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Non-linkage to care and non-viral suppression among Hispanic/Latino persons by birthplace and social vulnerability—United States, 2021

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Abstract

Background. Assessing individual- and community-level factors may help to explain differences among Hispanic/Latino adults with diagnosed HIV not linked to care and without viral suppression in the United States.

Methods. We analyzed CDC's National HIV Surveillance System data among Hispanic/Latino persons aged ≥ 18 years with HIV diagnosed during 2021 in 47 states and the District of Columbia and linked cases via census tracts to the CDC/ATSDR's Social Vulnerability Index (SVI). Adjusted prevalence ratios and 95% confidence intervals for non-linkage to care and non-viral suppression were estimated using Poisson regression model.

Results. Among 5,056 Hispanic/Latino adults with HIV diagnosed in 2021, 51.5% were born in the United States, 17.3% in Mexico, 9.2% in Central America, 11.1% in South America, 1.8% in Puerto Rico, 6.8% in Cuba, and 2.4% in the Caribbean. Compared with U.S.-born Hispanic/Latino adults, those born in Mexico and South America had a lower prevalence of non-linkage to care. Hispanic/Latino adults born in Mexico, South America, and the Caribbean (excluding Puerto Rico and Cuba) had a lower prevalence of non-viral suppression, compared with those born in the United States. No significant differences were observed among SVI quartiles for either care outcome.

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Disclaimer

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of CDC.

Competing interests:

The authors declare no competing interests.

Ethics approval:

Per federal guidelines, the National HIV Surveillance System (NHSS) is determined a public health activity and not human subject research; therefore, our study did not require institutional review board review or approval.

Conclusion. This study aimed to challenge the narrow perspective on HIV care outcomes by examining the impact of birthplace and social vulnerability among Hispanic/Latino adults. To increase HIV care and prevention among Hispanic/Latino persons, research must evaluate health disparities within the group, and efforts are needed to better understand and tailor interventions within the diverse Hispanic/Latino population.

Keywords

HIV; Hispanic/Latino; social vulnerability; birthplace; linkage to care; viral suppression

Introduction

Hispanic/Latino persons are disproportionately affected by HIV in the United States. Although accounting for only 19% of the U.S. population in 2021 [1], infections among this ethnic group accounted for 29% (9,300 of 32,100) of estimated new HIV infections [2]. About 15 of every 100 Hispanic/Latino persons living with HIV infection were unaware of their infection in 2021[2]. Of those who received a diagnosis during 2021, 84.5% of Hispanic/Latino persons were linked to HIV medical care within 1 month of diagnosis and 73.2% had viral suppression within 6 months, making Hispanic/Latino persons the second highest racial/ethnic group for linkage to care and viral suppression within 6 months, despite disparities in diagnoses and lower levels of knowledge of HIV status [3]. Yet, observations for receipt of any HIV medical care and viral suppression at the most recent viral load test during 2021 among all persons living with diagnosed HIV show that Hispanic/Latino persons are among the lowest percentages, compared to other racial/ethnic groups [3]. Improving all indicators of HIV care outcomes among the Hispanic/Latino population is necessary to lessen disparities and achieve the National HIV/AIDS Strategy (NHAS) goals [4].

Health disparities among racial/ethnic groups in the United States, including Hispanic/Latino persons, result from a culmination of systemic, social, economic, and environmental disadvantages, such as poverty, poor housing conditions, and lack of quality health care [5–6]. Social vulnerability is a term that refers to the external stressors that affect a community's resilience and may lead to negative health effects [7]. Due to social and economic segregation, Hispanic/Latino persons and some other traditionally marginalized groups tend to live in socially vulnerable census tracts [7]. Studies have found that those in more socially vulnerable areas have negative health outcomes across an assortment of conditions [8–13]. A study by the Centers for Disease Control and Prevention (CDC) also noted that a disproportionate number of Hispanic/Latino adults lived in the most socially vulnerable tracts at the time of HIV diagnosis, 51.5% compared to 24.4% for their White counterparts [14].

In addition to the impact that community-level factors have on health outcomes among Hispanic/Latino persons, this group also experiences unique individual-level factors. Approximately one-third (32%) of Hispanic/Latino persons residing in the United States were born outside of the country [15]. Nativity and birthplace represent just two social determinants of health for which Hispanic/Latino persons face distinct differences within

the ethnic group. For HIV, CDC reports that mode of HIV transmission varies by birthplace among Hispanic/Latino persons [16]. For example, Hispanic/Latino males with diagnosed HIV infection who were born in Puerto Rico and the Caribbean have less infection attributed to male-to-male sexual contact (77.7% and 72.9%, respectively) and more infection attributed to heterosexual contact (14.5% and 21.7%), compared to other birthplaces including the United States (85.4% and 5.5%, respectively) [16]. Differences in HIV care outcomes by transmission category have been reported, both overall and among Hispanic/Latino persons [3] and may be attributed to different sociostructural factors depending on the population (e.g., stigma, criminalization, access to low barrier services, comorbidities) [3,17]; it is not known how birthplace may contribute, but cultural differences may impact HIV knowledge, healthcare seeking behaviors, and perceived stigma and vary by transmission category [18]. Additionally, differences by birthplace have been noted for other care outcome measures: increased odds of short HIV-to-AIDS intervals among Mexico- or Central America-born versus U.S.-born Hispanic/Latino persons, increased risk of opportunistic infections among U.S.-born versus Central America-born Hispanic/Latino females, lower survival for those with Stage 3 (AIDS) classifications among Puerto Rico-born versus U.S.- or South America-born Hispanic/Latino persons, and differences in HIV-related mortality (inconsistent results by birthplace across studies) [19].

As health equity takes on a central role in HIV prevention and treatment, it is crucial to recognize the diversity within the Hispanic/Latino population in the United States and avoid analyzing data for them as a homogenous ethnic group [20–22]. In research of HIV and other diseases, disaggregation by demographic characteristics such as nativity and birthplace has revealed health disparities within the Hispanic/Latino ethnicity [19,23–26]. The importance of disaggregation is emphasized by the continually evolving demographics of Hispanic/Latino persons in the United States. Greater proportions are U.S.-born compared to immigrants; populations with origins in South America, Central America, and the Caribbean are faster growing than populations of Mexican origin; and rates of U.S. citizenship, college attendance, and English-language proficiency continue to increase [15]. With these demographic shifts come shifts in the challenges to equitable health outcomes for this group.

Few studies have determined the effects of social vulnerability or birthplace on HIV care outcomes among Hispanic/Latino persons [19,23–24,27–28]. This study is one of the first to analyze national, census tract-level HIV data by birthplace and social vulnerability to evaluate linkage to care and viral suppression (core indicators of the Ending the HIV Epidemic in the U.S. [EHE] initiative [3]). Comparing characteristics of Hispanic/Latino persons with diagnosed HIV by birthplace can inform the different challenges subgroups face within this ethnic population. This paper will assess prevalence ratios of non-linkage to care and non-viral suppression by individual- and community-level characteristics, which will quantify barriers to HIV care services and identify additional opportunities for focused HIV prevention and control efforts.

Methods

Data were obtained from CDC's National HIV Surveillance System (NHSS) and the CDC/Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI).

NHSS

Data for Hispanic/Latino adults aged ≥ 18 years with HIV diagnosed during 2021 and reported to CDC through December 2022 were obtained from CDC's NHSS. Forty-seven (47) states and the District of Columbia had complete reporting of CD4+ T-lymphocyte count (cells/ μ L) or percentage (CD4) and viral load (VL) test results to CDC as of December 2022. Data for states and associated jurisdictions that do not have laws requiring reporting of all CD4 and viral load tests or that had incomplete reporting of laboratory data to CDC were not included in the analysis. Areas without laws: Idaho. Areas with incomplete reporting: New Jersey, Pennsylvania (excluding Philadelphia), and Puerto Rico. Non-linkage to HIV medical care was defined as no documentation of ≥ 1 CD4 or VL tests within 1 month of HIV diagnosis. Non-viral suppression was defined as no VL test result of < 200 copies within 6 months of HIV diagnosis. Transmission category data have been statistically adjusted to account for persons with missing data on risk factors [29]. HIV surveillance data were geocoded to the U.S. census tract level based on a person's residential address at the time of diagnosis and then linked at the census tract level to SVI indicators.

Variables

SVI data at the census tract level were obtained from the 2020 CDC/ATSDR SVI, which is used to identify the most vulnerable communities (i.e., those with the greatest needs), before, during, and following public health emergencies [30]. Sixteen population-based measures were used to generate overall SVI scores which ranged from 0 to 1. Overall, SVI scores were presented as percentile rankings by census tract, and higher scores represented greater vulnerability. Each census tract was ranked on 16 social factors and grouped into four domains: (1) socioeconomic status, which was based on proportions of persons below poverty, unemployment, housing cost burden, lack of high school diploma, and lack of health insurance; (2) household characteristics, which was based on age (pediatric (≤ 17 years) and elderly (≥ 65 years) populations), civilians aged ≥ 5 years with a disability, single parent households, and English language proficiency; (3) racial and ethnic minority status (i.e., do not identify as only non-Hispanic/Latino White race); and (4) housing type and transportation, which was based on proportions of persons in multi-unit structures, mobile homes, crowding, no household vehicle access, and institutionalized group quarters. SVI scores were classified into quartiles per their distribution among all U.S. census tracts.

Census tract-level NHSS data from the 47 states and the District of Columbia for Hispanic/Latino adults with HIV diagnosed during 2021 were linked with SVI data. Data were analyzed by the following mutually exclusive places of birth, based on the U.S. Census Bureau designations: United States (50 states and the District of Columbia), Mexico, Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), South America (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay,

Peru, Suriname, Uruguay, and Venezuela), Puerto Rico, Cuba, and other Caribbean areas (hereafter *Caribbean*; includes Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Cayman Islands, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Montserrat, Saint Barthelemy, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands, Virgin Islands [British], and Virgin Islands [U.S.]). Note that while persons born in U.S. territories (e.g., Puerto Rico and U.S. Virgin Islands) are considered citizens of the United States, we have categorized them separately due to the political, social, economic, and cultural differences between their birthplace and the United States that impact health. Data were assessed by age groups (18–24, 25–34, 35–44, 45–54, ≥ 55 years); sex assigned at birth and transmission categories (male-to-male sexual contact [MMSC], IDU, male-to-male sexual contact *and* injection drug use [MMSC/IDU], heterosexual contact [i.e., with a person known to have, or with a risk factor for, HIV infection], other [i.e., including hemophilia, blood transfusion, perinatal exposure, and risk factor not reported or not identified]); region of residence (the four U.S. Census regions: Northeast [Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont], Midwest [Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin], South [Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia], and West [Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming]); population area of residence (metropolitan statistical areas [MSA; pop. $\geq 500,000$], metropolitan areas [pop. 50,000–499,999], nonmetropolitan areas [pop. $< 50,000$]); and SVI quartiles for census tracts with the lowest SVI scores (Quartile 1: least vulnerable census tracts) to census tracts with the highest scores (Quartile 4: most vulnerable census tracts). Cases were excluded if (1) the address was nonresidential (e.g., military base, corrections facility), (2) no census tract was associated with the case, (3) no SVI information was available for the census tract, or (4) the census tract from the surveillance data could not be matched to a census tract provided by the SVI; in total, 537 cases were excluded for these reasons. Additionally, 2,999 persons were excluded due to missing or invalid data for birthplace, and 52 persons were excluded due to birthplace outside of one of the designated areas.

Analyses

First, a descriptive analysis was conducted comparing individual-level (sex, age, transmission category, non-linkage to care within 1 month of diagnosis, non-viral suppression within 6 months of diagnosis) and community-level (region, population area, SVI quartile) characteristics by birthplace.

Second, crude and adjusted prevalence ratios and 95% confidence intervals (CIs) for non-linkage to care within 1 month and non-viral suppression within 6 months were calculated using the SAS GENMOD procedure (SAS version 9.4, SAS Institute, Cary, NC). Modelling was first attempted using a regression model with a log-link function and binomial variation; however, as some models were unable to converge, we instead used a Poisson regression model with robust error variance for all models. Each care outcome had three models: a crude model (Model 1), a model adjusting for individual-level characteristics (sex, age,

birthplace) (Model 2), and a model adjusting for variables in Model 2 plus SVI quartiles (Model 3). Significance was determined using 95% CIs, where values were considered significant if the 95% CI did not include 1.

Results

Characteristics of population

A total of 5,056 Hispanic/Latino persons with HIV infection diagnosed in 2021 were included in the analysis. Of that, approximately half (51.5%; $n = 2,602$) were born in the United States, 17.3% (876) in Mexico, 11.1% (562) in South America, 9.2% (464) in Central America, 6.8% (342) in Cuba, 1.8% (91) in Puerto Rico, and 2.4% (119) in the Caribbean (Table 1). By age, Hispanic/Latino adults born in the United States were younger at diagnosis (23.9% under age 25; 68.1% under age 35) than non-U.S.-born Hispanic/Latino adults (ranging from 7.6% to 17.7% under age 25; 42.1% to 58.4% under age 35). By transmission category among Hispanic/Latino males, infection attributed to MMSC was higher among those born in Central or South America (both 92.0%) and lower among those born in Puerto Rico and the Caribbean (85.1% and 84.3%, respectively), compared to the United States (87.7%). All non-U.S.-born Hispanic/Latino males had lower or equal proportion of infection attributed to IDU as U.S.-born Hispanic/Latino males (3.0%), except for Puerto Rico (5.7%). Infection attributed to MMSC/IDU was less common among non-U.S.-born than U.S.-born Hispanic/Latino males (ranging from 0.5% to 3.0%, compared to 5.2%). Infection attributed to heterosexual contact among non-U.S.-born Hispanic/Latino males was higher (ranging from 5.8% to 9.9%, compared to 4.0%). Among Hispanic/Latino females, infection attributed to IDU was lower and infection attributed to heterosexual contact was higher for all non-U.S.-born compared to U.S.-born, except for Puerto Rico-born females.

Most Hispanic/Latino adults lived in the Southern region of the United States at the time of diagnosis, regardless of birthplace, often followed by the West (excluding Idaho) (Table 1). The two exceptions were Mexico-born adults with 48.3% residing in the West (excluding Idaho) and Caribbean-born adults with 51.3% residing in the Northeast (excluding New Jersey and Pennsylvania), both followed by the South. The MSAs were the primary population area of residence for all Hispanic/Latino adults from all birthplaces (ranging from 87.9% to 97.8%). By SVI quartile for residence at time of diagnosis, the most vulnerable census tracts accounted for the most diagnoses, regardless of birthplace (Quartile 4 [Q4]; 54.0% overall). Number of diagnoses decreased as social vulnerability decreased, with Quartile 3 (Q3) accounting for 25.8% and Quartile 2 (Q2) for 13.3% of all diagnoses. Hispanic/Latino adults born in South America were the only group to have less than half (38.4%) living in the most socially vulnerable census tracts (Q4).

Non-linkage to HIV care within 1 month

Overall, 13.9% of Hispanic/Latino adults in our study were not linked to care within one month of HIV diagnosis in 2021 (Table 1). The PRs from Model 1, the univariate, crude Poisson regression models (i.e., not controlling for covariates) yielded similar results to adjusted prevalence ratios (aPRs) of the two multivariate models (Model 2 and Model 3)

(Table 2). All PRs and their corresponding aPRs from Model 2 and Model 3 had overlapping 95% confidence intervals (CIs) and did not impact the significance of a given variable. The exceptions to this were Hispanic/Latino females (compared to Hispanic/Latino males) and age group 35–44 years at diagnosis (compared to age group 18–24 years). For these, both Model 2 (controlling for individual-level variables) and Model 3 (controlling for both individual- and community-level variables) resulted in aPRs that eliminated the significant difference in non-linkage with referent groups, although the PRs and aPRs had largely overlapping CIs.

For Model 3, while all birthplaces outside of the U.S. had lower percentages of non-linkage to care (ranging from 11.0% to 13.7%) than those born in the U.S. (15.6%), only two places of birth had a significantly lower risk of non-linkage to care compared with U.S.-born adults: Mexico-born and South America-born Latino adults (Table 2). The aPR for Mexico-born, compared to U.S.-born adults, was 0.723 (95% CI: 0.583 – 0.897), indicating that Mexico-born Latino adults had a 27.7% lower prevalence of non-linkage to care. Similarly, for South America-born adults, the aPR of 0.781 (CI: 0.610 – 0.999) indicates that South America-born Latino adults had a 21.9% lower prevalence of non-linkage to care than U.S.-born Latino adults.

Although all other SVI quartiles had a higher percentage of non-linkage to care (ranging from 12.9 to 14.7%) when compared to Q1 (the least vulnerable quartile; 11.8%), no significant differences were observed in any model for non-linkage to care for any quartile, compared to Q1 (Table 2).

Non-viral suppression

Overall, 23.4% of Hispanic/Latino adults in our study did not have viral suppression within six months of HIV diagnosis in 2021 (Table 1). As was observed with the non-linkage to care models, similar non-significance in PRs and aPRs were obtained from the 3 models (Table 3). The age group of ≥ 55 years at diagnosis was the one exception, as the aPR was significant (1.234; 95% CI: 1.0004 – 1.522) compared to the reference group (18–24 years) for Model 2 (multivariate for individual-level variables) only.

For all 3 models, all birthplaces outside of the United States had lower percentages of non-viral suppression (ranging from 13.4 to 23.9%) than those born in the United States (26.2%); however, three places of birth had a significantly lower prevalence of non-viral suppression compared to U.S.-born adults – Mexico, South America, and Caribbean (Table 3). For Model 3, Mexico-born Latino adults had a 25.2% lower prevalence (aPR: 0.748; 95% CI: 0.645 – 0.869), South America-born Latino adults had a 30.8% lower prevalence (aPR: 0.692; CI: 0.573 – 0.837), and Caribbean-born adults had a 51.7% lower prevalence (aPR: 0.483; CI: 0.304 – 0.767) of non-viral suppression, compared to U.S.-born Latino adults.

For SVI, those living in Q4 (highest vulnerability; 25.0%) and Q2 (second lowest vulnerability; 23.6%) had higher non-viral suppression than those living in Q3 (20.6%), which had lower non-viral suppression, compared to Q1 (lowest vulnerability; 21.6%) (Table 3). No significant differences were observed in any model for non-viral suppression for any quartile, compared to Q1.

Discussion

In this analysis, 86.1% and 76.6% of Hispanic/Latino adults with HIV diagnosed in 2021 were linked to care within one month and had viral suppression within six months of diagnosis, respectively. Overall, the results showed that, among Hispanic/Latino adults, non-linkage was lowest in males, those aged 35–44 years, and those born in Mexico and South America. Non-viral suppression was highest in those aged 55 years and older and lowest in those born in Mexico, South America, and the Caribbean. Additionally, the greatest proportion of Hispanic/Latino adults with diagnosed HIV resided in the most socially vulnerable census tracts (Q4), but no significant difference was found in non-linkage or non-viral suppression by SVI quartile.

This analysis found that higher linkage to care was observed among Hispanic/Latino persons living in the United States who were born in Mexico and South America, and viral suppression was higher among those born in Mexico, South America, and the Caribbean. Previous research showed contrary results to our analysis. Two studies of Hispanic/Latino persons with HIV living in Florida observed an increased odds of positive care outcomes for Cuba- and Puerto Rico-born Hispanic/Latino persons and decreased odds of positive outcomes for Mexico-born and Central America-born Hispanic/Latino persons [23–24]; these differences may be attributable to differences among the population at the state level compared to national level. In addition, studies on other HIV indicators (e.g., time of diagnosis, stage of disease, and survival) by birthplace have been inconsistent in their findings with no clear pattern among Mexico-, South America-, or Caribbean-born persons observed [23,28,31]. One potential explanation for our findings is a phenomenon observed in public health research called the “Hispanic Health Paradox” [32–33]. The paradox notes the relatively good health and health outcomes (particularly less mortality) of Hispanic/Latino persons compared to non-Hispanic/Latino persons in the United States, despite lower wealth, less educational attainment, and other factors classically linked to poor health outcomes [34–38]. This observation strongly depends on there being better health among non-U.S. born Hispanic/Latino persons. Proposals for the reasoning behind the health paradox have ranged from the “healthy immigrant effect” (i.e., the idea that the strongest persons migrate and bring with them the advantage of good health) to “salmon bias” (i.e., that unhealthy migrants return to their home countries and thus their health conditions and deaths are unreported in the United States) to unreliable data (e.g., early studies were based on unstandardized demographic collection) [35–40]. The paradox is broad and views Hispanic/Latino persons as a homogenous group. Our study shows that the paradox may be less overarching and relevant based on birthplace.

The protective effect for Mexico-, South America-, and Caribbean-born Hispanic/Latino persons seen in this study may be linked to aspects of immigration and culture (e.g., acculturation, English language proficiency, co-ethnic density) that we are not able to analyze with the given data. Mexico- and South America-born Hispanic/Latino persons have contrasting demographic, such as with respect to education (i.e., South America-born Hispanic/Latino immigrants have higher levels of educational attainment than Mexico-born counterparts [41–42]), citizenship status (i.e., higher percentage of citizenship among South American immigrants than Mexican immigrants [1]), and English-language proficiency (i.e.,

recent Hispanic/Latino immigrants from South American countries are more likely to be proficient in English compared to Mexican immigrants [41]). An interesting commonality between the two groups, however, is that Hispanic/Latino adults with diagnosed HIV born in Mexico and South America (as well as those born in Central America) were less likely to have reported experiencing any health care discrimination [43]. It is likely that differing intersections of demographics and experiences for each group rather than a singular common characteristic contribute to the positive care outcomes observed for these specific groups. Additional information on non-U.S.-born persons (e.g., timing of entry into the United States and history of immigration status) and U.S.-born persons (e.g., generation status and country of heritage) could provide insight into how these protective effects may be confounded by immigration and acculturation.

Our analysis found no significant difference in the prevalence of non-linkage and non-viral suppression by SVI quartile in univariate or multivariate analyses. Previous research has only observed differences in HIV diagnoses rates by SVI quartile among Hispanic/Latino persons and has not evaluated care outcomes [14, 44]. One study observed fewer within-group disparities of HIV diagnoses among Hispanic/Latino adults than among Black/African American or White adults, when comparing the most socially vulnerable census tracts to the least socially vulnerable census tracts [14]. When breaking down SVI by minority status and English proficiency theme (note that theme groups have changed slightly for the SVI version used in our study), the diagnoses rates among Hispanic/Latino adults who lived in the most socially vulnerable census tracts were 1.5 times those who live in the least socially vulnerable census tracts; notably, more than two-thirds (68.1%) of Hispanic/Latino adults lived in the most vulnerable tracts for this theme [44]. Although the association between social vulnerability and diagnoses was lower for Hispanic/Latino adults than other races, it was still significant in these studies. We anticipated that a similar degree of association would be seen with care outcomes in our study, especially given the consideration of birthplace. However, the lack of significant difference by SVI quartile may be explained by research showing that, despite Hispanic/Latino persons having low knowledge of HIV status [2] and later stage diagnosis [3], care outcomes are good [45].

Limitations

Our analysis is subject to several limitations. First, diagnoses of HIV infection do not represent new infections (incidence). The time from infection to diagnosis varies by individual, and residence at the time of HIV diagnosis may not be the residence at the time infection was acquired. This is relevant to immigrant populations, as data on the country where HIV infection was acquired and/or related self-reported date on initial HIV diagnosis (outside of the US) may be limited. Relatedly, NHSS only captures diagnoses reported by the confidential name-based HIV registries of state and local health departments and does not include anonymous HIV testing or self-testing. Due to concerns of cost, deportation, and other barriers to healthcare access, Hispanic/Latino immigrants may be underreported in HIV registries. Second, HIV care outcome data are limited to jurisdictions with laws requiring reporting of CD4 and VL tests and with complete reporting of results to NHSS. For 2021, this resulted in the exclusion of data from New Jersey, Puerto Rico, Pennsylvania, and Idaho; the former three have significant populations of Hispanic/Latino

persons, collectively 10.3% of all diagnoses among Hispanic/Latino persons. The exclusion of data from some states with large Hispanic/Latino populations and potentially different nativity/birthplace characteristics may result in the underrepresentation of cases among Hispanic/Latino persons and certain subgroups. Third, about one-third (34.6%) of Hispanic/Latino persons with HIV diagnosed in 2021 had missing or invalid data for birthplace. The distribution of these excluded cases may affect certain subgroups disproportionately, and thus the study population may not be representative of the birthplaces of the whole population of Hispanic/Latino persons with diagnosed HIV. The higher overall linkage and viral suppression among Hispanic/Latino adults observed in our study population may result from the exclusion of cases with limited data on birthplace and address of residence. Individuals missing these types of information could be less likely to seek or to have access to HIV medical care beyond testing, thus their exclusion could inflate the percentage of those linked to care and with viral suppression in our study. Fourth, we used census tract-level data as a surrogate to represent the environment in which people with diagnosed HIV infection lived at the time of diagnosis. Conclusions and findings should be interpreted with caution and not inferred at the individual level.

Conclusion

As the U.S. Hispanic/Latino population continues to grow and its demographics change, public health research must evolve to evaluate health disparities within the group as well as in comparison with other racial/ethnic groups. Hispanic/Latino persons in the United States vary by nativity, language, immigration status, healthcare access and insurance coverage, and experiences with discrimination, yet they are often viewed as a single, homogenous group. This study aimed to challenge the narrow perspective on HIV care outcomes by examining the impact of birthplace and social vulnerability. Future analyses should consider the role of culture, immigration, and community-level factors on barriers to HIV prevention and care services among Hispanic/Latino persons in the United States to better inform the development of effective and novel strategies and programs to address ethnic disparities.

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Abbreviations and Acronyms

AIDS	Acquired Immunodeficiency Syndrome
aPR	adjusted prevalence ratio
ATSDR	Agency for Toxic Substances and Disease Registry

CD4	CD4+ T-lymphocyte count (cells/ μ L) or percentage
CDC	Centers for Disease Control and Prevention
CI	confidence interval
HIV	human immunodeficiency virus
MSA	metropolitan statistical area
NHAS	National HIV/AIDS Strategy
IDU	injection drug use
MMSC	male-to-male sexual contact
NHSS	National HIV Surveillance System
PR	prevalence ratio
SVI	Social Vulnerability Index
U.S.	United States
VL	viral load

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Table 1.

Diagnoses of HIV infection among Hispanic/Latino persons aged ≥ 18 years, by birthplace and selected characteristics, 2021—census tract, 47 states and the District of Columbia

	Total^a		United States^b		Mexico		Central America^c		South America^d		Puerto Rico		Cuba		Other Caribbean^e	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Total^a	5,056	100	2,602	100	876	100	464	100	562	100	91	100	342	100	119	100
Age at diagnosis (yr)																
18–24	895	17.7	622	23.9	78	8.9	82	17.7	53	9.4	15	16.5	26	7.6	19	16.0
25–34	2,074	41.0	1,149	44.2	312	35.6	189	40.7	233	41.5	38	41.8	122	35.7	31	26.1
35–44	1,165	23.0	481	18.5	255	29.1	125	26.9	147	26.2	19	20.9	102	29.8	36	30.3
45–54	582	11.5	217	8.3	149	17.0	50	10.8	85	15.1	14	15.4	49	14.3	18	15.1
≥ 55	340	6.7	133	5.1	82	9.4	18	3.9	44	7.8	5	5.5	43	12.6	15	12.6
Transmission category^f																
Male sex at birth																
Male-to-male sexual contact (MMSC)	3,975	88.6	2,017	87.7	714	87.2	353	92.0	477	92.0	69	85.1	275	91.2	70	84.3
Injection drug use (IDU)	106	2.4	70	3.0	19	2.4	5	1.2	5	0.9	5	5.7	2	0.5	2	2.9
MMSC and IDU	156	3.5	118	5.2	21	2.5	4	1.0	6	1.2	2	3.0	2	0.5	2	2.8
Heterosexual contact	247	5.5	93	4.0	64	7.8	22	5.8	30	5.9	5	6.3	24	7.8	8	9.9
Other	2	0.0	1	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Subtotal	4,486	100	2,299	100	819	100	384	100	518	100	81	100	302	100	83	100
Female sex at birth																
IDU	63	11.1	50	16.5	5	8.8	3	3.5	0	0.0	2	23.0	1	1.3	2	6.4
Heterosexual contact	504	88.5	252	83.2	52	90.7	77	95.6	44	98.9	8	77.0	39	98.5	34	93.3
Other	2	0.4	1	0.3	0	0.0	1	0.9	0	0.0	0	0.0	0	0.0	0	0.0
Subtotal	570	100	303	100	57	100	80	100	44	100	10	100	40	100	36	100
Linkage to care within 1 month of diagnosis																
Yes	4,355	86.1	2,197	84.4	780	89	402	86.6	496	88.3	80	87.9	295	86.3	105	86.2
No	701	13.9	405	15.6	96	11	62	13.4	66	11.7	11	12.1	47	13.7	14	11.8
Viral suppression within 6 months of diagnosis																
Yes	3,872	76.6	1,919	73.8	698	79.7	353	76.1	460	81.9	74	81.3	265	77.5	103	86.6
No	1,184	23.4	683	26.2	178	20.3	111	23.9	102	18.1	17	18.7	77	22.5	16	13.4

	Total ^a	United States ^b	Mexico	Central America ^c	South America ^d	Puerto Rico	Cuba	Other Caribbean ^e
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Region of residence^h								
Northeast (excluding NJ and PA)	475 9.4	286 11.0	25 2.9	28 6.0	65 11.6	9 9.9	1 0.3	61 51.3
Midwest	398 7.9	190 7.3	119 13.6	23 5.0	44 7.8	10 11.0	6 1.8	6 5.0
South	2,536 50.2	1,152 44.3	309 35.3	292 62.9	358 63.7	68 74.7	310 90.6	47 39.5
West (excluding ID)	1,647 32.6	974 37.4	423 48.3	121 26.1	95 16.9	4 4.4	25 7.3	5 4.2
Population area of residence								
Metropolitan statistical areas (pop. ≥ 500,000)	4,577 90.5	2,309 88.7	770 87.9	427 92	540 96.1	89 97.8	328 95.9	114 95.8
Metropolitan areas (pop. 50,000–499,999)	345 6.8	215 8.3	72 8.2	25 5.4	17 3	2 2.2	11 3.2	3 2.5
Nonmetropolitan areas (pop. < 50,000)	134 2.7	78 3.0	34 3.9	12 2.6	5 0.9	0 0.0	3 0.9	2 1.7
SVI quartile								
Q1	347 6.9	188 7.2	62 7.1	26 5.6	52 9.3	8 8.8	8 2.3	3 2.5
Q2	674 13.3	376 14.5	98 11.2	44 9.5	107 19	10 11.0	27 7.9	12 10.1
Q3	1,306 25.8	683 26.2	221 25.2	90 19.4	187 33.3	18 19.8	89 26.0	18 15.1
Q4	2,729 54.0	1,355 52.1	495 56.5	304 65.5	216 38.4	55 60.4	218 63.7	86 72.3

Abbreviations: pop., population; SVI, Social Vulnerability Index; CD4, CD4+ T-lymphocyte count (cells/ μ L) or percentage [footnotes only]; CDC, the Centers for Disease Control and Prevention [footnotes only].

Note. Non-linkage to HIV medical care was defined as no documentation of ≥ 1 CD4 or VL tests within 1 month of HIV diagnosis during 2021. Non-viral suppression was defined as no VL test result of < 200 copies within 6 months of HIV diagnosis during 2021. Data are based on residence at time of diagnosis of HIV infection. Data not provided for states and associated jurisdictions that do not have laws requiring reporting of all CD4 and viral loads or that have incomplete reporting of laboratory data to CDC. Areas without laws: Idaho. Areas with incomplete reporting: New Jersey, Pennsylvania (excluding Philadelphia), and Puerto Rico.

^aExcludes the following: 537 who had missing or invalid data for census tract at time of diagnosis, 2,999 who had missing or invalid data for birthplace, and 52 who were born outside one of the designated areas (US, Central America, South America, or Caribbean).

^bIncludes Hispanic/Latino persons born in the 50 states and the District of Columbia.

^cIncludes Hispanic/Latino persons born in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama.

^dIncludes Hispanic/Latino persons born in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela.

^eIncludes Hispanic/Latino persons born in Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Cayman Islands, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Montserrat, Saint Barthelemy, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands, Virgin Islands (British), and Virgin Islands (U.S.).

^fTransmission category is classified based on a hierarchy of the risk factors most likely responsible for HIV transmission; classification is determined based on the person's assigned sex at birth. Data have been statistically adjusted to account for missing transmission category; therefore, values may not sum to column subtotals and total.

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^gStage of disease at time of diagnosis of HIV infection is based on first CD4 test performed or documentation of an AIDS-defining condition ≤ 3 months after a diagnosis of HIV infection. The 2014 case definition is used for classification.

^hData should be interpreted with caution as areas with incomplete reporting to CDC are not included.

Table 2. Non-linkage to HIV care within 1 month of HIV diagnosis during 2021 among Hispanic/Latino persons aged ≥ 18 years, by individual-level and community-level characteristics—census tract, 47 states and the District of Columbia

	Non-linkage to care		Model 1		Model 2		Model 3	
	Total n	n (%)	Crude PR for non-linkage to care PR (95% CI)	Adjusted PR for non-linkage to care aPR (95% CI)	Adjusted PR for non-linkage to care aPR (95% CI)	Adjusted PR for non-linkage to care aPR (95% CI)		
Assigned sex at birth								
Male	4,486	606 13.5	Referent		Referent	Referent		
Female	570	95 16.7	1.2338 1.0122 1.5038		1.2215 0.9952 1.4993	1.2169 0.9911 1.4942		
Age at diagnosis (yrs)								
18–24	895	141 15.8	Referent		Referent	Referent		
25–34	2,074	284 13.7	0.8692 0.7216 1.0470		0.9000 0.7464 1.0852	0.8999 0.7457 1.0860		
35–44	1,165	147 12.6	0.8009 0.6466 0.9920		0.8480 0.6816 1.0550	0.8477 0.6812 1.0549		
45–54	582	82 14.1	0.8943 0.6955 1.1499		0.9503 0.7338 1.2307	0.9530 0.7355 1.2347		
≥ 55	340	47 13.8	0.8775 0.6464 1.1911		0.9203 0.6731 1.2583	0.9162 0.6699 1.2531		
Birthplace								
United States ^a	2,602	405 15.6	Referent		Referent	Referent		
Mexico	876	96 11.0	0.7041 0.5713 0.8676		0.7239 0.5838 0.8975	0.7234 0.5833 0.8972		
Central America ^b	464	62 13.4	0.8585 0.6697 1.1005		0.8571 0.6677 1.1003	0.8492 0.6619 1.0895		
South America ^c	562	66 11.7	0.7545 0.5913 0.9627		0.7726 0.6044 0.9876	0.7805 0.6101 0.9986		
Puerto Rico	91	11 12.1	0.7766 0.4430 1.3613		0.7820 0.4474 1.3669	0.7796 0.4455 1.3642		
Cuba	342	47 13.7	0.8829 0.6672 1.1695		0.9001 0.6798 1.1919	0.8936 0.6741 1.1847		
Other Caribbean ^d	119	14 11.8	0.7558 0.4584 1.2463		0.7336 0.4448 1.2100	0.7201 0.4366 1.1875		
SVI quartile								
Q1	347	41 11.8	Referent	–	–	Referent		
Q2	674	99 14.7	1.2431 0.8847 1.7469	–	–	1.2367 0.8815 1.7349		
Q3	1,306	168 12.9	1.0887 0.7904 1.4996	–	–	1.0803 0.7850 1.4865		
Q4	2,729	393 14.4	1.2188 0.9014 1.6479	–	–	1.2082 0.8937 1.6336		

Model 1: Crude rates (each variable in a separate model).

Model 2: Controlling for individual-level variables (assigned sex at birth, race, age at diagnosis, and birthplace).

Model 3: Controlling for individual-level variables (assigned sex at birth, race, age at diagnosis, and birthplace) and neighborhood-level variable (SVI quartile).

Abbreviations: PR, prevalence ratio; CI, confidence interval; aPR, adjusted prevalence ratio; SVI, Social Vulnerability Index; CD4, CD4+ T-lymphocyte count (cells/ μ L) or percentage [footnotes only]; VL, viral load (copies/mL) [footnotes only]; CDC, the Centers for Disease Control and Prevention [footnotes only].

Note. Non-linkage to HIV medical care was defined as no documentation of ≥ 1 CD4 or VL tests within 1 month of HIV diagnosis during 2021. Data are based on residence at time of diagnosis of HIV infection. Data not provided for states and associated jurisdictions that do not have laws requiring reporting of all CD4 and viral loads or that have incomplete reporting of laboratory data to CDC. Areas without laws: Idaho. Areas with incomplete reporting: New Jersey, Pennsylvania (excluding Philadelphia), and Puerto Rico.

^aIncludes Hispanic/Latino persons born in the 50 states and the District of Columbia.

^bIncludes Hispanic/Latino persons born in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama.

^cIncludes Hispanic/Latino persons born in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela.

^dIncludes Hispanic/Latino persons born in Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Cayman Islands, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Montserrat, Saint Barthelémy, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands, Virgin Islands (British), and Virgin Islands (U.S.).

Table 3. Non-viral suppression within 6 months of HIV diagnosis during 2021 among Hispanic/Latino persons aged ≥ 18 years, by individual-level and community-level characteristics—census tract, 47 states and the District of Columbia

	Non-viral suppression			Model 1		Model 2		Model 3									
	Total n	n	(%)	Crude PR for non-viral suppression PR (95% CI)	Adjusted PR for non-viral suppression aPR (95% CI)	Adjusted PR for non-viral suppression aPR (95% CI)	Adjusted PR for non-viral suppression aPR (95% CI)										
Assigned sex at birth	4,486	1052	23.5	Referent	Referent	Referent	Referent	Referent									
	Male	570	132						23.2	0.9875	0.8427	0.9501	0.8085	1.1165	0.9442	0.8036	1.1095
Age at diagnosis (yrs)	895	222	24.8	Referent	Referent	Referent	Referent	Referent									
	18–24	2,074	454						21.9	0.8825	0.7672	0.9168	0.7965	1.0553	0.9185	0.7977	1.0575
	25–34	1,165	276						23.7	0.9551	0.8190	1.0358	0.8858	1.2111	1.0393	0.8884	1.2157
	35–44	582	138						23.7	0.9559	0.7944	1.0583	0.8758	1.2788	1.0657	0.8819	1.2877
	45–54	340	94						27.6	1.1146	0.9068	1.2340	1.0004	1.5220	1.2281	0.9956	1.5148
≥ 55																	
Birthplace																	
United States ^a	2,602	683	26.2	Referent	Referent	Referent	Referent	Referent									
Mexico	876	178	20.3						0.7741	0.6689	0.8959	0.7523	0.6480	0.8734	0.7484	0.6445	0.8691
Central America ^b	464	111	23.9						0.9114	0.7654	1.0852	0.9099	0.7636	1.0841	0.8935	0.7500	1.0644
South America ^c	562	102	18.1						0.6914	0.5735	0.8336	0.6795	0.5624	0.8211	0.6922	0.5727	0.8367
Puerto Rico	91	17	18.7						0.7117	0.4614	1.0979	0.7059	0.4571	1.0901	0.6981	0.4524	1.0774
Cuba	342	77	22.5	0.8577	0.6974	1.0549	0.8306	0.6748	1.0225	0.8219	0.6671	1.0125					
Other Caribbean ^d	119	16	13.4	0.5122	0.3232	0.8117	0.4967	0.3126	0.7893	0.4825	0.3036	0.7668					
SVI quartile																	
Q1	347	75	21.6	Referent	Referent	Referent	Referent	Referent									
Q2	674	159	23.6						1.0915	0.8568	1.3904	–	–	–	1.0862	0.8522	1.3844
Q3	1,306	269	20.6						0.9530	0.7595	1.1957	–	–	–	0.9466	0.7536	1.1890
Q4	2,729	681	25.0						1.1545	0.9352	1.4253	–	–	–	1.1480	0.9286	1.4193

Model 1: Crude rates (each variable in a separate model).

Model 2: Controlling for individual-level variables (assigned sex at birth, race, age at diagnosis, and birthplace).

Model 3: Controlling for individual-level variables (assigned sex at birth, race, age at diagnosis, and birthplace) and neighborhood-level variable (SVI quartile).

Abbreviations: PR, prevalence ratio; CI, confidence interval; aPR, adjusted prevalence ratio; SVI, Social Vulnerability Index; VL, viral load (copies/mL.) [footnotes only]; CDC, the Centers for Disease Control and Prevention [footnotes only].

Note. Non-viral suppression was defined as no VL test result of < 200 copies within 6 months of HIV diagnosis during 2021. Data are based on residence at time of diagnosis of HIV infection. Data not provided for states and associated jurisdictions that do not have laws requiring reporting of all CD4 and viral loads or that have incomplete reporting of laboratory data to CDC. Areas without laws: Idaho. Areas with incomplete reporting: New Jersey, Pennsylvania (excluding Philadelphia), and Puerto Rico.

^a Includes Hispanic/Latino persons born in the 50 states and the District of Columbia.

^b Includes Hispanic/Latino persons born in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama.

^c Includes Hispanic/Latino persons born in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela.

^d Includes Hispanic/Latino persons born in Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Cayman Islands, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Montserrat, Saint Barthelemy, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands, Virgin Islands (British), and Virgin Islands (U.S.).