limitations. Women were more likely to participate in the study than men, which was anecdotally explained by the restriction of enrollment to one family member per household and gender norms associated with expectations of work and participation in health services (and, by extension, research). However, with a subsample of over 2,000 men there is sufficient power to estimate population prevalence for cisgender men and women. Though reflecting the expected population distribution, the sample of transgender and non-binary people was small, prohibiting population estimates for this group and leading to risk of sparse data bias. We note that 8.5% of the 47 transgender and non-binary participants were living with HIV. Considering these findings and intersectional vulnerabilities associated stigmatization of migration and gender identity,[30] transgender people are an important population for public health and humanitarian attention. There is risk of social desirability bias in survey responses, though the multi-modal approach and implementation by a trusted community-based organization, of which many of the staff were Venezuelan, likely mitigated such bias. As an observational, cross-sectional design, there is risk of reverse causality, incidence-prevalence bias, and unmeasured confounding. Finally, this study was powered to detect HIV prevalence; while analyses of the HIV care continuum provide important information, results should be interpreted with caution due to small numbers.

The study limitations are buffered by several strengths. Successful enrollment of a robust sample size of more than 6,200 migrants and refugees in four cities of Colombia within eight months was attributed to community trust in the organization implementing field research, legal support to ensure linkage to care, and the use of RDS-methodology that leverages social networks. The RDS weighting procedures allow for the approximation of population estimates, overcoming limitations associated with other nonprobability sampling approaches.[4] Age distribution and timing of arrival reported by study participants are consistent with those reported by migration agencies for Venezuelans living in Colombia and gender distributions of HIV infection align with those reported among diagnosed infections of Venezuelan migrants by government agencies, suggesting high internal validity.[16,31] Given migration of Venezuelans to multiple countries in Latin America the study findings may have generalizability to other areas in the region.[32] Intense global migration and displacement trends suggest that study methods could be adapted for other health surveillance for migrants and refugees globally.

Conclusion

The HIV prevalence estimates reported here for Venezuelan migrants and refugees are close to those long defined by UNAIDS and WHO as a generalized epidemic.[33] Behavioral risks for HIV were generally low and similar to those reported in the 2015 Colombian national health survey,[34] but history of HIV testing, awareness of partner's HIV status, and access to HIV services were also low. These highlight the importance of improving access to

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and uptake of HIV prevention and diagnostics among Venezuelan migrants and refugees in Colombia. It also supports prior guidance that services for migrants and refugees be incorporated through programs for the host population.[26] Because HIV prevalence was highest among key populations, particularly MSM, programs serving key populations should continue to be supported or enhanced to ensure access by these groups regardless of nationality or migration status. Legal aid and novel strategies coordinated across health and humanitarian sectors to increase access and uptake of HIV testing are critical to early HIV detection and improved clinical outcomes, as well as facilitating linkage to prevention programs. Observed disparities in clinical outcomes by migration status that may be addressed by the new 10-year Temporary Protection Statute underscores the importance of ongoing evaluation of migration policy and public health responses to HIV amongst migrants, refugees, and host communities in Colombia over the next several years; such findings are relevant locally, as well as to other settings where migrants and refugees are dispersed within host communities and settings with south-south migration trends.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements:

This work was supported by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the Centers for Disease Control and Prevention (CDC) under the terms of Cooperative Agreement number NU2GGH002000–03-01. The contents of this manuscript are solely the responsibility of the authors and do not necessarily represent the official views of PEPFAR, the CDC, or the Department of Health and Human Services. This research has been facilitated by the infrastructure and resources provided by the Johns Hopkins University Center for AIDS Research, an NIH funded program (1P30AI094189), which is supported by the following NIH Co-Funding and Participating Institutes and Centers: NIAID, NCI, NICHD, NHLBI, NIDA, NIA, NIGMS, NIDDK, NIMHD. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Gratitude is extended to the thousands of Venezuelan migrants and refugees who participated in this study. This report would not have been possible without their participation and shared experiences. The study was implemented by a dedicated and compassionate team led by Red Somos including: Cindy Quijano, Alejandra Vela, Yessenia Moreno, Francisco Rigual, Marlon Stwar Sierra, Luis Pérez, Edwin Ferney Ramos, Edenys Rangel, Karen Marivi Vera, Valentina Calderón Giraldo, Daniel Felipe Durán Mongua, Stefanie Perdomo Martín, Paula Rincón Giraldo, Heriberto Mejía, Luder Fuentes, Jesús Javier Sandoval, Indira Fuentes, Leives Jiménez, Esther María Beltrán, Rocío Pérez, Mayra de la Cruz, Byron Gutiérrez, Oladys Bolaño, Xiomara Barrios, José Amaris Povea, Nayrimi Andreina Valbuena Castillo, Rowel Vera, José Gregorio Nieves, Hendriel Briceño, Omany Fereira, and Jesús Adelvi Rojas. We acknowledge with gratitude the support of colleagues at the US Centers for Disease Control and Prevention, Dante Bugli, Eva Leidman, Kevin Clarke, Sagarika Das, Abu Abdul-Quader; Johns Hopkins University, James Case, Kristin Bevilacqua, Sarah Arciniegas, and Wilson Gomez; and the United Nations High Commissioner for Refugees in Colombia, Federico Duarte and Saskia Loochkartt.

Data Sharing:

De-identified individual data and data dictionary will be made available upon reasonable request after approval of a proposal and signing of a data use agreement. Requests for data sharing can be sent to Dr. Andrea Wirtz (awirtz1@jhu.edu) and will be reviewed by study team members from the collaborating organizations, Johns Hopkins University, Red Somos, and the Ministry of Health and Social Protection.

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References:

1. International Organization for Migration. World Migration Report 2020. Geneva, 2020. https://publications.iom.int/books/world-migration-report-2020.
2. Saleh M, Farah Z, Howard N. Infectious disease surveillance for refugees at borders and in destination countries: a scoping review. BMC Public Health 2022; 22(1): 227. [PubMed: 35114956]
3. UNHCR. Urban refugee health. 2009. https://www.unhcr.org/en-us/protection/hcdialogue%20/4b1397139/urban-refugee-health.html?query=urban%20refugee.
4. Santoso D, Asfia S, Mello MB, et al. HIV prevalence ratio of international migrants compared to their native-born counterparts: A systematic review and meta-analysis. EClinicalMedicine 2022; 53: 101661. [PubMed: 36147629]
5. UN Population Division. World Population Prospects: 2022. Geneva, 2022. https://data.worldbank.org/indicator/SP.POP.TOTL?locations=CO-VE.
6. R4V. Refugees and Migrants from Venezuela. 05 Sept 2022 2022. https://www.r4v.info/en/refugeeandmigrants (accessed Oct 2022.
7. Page KR, Doocy S, Reyna Ganteaume F, Castro JS, Spiegel P, Beyrer C. Venezuela's public health crisis: a regional emergency. The Lancet 2019; 393(10177): 1254–60.
8. Pan American Health Organization. Proposal for Increasing Health Care Coverage for Venezuelan Refugees and Migrants Living with HIV: Update in response to the COVID-19 pandemic. Washington DC,: PAHO, UNAIDS, 2021.
9. Restuccia D, Carrión-Nessi FS, Omaña-Ávila ÓD, et al. Prevalence of undiagnosed HIV in Venezuelan patients with suspected COVID-19 during the first wave: A complex syndemic. Travel Medicine and Infectious Disease 2021; 44: 102207. [PubMed: 34785375]
10. UNAIDS. Country Factsheet: Venezuela 2021. Geneva, 2021. https://www.unaids.org/en/regionscountries/countries/venezuela.
11. United Nations. International Covenant on Economic, Social, and Cultural Rights. Geneva; 1967.
12. HIV Policy Lab. Migrants access to healthcare. 2021. https://www.hivpolicylab.org/policy/CT7 (accessed Dec 2022).
13. Antiretroviral Therapy Cohort C, Shepherd BE, Jenkins CA, et al. Higher rates of AIDS during the first year of antiretroviral therapy among migrants: the importance of tuberculosis. AIDS 2013; 27(8): 1321–9. [PubMed: 23925379]
14. Angeleri S. Access to health care for Venezuelan irregular migrants in Colombia: between constitutional adjudication and human rights law. The International Journal of Human Rights 2021: 1–27.
15. Fernández-Nino JA, Bojorquez-Chapela I. Migration of Venezuelans to Colombia. The Lancet 2018; 392(10152): 1013–4.
16. Ministerio de Relaciones Exteriores. Distribución de Venezolanos en Colombia. 03 Marzo 2021. https://www.migracioncolombia.gov.co/infografias/distribucion-de-venezolanos-en-colombia-corte-31-de-enero-de-2021.
17. Reuters. U.S. to Pay for Thousands of Doses of HIV Drugs for Venezuelan Migrants. 28 Aug 2019 2019. https://www.reuters.com/article/us-colombia-usa-health/u-s-to-pay-for-thousands-of-doses-of-hiv-drugs-for-venezuelan-migrants-idUSKCN1VI2LQ.
18. Stevenson M, Guillén JR, Bevilacqua K, et al. Qualitative assessment of the impacts of the COVID-19 pandemic on migration, access to healthcare, and social wellbeing among Venezuelan migrants and refugees in Colombia. Journal of Migration and Health 2023; (In Press).
19. Wirtz AL, Page KR, Stevenson M, et al. HIV Surveillance and Research for Migrant Populations: Protocol Integrating Respondent-Driven Sampling, Case Finding, and Medicolegal Services for Venezuelans Living in Colombia. JMIR Res Protoc 2022; 11(3): e36026. [PubMed: 35258458]
20. Ministerio de Salud y Protección Social, Empresa Nacional Promotora del Desarrollo Territorial, Instituto de Evaluación de Tecnologías en Salud. Guía de práctica clínica basada en la evidencia científica para la atención de la infección por VIH / Sida en personas adultas, gestantes y adolescentes. Versión para Profesionales de la salud. 2021. https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/PP/ET/gpc-vih-adultos-version-profesionales-salud.pdf.

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21. UNAIDS. Understanding Fast-Track: Accelerating Action to End the AIDS Epidemic by 2030. Geneva, June 2015. https://www.unaids.org/sites/default/files/media_asset/201506_JC2743_Understanding_FastTrack_en.pdf (accessed JC 2743.
22. Discacciati A, Orsini N, Greenland S. Approximate Bayesian Logistic Regression via Penalized Likelihood by Data Augmentation. The Stata Journal 2015; 15(3): 712–36.
23. UNAIDS. Country Factsheet Colombia. 2021. https://www.unaids.org/en/regionscountries/countries/colombia.
24. Castillo Cañón JC, Bojorquez Chapela I, Fernández Niño J, Valbuena Garcia AM, Acuña Merchan L. Healthcare-related expenditures among immigrants and non-immigrants living with HIV in colombia. Health Soc Care Community 2021; 29(6): 1887–95. [PubMed: 33539654]
25. Nkulu-Kalengayi FK, Jonzon R, Deogan C, Hurtig A-K. Evidence and gaps in the literature on HIV/STI prevention interventions targeting migrants in receiving countries: a scoping review. Global Health Action 2021; 14(1): 1962039. [PubMed: 34404337]
26. UNAIDS. Policy Brief : HIV and Refugees. 2007. https://www.unaids.org/en/resources/documents/2007/20070215_jc1300-policybrief-refugees_en.pdf.
27. R4V. Support Plan 2021, Colombia - GIFMM Support Plan for the Implementation of the Temporary Protection Status for Venezuelans. June 2021. https://reliefweb.int/report/colombia/support-plan-2021-colombia-gifmm-support-plan-implementation-temporary-protection.
28. United Nations High Commissioner for Refugees. Temporary Protection Status in Colombia (November 2021). 3 Dec 2021. https://reliefweb.int/report/colombia/temporary-protection-status-colombia-november-2021-0 (accessed 01 May 2022).
29. 740.000 migrantes venezolanos están afiliados a seguridad social y la meta es llegar a 900.000 en Colombia. 17 Jun 2022 2022. https://www.infobae.com/america/colombia/2022/06/17/740000-migrantes-estan-afiliados-a-seguridad-social-y-la-meta-es-llegar-a-900000/.
30. Boccardi A Acción por la vida y derechos de las mujeres: Es urgente hacer frente a las mafias de proxenetismo y, a la par, frenar la hostilización y criminalización. 18 Feb 2023 2023. http://www.elperuano.pe/noticia/204864-accion-por-la-vida-y-derechos-de-las-mujeres.
31. Ministerio de Salud y Protección Social. Situación de salud: Enfermedades infecciosas y parasitarias. 2020. https://www.sispro.gov.co/observatorios/onmigracionysalud/indicadores/Paginas/Situacion-de-salud.aspx (accessed 01 May 2022.
32. Crabtree-Ramírez B, Belaunzarán-Zamudio PF, Cortes CP, et al. The HIV epidemic in Latin America: a time to reflect on the history of success and the challenges ahead. Journal of the International AIDS Society 2020; 23(3): e25468. [PubMed: 32115884]
33. Brown T, Peerapatanapokin W. Evolving HIV epidemics: the urgent need to refocus on populations with risk. Current Opinion in HIV and AIDS 2019; 14(5): 337–53. [PubMed: 31368909]
34. Ministerio de Salud y Protección Social, Profamilia. Encuesta Nacional de Demografía y Salud 2015. Jan 2017. https://dhsprogram.com/publications/publication-FR334-DHS-Final-Reports.cfm.

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Research in Context:

Evidence before this study:

In 2021, the Venezuelan crisis represented the largest external human displacement experienced in the region and second largest external human displacement event globally. We searched PubMed and Google Scholar to find systematic reviews, reports, and individual publications describing HIV prevalence among migrants and refugees in the peer-reviewed literature, particularly focusing on migrants and refugees from Venezuela and/or residing in the Americas. The search used combinations of text and MeSH terms for migrants, refugees, and HIV infection in English and Spanish languages ((migrant* OR refugee* or refugiado* or inmigrante*) AND (HIV) published between January 1, 2013 to September 1, 2023.

- Several systematic reviews have been published to describe HIV prevalence, behavioral risks, and access to HIV prevention and care services among migrants and refugees (Schousboe and Wejse; Wein and Kashuba; Mishra and Spiegel; and Santoso and colleagues). These reviews demonstrated that research has been largely limited to those residing in the global north and high-income countries and to study designs that frequently employed convenience sampling approaches.
- The Colombian Ministry of Health and Social Protection reports the number of diagnosed HIV infections among refugees and migrants along with age, gender, and geographic distribution of cases. In 2020, 1,514 new cases of HIV infection were reported among Venezuelans in Colombia. Distribution of cases by migration status and engagement in HIV care are not reported.
- Discussion of HIV infection and related access to services among Venezuelan migrants and refugees were predominantly available in the form of commentaries, qualitative research, and analyses of data collected through HIV service delivery. Reports from Perú and Colombia discuss the potential impacts of large-scale migration on the local HIV and infectious disease epidemiology and programming; however, a more recent report indicated there has been no impact on the HIV epidemiology among Colombian residents that is associated with migration. No population-based estimates of HIV prevalence have been published for Venezuelan migrants or refugees.

Added value of this study:

To our knowledge, this study among 6,221 recently arrived Venezuelan migrants and refugees in Colombia is the first study to evaluate population HIV prevalence among Venezuelan migrants and refugees, which is critical to informing local programs and HIV treatment distribution. Our in-depth analysis of correlates of HIV diagnosis and HIV viral suppression provides information about modifiable targets for individual, interpersonal, and structural-level interventions to improve HIV testing, prevention, and care. The link between legal migration status and HIV viral suppression underscores the need for legal support for migrants and refugees to obtain legal residency permits and health

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insurance to promote sustained access to HIV services. Methods, collaborative models, and approaches (e.g., legal support for sustained access to care) used in this study can be adapted and replicated for use in other countries hosting migrants and refugees.

Implications of all available evidence:

Ongoing HIV research and surveillance among migrants and refugees, as well as the host populations, are critical to evidence-based policy and programmatic decisions. Expansion of existing programs to include migrants and refugees in services provided to host communities is important to mitigating anti-migrant/refugee stigma. Because access to HIV care (and other healthcare) is limited by legal migration status in many settings, policy-level interventions may have significant impacts on gaps in the HIV care continuum observed among migrants and refugees.

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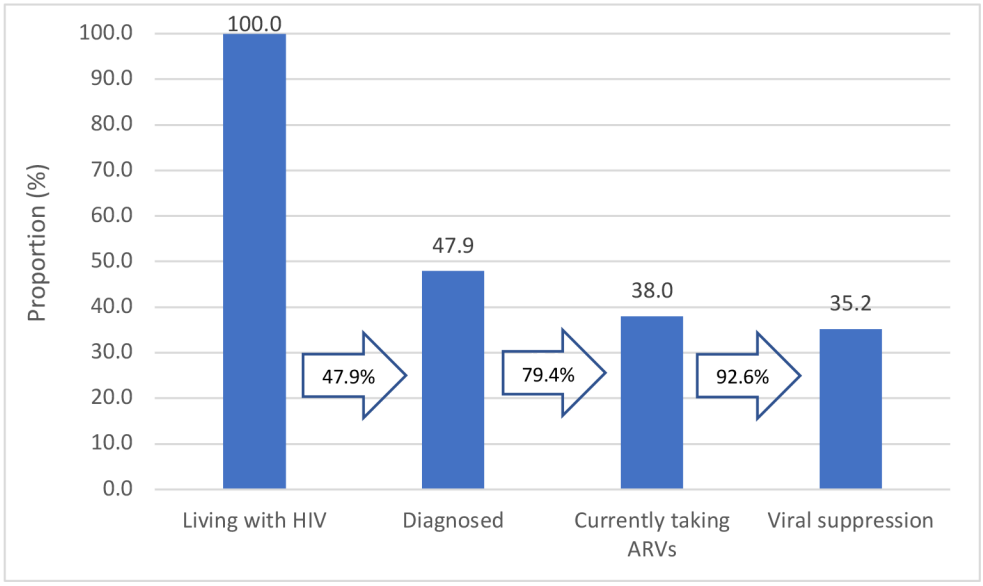

Figure 1.

HIV care continuum among participants with laboratory-confirmed HIV infection (n=71)

Note: Estimates are unweighted due to the number of PLHIV.

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Table 1.

Characteristics of Venezuelan migrants and refugees in an RDS sample from Bogota, Soacha, Barranquilla, and Soledad enrolled between July 30, 2021 through February 5, 2022 (N=6,221)

	Sample proportion		Population estimate	
	n	%		
Mean age in years (Std. Dev)	34.5	(11.3)		
Gender (n=6217)				
Man	2124	34.2	33.9	(31.8–36.0)
Woman	4046	65.1	65.6	(63.5–67.7)
Transgender or Nonbinary	47	0.8	--	--
Education (n=6218)				
No formal education	127	2.0	2.3	(1.7–3.1)
Primary	1256	20.2	19.7	(18.8–21.5)
Secondary	3429	55.1	54.3	(52.0–56.5)
Higher	1352	21.7	22.3	(20.5–24.2)
Other	54	0.9	1.4	(0.9–2.2)
High literacy (n=6114; ref: low)	5005	81.9	84.0	(82.3–85.6)
Employment (n=6219)				
Formal full-time	465	7.5	8.8	(7.6–10.3)
Formal part-time	284	4.6	4.9	(4.1–5.9)
Informal/under the table	3028	48.7	41.2	(39.0–43.4)
Full-time student	28	0.5	0.5	(0.3–1.0)
Retired	35	0.6	0.7	(0.4–1.1)
Unemployed	2283	36.7	41.9	(39.7–44.2)
Other	96	1.5	2.0	(1.4–2.9)
Income				
Less than minimum wage (908,526 pesos)	4905	78.9	76.3	(74.3–78.1)
Minimum wage (908,526 pesos)	988	15.9	18.2	(16.5–20.1)
Between 908,526 – 1,817,052 pesos	288	4.6	4.7	(3.8–5.8)
More than 1,817,052 pesos	39	0.6	0.8	(0.5–1.3)

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	Sample proportion		Population estimate	
	n	%		
Relationship status				
Never married	2287	36.8	42.2	(40.0–44.5)
Married or cohabitating	2991	48.1	44.5	(42.3–46.7)
Divorced or separated	812	13.1	11.2	(10.0–12.6)
Widowed	130	2.1	2.0	(1.5–2.6)
Food security (USDA measure; past 12mo)				
Secure	414	6.7	7.9	(6.7–9.2)
Low food security	1407	22.6	26.5	(24.5–28.5)
Very low food security	4400	70.7	65.7	(63.5–67.8)
Migration status at time of participation				
Regular	1779	28.6	29.3	(27.3–31.4)
Irregular	4442	71.4	70.7	(68.6–72.7)
Ever sexually active (ref: no)	6028	96.9	96.3	(95.2–97.1)
Condom use at last sex (ref: no; n=6028, regardless of partner gender, does not include sex work)	1727	28.6	31.2	(29.1–33.3)
Man who has sex with men (among men n=2124; ref: no)	207	9.8	12.0	(9.6–15.0)
Ever paid for sex (ref: no)	82	1.3	1.2	(0.8–1.8)
Lifetime transactional sex (ref: no; n=6219)	106	1.7	1.5	(1.1–2.2)
Lifetime injecting drug use (ref: no)	130	2.1	1.9	(1.4–2.5)
Key population (ref: no)	407	6.5	6.8	(5.7–8.0)
Partner's HIV status (n=6028)				
HIV-negative	2878	47.7	50.7	(48.5–53.0)
HIV-positive	54	0.9	1.1	(0.7–1.8)
Unknown	3096	51.4	48.2	(45.9–50.5)
Ever diagnosed with STI (ref: no history; n=6171)	191	3.1	3.2	(2.4–4.3)
Ever treated for an STI in Venezuela or Colombia (among those diagnosed; ref: not treated)	134	77.5	81.3	(68.1–89.8)
Laboratory confirmed syphilis infection	324	5.2	5.0	(4.1–6.0)

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	Sample proportion		Population estimate	
	n	%		
Lifetime HIV test (n=6219)				
No	2924	47.0	46.5	(44.3–48.8)
Yes	3256	52.4	52.8	(50.6–55.1)
Don’t know	39	0.6	0.6	(0.4–1.0)

Notes: n: denominator within variable due to missingness or skip patterns; N: total study population; 95%CI: 95% Confidence Interval; Food security was measured using the USDA six-item food security measure and classified according to scoring guidelines; Key population defined as individuals who identify within at least one of the following groups: transgender or nonbinary gender, men who have sex with men, report lifetime transactional sex, and/or report lifetime injecting drug use.

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Table 2

Population HIV prevalence estimates among Venezuelan migrants and refugees overall and within subgroups in four cities of Colombia (N=6,221)

	Sample	proportion	Population estimate	
	n	%	%	95%CI:
HIV prevalence overall	71	1.1	0.9	(0.6–1.4)
Site				
Bogotá & Soacha (n=3,102)	28	0.9	0.8	(0.4–1.5)
Barranquilla & Soledad (n=3,118)	43	1.4	1.2	(0.7–2.0)
Age				
18 to 30 (n=2,470)	29	1.2	0.8	(0.5–1.4)
30 to 39 (n=1,978)	26	1.3	1.1	(0.6–2.2)
40 to 49 (n=1,024)	9	0.9	0.4	(0.2–0.9)
50+ (n=748)	7	0.9	1.5	(0.3–6.6)
Gender				
Man (n=2,123)	41	1.9	1.6	(0.9–2.6)
Woman (n=4,046)	26	0.6	0.6	(0.2–1.2)
Transgender/Nonbinary (n=47)	4	8.5	--	--
Migration status				
Regular (n=1,779)	26	1.5	1.4	(0.8–2.5)
Irregular (n=4,442)	45	1.0	0.7	(0.4–1.4)
Syphilis infection (n=324)	17	5.3	7.0	(2.6–3.4)
Key population (n=407)	27	6.7	6.4	(3.5–11.5)
Men who have sex with men (n=207)	23	11.1	9.5	(4.9–17.7)
Ever paid for sex (n=82)	3	3.7	2.2	(0.6–7.7)
Lifetime transactional sex (n=106)	7	6.6	3.2	(1.3–7.4)
Lifetime injecting drug use (n=130)	3	2.3	0.8	(0.2–2.7)

Notes: n: denominator for subgroup; N: total study population; 95%CI: 95% Confidence Interval; Ref: reference group not displayed; Population estimates were not calculated for transgender participants due to the small sample size; Key population was defined as individuals who identify within at least one of the following groups: transgender or nonbinary gender people, men who have sex with men, individuals who report lifetime transactional sex, and/or report lifetime injecting drug use.

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Table 3:

Adjusted multinomial regression model of variables associated with diagnosed and undiagnosed infection compared to no HIV infection among Venezuelan migrants and refugees in Colombia (n=6,019)

	Diagnosed HIV infection			Undiagnosed HIV infection		
	PrR	**95%CI**	***p-value***	**PrR**	**95%CI**	***p-value***
Barranquilla or Soledad site (ref: Bogotá or Soacha)	3.3	(1.5–7.1)	*0.0022*	1.4	(0.7–2.7)	*0.3152*
Gender (ref: woman)						
Man	2.6	(1.1–5.9)	*0.025*	1.9	(0.9–4.0)	*0.0723*
Transgender or non-binary	7.5	(1.4–40.4)	*0.0184*	5.4	(1.1–27.2)	*0.0428*
Member of a key population (ref: no)	8.2	(3.7–18.2)	*p<0.0001*	4.0	(1.8–8.9)	*0.0007*
Laboratory confirmed syphilis infection (ref: non-reactive)	3.5	(1.5–8.2)	*0.004*	3.6	(1.6–8.4)	*0.0023*
Irregular migration status (ref: Regular status)	0.5	(0.2–0.9)	*0.0304*	1.3	(0.6–2.8)	*0.5295*
Used humanitarian services in Colombia (ref: no)	4.1	(2.0–8.3)	*0.0001*	0.8	(0.3–2.0)	*0.6043*

Notes: Multinomial regression allows for more than two categories of the dependent or outcome variable; base category is no HIV infection; PrR: adjusted prevalence ratio; Key population defined as individuals who identify as men who have sex with men, transgender people who have sex with men, people who report lifetime transactional sex, or people who report lifetime injecting drug use. Age, year of migration, any violence victimization in Colombia, symptoms of hazardous alcohol use, and psychologic distress were not associated with diagnosed or undiagnosed HIV infection in bivariate or multivariable models.

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Table 4.

Factors associated with viral suppression among Venezuelans migrants and refugees living with HIV in Colombia (n=70)

	OR	95%CI	*p-value*	aOR	95%CI	*p-value*
Irregular migration status (Ref: Regular)	0.2	(0.1–0.6)	*0.0037*	0.3	(0.1–0.9)	*0.0263*
Member of key population (Ref: no)	3.0	(1.1–7.9)	*0.0297*			
Country of last HIV tests (Ref: Venezuela)						
Colombia	0.2	(0.0–0.7)	*0.015*	0.1	(0.0–0.5)	*0.0077*
Never tested	0.2	(0.1–0.5)	*0.0026*	0.2	(0.1–0.8)	*0.0176*
Used humanitarian services (Ref: No use)	2.7	(0.9–7.6)	*0.0632*			

Note: Viral suppression is defined as <1000 copies/ml; OR: odds ratio; aOR: adjusted odds ratio calculated via a penalized multivariable logistic regression model; final models are fit based on goodness of fit statistics and tested for collinearity; Reporting membership in a key population and use of humanitarian services in Colombia were associated with viral suppression at the bivariate level but were not associated in the multivariable model. Gender, time since migration, site, age, education, literacy, income, food security, and BMI were not associated with viral suppression in bivariate or multivariable models. Sensitivity analysis using undetectable viral load as the outcome found no meaningful difference in identified correlates (results not displayed). 71 participants were living with HIV but one participant who had been previously diagnosed declined viral load testing, thus restricting this analytic sample to 70.