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# Complex Patterns Across the Migration Process and Associated HIV Testing and Risk Behaviors among Latino Immigrants

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## Abstract

**Background** Migrants are at elevated risk for adverse HIV-related outcomes. Yet, there is limited understanding about the complexity of the migration process and the different migration experiences that may influence HIV testing and risk behaviors. This study examined whether patterns in immigrants' migration experience were associated with HIV risk and preventive behaviors.

**Methods** Surveys were conducted with Latino immigrant adults ($n = 306$) in New York City during the spring of 2017. Informed by formative interviews, variables were developed to assess the migration process and document information about Latino immigrants' experiences during six particular stages of migration (pre-departure, travel, destination, interception, return, and settlement). We conducted a Latent Class Analysis (LCA) to detect patterns in the migration experience among participants and examined the associations between the latent classes and HIV testing and risk behaviors.

**Results** LCA clustered participants into three migration experience classes: positive experience (50.3%), neutral experience (36.3%), and negative experience (13.4%). The migration classes were significantly associated with sociodemographic variables, including sex, age, and income. Different experiences during the migration process did not influence immigrants' past or current HIV testing or risk behaviors. However, the migration classes were associated with immigrants' future intentions to test for HIV with the positive migration experience class reporting greater intentions to test for HIV in the next 12 months than the negative experience class (aOR, 2.95; 95% CI, 1.21–7.17; $p < .05$).

**Conclusion** Results suggest the applicability of a migration experience framework for understanding future HIV risk and preventive behaviors among immigrants.

**Keywords** HIV testing · HIV risk behaviors · Immigrants · Latinos · Migration process

## Introduction

In the USA, Latinos are disproportionately affected by HIV, accounting for a quarter of all new HIV diagnoses while representing 18% of the total population [1]. Latinos also constitute the nation's largest immigrant group, representing 45% of the foreign-born population [2, 3]. Notably, data suggest that the majority of HIV infections among the immigrant population occur *after* migration to the USA, highlighting an important opportunity for HIV prevention.

While the association between migration and HIV infection is well established [4, 5], the specific pathways linking these factors are less clear [6–8]. A potential mechanism through which migration can increase vulnerability to HIV is decreased access to HIV prevention services. As migrants face legal, cultural, and language barriers that limit opportunities for HIV prevention in destination countries [9, 10], they may be less likely to engage preventive services and behaviors. Hence, Latino immigrants are more likely to be diagnosed late with HIV and less likely to use health services than their US-born counterparts. [11–13]

Migration, however, is a complex process, and individuals migrate for a diverse array of reasons [14]. The focus on individuals as migrants or non-migrants in relation to HIV testing or risk behaviors neglects this complexity. Specifically, the tendency to compare immigrants to their native-born counterparts may confine strategies for increasing HIV testing and reducing risk behaviors to individual level characteristics that are often unamenable to change. Such approaches may limit

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viable opportunities to improve the contexts and conditions associated with migration that may shape risk or preventive behaviors.

A growing number of studies have examined migrants' HIV risk along the stages of the migration process [15–19]. These studies utilize a theory of migration and health that focuses on the diverse stages involved in the migration process, including the pre-departure, travel, destination, interception, return, and settlement stages [14]. These stages are associated with distinct phases or locations involved in migrating from one country to another. Thus, each stage may present unique contexts and experiences associated with differential challenges and opportunities for HIV prevention [15]. Zimmerman, Kiss, and Hossain (2011) explain that while the stages may not occur in linear fashion, they may influence one another [14]. For example, migrants' experiences during the pre-departure stage can affect the travel stage, and the travel stage can influence the destination stage. Notably, some migrants may not encounter every stage, and others may enter a stage more than once (e.g., return stage).

Applications of this theoretical framework have sought to capture migrants at particular stages of the migration process to assess HIV-related outcomes. Martinez-Donate et al. (2015) surveyed migrants traveling across the Mexico–US border and grouped individuals into migration stages based on factors such as history of migration to the USA, period of time lived in the USA, and history of illegal entry into the USA [15]. Another study of migrants in China categorized migrants into stages based on whether they were about to migrate, had already migrated, or had returned to their places of origin [18].

While these applications highlight the importance of considering the differential impacts of each of the stages of migration in relation to HIV transmission, they overlook the potential differences *within* each of the stages as well as their cumulative impact. Migrants who share the same migration stage may differ in their experience of the stage, which may be influential in decision-making and behaviors. For example, migrants who easily migrated to their destination country may have had a more positive experience in the destination stage than those who had a difficult journey. As a result, migrants with more positive experiences may engage in different behaviors than those exposed to more stressful experiences [20]. Hence, understanding the complex migration process warrants examination of immigrants' attitudes towards each of the migration stages as well as the overall process [21]. This understanding is critical as migrants' orientation towards their migration experiences can impede or facilitate health behaviors and outcomes [22]. Specifically, attention to migrants' experience of the migration process may not only explain why certain migrants enter a particular migration stage, but may also reveal reasons for engagement in risk or protective health behaviors.

Taken together, this study applies an integrated framework that acknowledges the different influences of the migration stages as well as the ways in which each of the stages is experienced. This study builds upon extant research by examining migrants' experiences across the stages of migration among Latino immigrants in New York City who would typically be categorized as being in a singular migratory stage. We sought to expand upon the conceptualization of the migration process to integrate differences in the experiences of and attitudes towards the migratory stages. We assess for distinctive typologies of experience of the migration process among Latino immigrants through Latent Class Analysis (LCA) and examine whether different typologies are associated with HIV testing or risk behaviors. The aim of this study is to identify underlying patterns of experience across the migration stages and to determine whether these patterns are associated with greater or lower probability of engaging in HIV testing or risk behaviors among Latino immigrants in New York City.

## Methods

The study was conducted in New York City, which is one of the US cities with the greatest numbers of immigrants and people living with HIV [23, 24]. We used data from surveys conducted with Latino immigrant adults ($n = 306$) residing in Queens in New York City during the spring of 2017. The neighborhood of Corona was selected as the study site given the high concentration of Latino immigrants residing in the area. Approximately, 60% of residents in Corona are immigrants and 62% are Latino [25]. Latino immigrants were recruited via door-to-door recruitment in the community. The Corona neighborhood was divided into eight target zones that were randomly selected on each day of recruitment. Staff bilingual in Spanish and English knocked on doors of residences within the selected zone to recruit participants. To reduce selection bias, recruitment occurred on all days of the week from 8 a.m. to 8 p.m. Additional details on sampling procedures can be found in another publication [26]. The study was reviewed and approved by the Institutional Review Board at New York University.

Eligible participants were adults ages 18 years and older, were born outside of the continental USA, and identified as being Latino. Residence in the same household as another participant was not an exclusion criterion for participation. Additionally, HIV status was not a criterion for participation. Notably, approximately 20% of persons approached during recruitment refused to participate. While we were unable to obtain adequate demographic data of refusers, we note the potential bias resulting from non-contact with potential participants (e.g., not home at time of recruitment) and refusal to participate.

### Measures

**Sociodemographic Variables** The survey instrument asked participants to report several sociodemographic characteristics

including sex, age, sexual orientation, country of origin, length of time in USA, education, income, immigration status, language, and health insurance.

**Migration Stage Variables** Participants were asked questions about the migration process that focused on the six migration stages adapted from Zimmerman, Kiss, and Hossain (2011) [14]: (1) pre-departure, (2) travel, (3) destination, (4) interception, (5) return, and (6) settlement. Items assessed participants' experiences of and attitudes towards each stage. These items were informed by formative research conducted with Latino immigrants ($n = 34$) through in-depth interviews that explored experiences of migrating to the USA. Specifically, participants revealed characteristics about each stage that were relevant to their overall migration experience. The experiences or characteristics of each stage were described as positively or negatively shaping their migration experience. These data informed the items used to assess each stage in this study. We describe the items below and explain how results from the in-depth interviews characterized each stage.

We assessed the pre-departure stage through items that asked about which push or pull factors motivated migration. Specifically, we asked participants to indicate their primary reason for leaving their home country. Push factors drive migrants from their country of origin and can include factors such as extreme poverty, violence, or political turmoil. Immigrants reported that migration due to push factors were challenging and difficult because migration seemed to be necessary for survival. Moreover, push factors compelled individuals to migrate even though they desired to remain in their countries on origin. In contrast, migration due to pull factors, such as better economic or educational opportunities in the USA, or the desire to reunite with or join family members, was viewed as a more positive and hopeful experience. Separate variables were created that indicated whether participants (1) migrated because of conditions in country of origin and (2) migrated because of conditions in the USA.

The travel stage was described by diverse experiences among in-depth interview participants. Despite the diversity, immigrants described the travel stage as either easy or difficult. Those who had to endure a long or difficult journey explained that it was not easy to migrate and viewed the migration process in a more negative light. In contrast, those who migrated without much trouble described the experience as a positive and exciting one. For this study, the travel stage was assessed through an item that asked about participants' ease of migrating to the USA: (1) it was easy to migrate to the mainland USA. Participants responded to this item on a Likert scale from 1 to 5 (1 strongly agree, 5 strongly disagree). Responses were recoded so that a response of 1 or 2 was "yes," and responses of 3, 4, and 5 were "no."

When asked about the experience of arriving to the USA, immigrants cited knowledge to be an important factor in shaping this stage. Specifically, those who were knowledgeable about the migration process and knew what to do when arriving to the USA reported a more positive experience with arrival. Hence, the destination stage was assessed via knowledge about how to migrate to the USA: (1) I knew what to do when migrating to the mainland USA. Similar to the travel stage item, the responses were recoded from Likert scale to yes or no.

The interception stage often has negative or punitive implications. Specifically, interception occurs when migrants are detained or sent back to their country of origin despite their desire to remain in their current residence. Hence, in this context, interception encompassed any measures taken to prevent or interrupt immigration to the USA. In-depth interview participants who were deported or knew individuals who were deported described the experience as a painful and traumatic one. Hence, the interception stage was assessed by an item that asked whether participants were ever deported back to their home country (yes/no).

The return stage is a complex one because immigrants can visit their country of origin with the intention to return to the USA. In contrast, some immigrants viewed their migration to the USA as temporary and sought to permanently return to their countries of origin. In-depth interview participants explained that having had returned to one's country of origin was a privilege and was viewed as a positive experience. This sentiment related to participants' beliefs that those with documentation had the freedom to return to their countries of origin. Similarly, the plan to visit one's country of origin was viewed positively. As many immigrants have family or friends in their countries of origin, visiting was a desirable event. In contrast, immigrants who planned to permanently return to their countries of origin explained either that migration was a means to an end or felt that they would not be able to survive in the USA. Hence, permanent return was viewed more negatively. Taken together, items asked about participants' past return experience and intentions to return to their country of origin: (1) have you ever returned to your country of origin since arrival to the USA? (yes/no); (2) do you plan to visit your country of origin in the next 6 months? (yes/no); and (3) do you plan to permanently return to your country of origin in the next 6 months? (yes/no).

Entering the settlement stage was viewed positively by an in-depth interview with participants as it was indicative of having "successfully" migrated to the USA. The settlement stage was assessed by items that asked about immigrants' adaptation and connection to the USA as well as their perceived permanence within the country: (1) I consider the USA my home; (2) I feel closely connected to the community where I live in the USA; (3) I fit in socially in the community where I live in the USA; and (4) I do not plan to leave the mainland USA in the next 6 months (yes/no). The first three items were dichotomized into yes/no from Likert-type scale responses.

**HIV Testing and Risk Behavior Variables** The main outcome variable for the study was HIV testing. We assessed past, current,

future, and far future HIV testing behaviors: (1) ever tested for HIV (yes/no), (2) tested for HIV in past 12 months (yes/no), (3) intention to test for HIV in next 12 months, and (4) intention to test for HIV every 12 months. Intention to test for HIV in the next 12 months and every 12 months were measured on a Likert-type scale (1 strongly agree, 5 strongly disagree). Responses to these items were recoded to yes (1–2), unsure (3), and no (4–5).

Secondary outcome variables included sexual risk behaviors: (1) had sex in past 12 months, (2) had more than one sex partner in past 12 months, and (3) used condom during last sex.

## Data Analysis

We used latent class analysis (LCA) to identify classes of individuals reporting similar patterns of experiences across the migration stages. This approach allows identification of complex patterns or typologies of cases in multivariate categorical data. The 11 dichotomous migration process indicators were modeled using a binomial logit link, and the overall count of the different migration stage characteristics reported was modeled using a log Poisson link. These methods were used to identify the optimal number of classes using the Bayesian information criterion (BIC) to balance model fit and parsimony [27]. After the optimal number of classes were determined, we applied Bayes' Rule to assess the posterior probability that a participant belonged to a particular class. For the LCA, we treated study participants who refused to answer a question as missing in the data. Fewer than 5% of data were missing overall across all of the variables used for the LCA. Data was assumed to be missing at random, and was accounted for using a full information maximum likelihood procedure. The LCA analysis was conducted in Mplus version 7.31 using maximum likelihood model fit methods.

The sociodemographic covariates (sex, age, sexual orientation, country of origin, length of time in USA, education, income, language, immigrant status, and health insurance) and the HIV testing and sexual risk behaviors were compared across the predicted LCA migration classes through Chi-squared tests conducted using STATA 14. Additionally, logistic and multinomial logistic regression models, controlling for the sociodemographic covariates, were used to examine associations between the migration classes and the HIV testing behaviors. For the logistic regression models, the outcomes of intention to test for HIV in the next 12 months and every 12 months were recoded to yes/no by grouping the "unsure" responses with the "no" responses.

# Results

## Migration Experience Patterns from the LCA Model

The LCA model indicated that a three-class solution was optimal based on the BIC. Class 1 (13.4%) was defined as "negative migration experience"; class 2 (36.3%) was defined as "neutral migration experience," and class 3 (50.3%) as "positive migration experience." Table 1 shows the three latent classes relative to the indicator variables, organized by stages of migration. Class 1 had higher than average negative experiences/characteristics of the migration process and lower than average positive experiences. Class 3 had higher than average positive experiences/characteristics of the migration process and lower than average negative experiences. Class 2 had high probabilities for some positive experiences, primarily in the settlement migration stage.

All of the examined sociodemographic characteristics (i.e., sex, age, country of origin, length of time in USA, income, immigration status, language, health insurance) except sexual orientation and education were significantly associated with the three LCA classes ($p < 0.02$) (Table 2). By gender, female Latino immigrants were overrepresented in latent class 2 of neutral migration experience. Male Latino immigrants were less likely to be in class 2 and more likely to be in class 3 of positive migration experience. Regarding age, participants who were between ages 25 to 44 years tended to be overrepresented in the classes of negative and neutral migration experiences. Latino immigrants who were ages 45 and older were more likely to be in the positive migration experience class. Participants from Mexico and Ecuador tended to be in class of neutral migration experience and were less like to be in the class of positive migration experience. Participants from the Dominican Republic and Colombia were more likely to be in the class of positive migration experience, and less likely to be in the neutral class.

Latino immigrants who had been in the USA for 10 to 15 years were overrepresented in the neutral class and were less likely to be in the positive class. Individuals who resided in the USA for over 20 years were less likely to be in the negative or neutral class and were overrepresented in the positive migration class.

Income was also significantly associated with the migration experience classes. Latino immigrants who had incomes that were less than $19,999 per year were more likely to be in the negative migration experience class. Individuals with incomes of $20,000 to $29,999 were less likely to be in the negative migration experience class. Participants with incomes that were more than $30,000 were more likely to be in the class of positive migration experience.

Legal permanent residents and naturalized citizens were more likely to be in the positive migration experience class and less likely to be in the neutral migration class. Naturalized citizens were also less likely to be in the negative migration experience class. Undocumented immigrants were overrepresented in the class of neutral migration experience and less likely to be in the positive migration class. Participants with eligible immigration status were overrepresented in the negative migration class and less likely to be in the positive migration class.

**Table 1** Latent class analysis model: prevalence and counts within each class

| Latent class | $N = 306$ % | Negative migration experience $N = 41$ % | Neutral migration experience $N = 111$ % | Positive migration experience $N = 154$ % |
|---|---|---|---|---|
| Pre-departure stage | | | | |
| Migrated because of conditions in country of origin (push)[a] | 15.0 | 11.4 | 19.8 | 12.7 |
| Migrated because of conditions in USA (pull)[b] | 95.4 | 96.4 | 93.7 | 96.3 |
| Travel stage | | | | |
| It was easy to migrate to the mainland USA[b] | 47.2 | 20.3 | 19.1 | 73.1* |
| Arrival stage | | | | |
| I knew what to do when migrating to the mainland USA[b] | 49.2 | 18.1 | 28.7 | 71.0* |
| Interception stage | | | | |
| Ever deported back to country of origin[a] | 22.4 | 26.6 | 13.3 | 23.7 |
| Return stage | | | | |
| Ever returned to country of origin since first arrival[b] | 55.2 | 36.8 | 23.5 | 81.7* |
| Plans to visit country of origin in next 6 months[b] | 32.0 | 22.5 | 0.8 | 54.4* |
| Plans to permanently return to country of origin in next 6 months[a] | 7.0 | 9.5 | 1.3 | 10.3 |
| Settlement stage | | | | |
| Does not plan to leave mainland USA in next 6 months[b] | 50.3 | 35.4 | 57.2 | 51.3 |
| I consider the USA my home[b] | 78.9 | 17.4 | 85.8 | 89.9* |
| I feel closely connected to the community where I live in the USA[b] | 83.9 | 4.2 | 94.1* | 97.1* |
| I fit in socially in the community where I live in the USA[b] | 67.3 | 12.0 | 70.1 | 79.4* |
| Average number of migration items | 5.91 | 2.91 | 4.94 | 7.34 |
| Proportion in each class | 100 | 13 | 36 | 50 |

[a] Negative migration stage experience/characteristic

[b] Positive migration stage experience/characteristic

*Greater than average prevalence > + 10%

Participants who reported speaking Spanish better than English were more likely to be in the negative migration experience class and less likely to be in the positive migration experience class. Immigrants who reported speaking Spanish and English equally were less likely to be in the class of negative and neutral migration and more likely to be in the positive experience class.

Health insurance was also associated with the latent classes. Immigrants who reported having health insurance were overrepresented in the positive migration experience class while those without insurance were more likely to be in the negative and neutral migration experience class.

## HIV Testing and Risk Behaviors by the Latent Classes

Past and current HIV testing behaviors (ever tested, tested for HIV in last 12 months) were not significantly associated with the three LCA classes (Table 3). Intention to test in the next 12 months was approaching significance ($p = 0.054$) in its association with the three classes. Specifically, immigrants who had a positive experience during the migration process were more likely to intend to get tested in the next 12 months. Immigrants in the positive migration class were also more likely to intend to get tested for HIV every 12 months ($p = .034$). The three LCA classes were not significantly associated with the secondary outcomes of HIV risk behaviors including condom use, having sex in the past 12 months, and having more than one sex partner in the last 12 months.

To further examine the associations between the LCA classes and HIV testing outcomes, we conducted logistic regressions using unadjusted models and adjusted models controlling for the sociodemographic covariates. In the unadjusted model, immigrants who had a neutral experience during the migration process did not statistically significantly differ in HIV testing behaviors relative to immigrants who had a negative experience (Table 4). However, immigrants who had a positive experience during the migration process were more likely to have ever tested for HIV (OR, 2.27; 95%CI, 1.03–5.01; $p < .05$). After controlling for the sociodemographic covariates, the associations were no longer significant. As suggested by the bivariate analysis in the unadjusted model, there were significant associations between the migration classes and intentions to test for HIV. Immigrants in the positive experience class were significantly more likely to intend to get tested for HIV in the next 12 months than immigrants in the negative migration experience class (aOR, 2.95; 95%CI, 1.21–7.17; $p < .05$).

**Table 2** Sociodemographic characteristics by the three latent classes

| | Total[a] *N* (%) | Negative *N* (%) | Neutral *N* (%) | Positive *N* (%) | *p* value |
|---|---|---|---|---|---|
| Sex | *N* = 306 | | | | 0.018* |
| Female | 161 (52.61) | 21 (51.22) | 70 (63.06) | 70 (45.45) | |
| Male | 145 (47.39) | 20 (48.78) | 41 (36.94) | 84 (54.55) | |
| Age (years) | *N* = 303 | | | | 0.000* |
| 18–24 | 36 (11.88) | 5 (12.20) | 11 (9.91) | 20 (13.25) | |
| 25–34 | 98 (32.34) | 15 (36.59) | 43 (38.74) | 40 (26.49) | |
| 35–44 | 81 (26.73) | 12 (29.27) | 41 (36.94) | 28 (18.54) | |
| 45–54 | 53 (17.49) | 6 (14.63) | 11 (9.91) | 36 (23.84) | |
| 55+ | 35 (11.55) | 3 (7.31) | 5 (4.50) | 27 (17.88) | |
| Sexual orientation | *N* = 306 | | | | 0.342 |
| Heterosexual | 286 (93.46) | 37 (90.24) | 102 (91.89) | 147 (95.45) | |
| Gay/lesbian/bisexual/other | 20 (6.54) | 4 (9.76) | 9 (8.11) | 7 (4.55) | |
| Country of origin | *N* = 306 | | | | 0.000* |
| Mexico | 65 (21.24) | 11 (26.83) | 36 (32.43) | 18 (11.69) | |
| Ecuador | 96 (31.37) | 12 (29.27) | 46 (41.44) | 38 (24.68) | |
| Dominican Republic | 83 (27.12) | 9 (21.95) | 10 (9.01) | 64 (41.56) | |
| Colombia | 20 (6.54) | 2 (4.88) | 4 (3.60) | 14 (9.09) | |
| Peru | 16 (5.23) | 4 (9.76) | 4 (3.60) | 8 (5.19) | |
| Other[b] | 26 (8.50) | 3 (7.32) | 11 (9.91) | 12 (7.79) | |
| Length of time in USA | *N* = 303 | | | | 0.004* |
| < 5 | 58 (19.14) | 8 (19.51) | 23 (21.10) | 27 (17.65) | |
| 5– < 10 | 34 (11.22) | 5 (12.20) | 12 (11.01) | 17 (11.11) | |
| 10– < 15 | 60 (19.80) | 7 (17.07) | 32 (29.36) | 21 (13.73) | |
| 15– < 20 | 64 (21.12) | 11 (26.83) | 25 (22.94) | 28 (18.30) | |
| 20+ | 87 (28.71) | 10 (24.39) | 17 (15.60) | 60 (39.22) | |
| Education | *N* = 303 | | | | 0.508 |
| Eighth grade or less | 52 (17.16) | 8 (20.00) | 22 (19.82) | 22 (14.47) | |
| Some high school | 59 (19.47) | 5 (12.50) | 24 (21.62) | 30 (19.74) | |
| Completed high school | 100 (33.00) | 14 (35.00) | 39 (35.14) | 47 (30.92) | |
| Some college | 60 (19.80) | 7 (17.50) | 16 (14.41) | 37 (24.34) | |
| Completed college | 32 (10.56) | 6 (15.00) | 10 (9.01) | 16 (10.53) | |
| Income | *N* = 297 | | | | 0.002 |
| $0–$9999 | 89 (29.97) | 14 (36.84) | 41 (37.96) | 34 (22.52) | |
| $10,000–19,999 | 81 (27.27) | 15 (39.47) | 29 (26.85) | 37 (24.50) | |
| $20,000–$29,999 | 55 (18.52) | 2 (5.26) | 23 (21.30) | 30 (19.87) | |
| $30,000–$39,999 | 39 (13.13) | 5 (13.16) | 10 (9.26) | 24 (15.89) | |
| $40,000+ | 33 (11.11) | 2 (5.26) | 5 (4.63) | 26 (17.22) | |
| Immigration status[c] | *N* = 301 | | | | 0.000* |
| Legal permanent resident | 95 (31.56) | 11 (27.50) | 15 (13.89) | 69 (45.10) | |
| Naturalized | 74 (24.58) | 5 (12.50) | 12 (11.11) | 57 (37.25) | |
| Undocumented | 86 (28.57) | 13 (32.50) | 61 (56.48) | 12 (7.84) | |
| Eligible | 33 (10.96) | 9 (22.50) | 15 (13.89) | 9 (5.88) | |
| Legal temp | 13 (4.32) | 2 (5.00) | 5 (4.63) | 6 (3.92) | |
| Language | *N* = 305 | | | | 0.003* |
| Only English | 120 (39.22) | 17 (41.46) | 44 (39.64) | 59 (38.56) | |
| Spanish better than English | 127 (41.50) | 22 (53.66) | 52 (46.85) | 53 (34.64) | |
| Both equally | 52 (16.99) | 2 (4.88) | 11 (9.91) | 39 (25.49) | |
| English better than Spanish | 6 (1.96) | 0 (0.00) | 4 (3.60) | 2 (1.31) | |

**Table 2** (continued)

| | Total[a] *N* (%) | Negative *N* (%) | Neutral *N* (%) | Positive *N* (%) | *p* value |
|---|---|---|---|---|---|
| Health insurance | *N* = 306 | | | | 0.000* |
| Yes | 174 (56.86) | 15 (36.59) | 37 (33.33) | 122 (79.22) | |
| No | 132 (43.13) | 26 (63.41) | 74 (66.67) | 32 (20.78) | |

[a] Total numbers may vary due to missing data

[b] Included: Cuba, El Salvador, Guatemala, Nicaragua, Venezuela, Paraguay, and Puerto Rico

[c] Definitions for categories of immigration status can be found at this source [28]

*$p < 0.05$

## Discussion

Using data from surveys conducted with Latino immigrant adults residing in Queens, New York, this study examined the associations between the migration process and the probability of engaging in HIV testing or risk behaviors. Results demonstrated that Latino immigrants had different experiences and attitudes of migration (negative, neutral, or positive migration experiences). These classes were associated with the majority of the examined sociodemographic characteristics (i.e., sex, age, country of origin, length of time in USA, income, immigration status, language, health insurance), suggesting the important relationship between sociodemographic factors and one's migration experience.

Notably, many sociodemographic characteristics may be unamenable to change, while experiences and understanding of one's migration experience can be targets of intervention. Hence, in addition to efforts to support subgroups who are

**Table 3** HIV testing and risk behaviors by the three latent classes

| | Total[a] *N* (%) | Negative *N* (%) | Neutral *N* (%) | Positive *N* (%) | *p* value |
|---|---|---|---|---|---|
| Ever tested for HIV | (*N* = 306) | | | | 0.136 |
| Yes | 237 (77.45) | 27 (65.85) | 86 (77.48) | 124 (80.52) | |
| No | 69 (22.55) | 14 (34.15) | 25 (22.52) | 30 (19.48) | |
| Tested for HIV in last 12 months | (*N* = 306) | | | | 0.353 |
| Yes | 128 (41.83) | 13 (31.71) | 47 (42.34) | 68 (44.16) | |
| No | 178 (58.17) | 28 (68.29) | 64 (57.66) | 86 (55.84) | |
| Intention to test in next 12 months | (*N* = 301) | | | | 0.054 |
| No | 84 (27.91) | 12 (29.27) | 31 (28.70) | 41 (26.97) | |
| Yes | 169 (56.15) | 18 (43.90) | 56 (51.85) | 95 (62.50) | |
| Unsure | 48 (15.95) | 11 (26.83) | 21 (19.44) | 16 (10.53) | |
| Intention to test every 12 months | (*N* = 301) | | | | 0.034* |
| No | 80 (26.58) | 10 (24.39) | 33 (30.56) | 37 (24.34) | |
| Yes | 170 (56.48) | 19 (46.34) | 54 (50.00) | 97 (63.82) | |
| Unsure | 51 (16.94) | 12 (29.27) | 21 (19.44) | 18 (11.84) | |
| Condom use | (*N* = 262) | | | | 0.417 |
| Yes | 176 (67.18) | 15 (40.54) | 32 (34.41) | 39 (29.55) | |
| No | 86 (32.82) | 22 (59.46) | 61 (65.59) | 93 (70.45) | |
| Had sex in past 12 months | (*N* = 303) | | | | 0.986 |
| Yes | 265 (87.46) | 36 (87.80) | 94 (87.04) | 135 (87.66) | |
| No | 38 (12.54) | 5 (12.20) | 14 (12.96) | 10 (12.34) | |
| I have had more than one sex partner in the last 12 months | (*N* = 299) | | | | 0.191 |
| Yes | 56 (18.73) | 11 (28.21) | 16 (14.95) | 29 (18.95) | |
| No | 243 (81.27) | 28 (71.79) | 91 (85.05) | 153 (81.05) | |

*$p < .05$

[a] Total numbers may vary due to missing data

**Table 4** Latent class analysis model: comparisons of main outcomes between the three latent classes

| | Ever tested for HIV | | | Tested for HIV in last 12 months | | | Intention to test in next 12 months[b] | | | Intention to test every 12 months[b] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | Model 1 OR (95CI) | Model 2 aOR[a] (95CI) | % | Model 1 OR (95CI) | Model 2 aOR (95CI) | % | Model 1 OR (95CI) | Model 2 aOR (95CI) | % | Model 1 OR (95CI) | Model 2 aOR (95CI) |
| Latent class | | | | | | | | | | | | |
| Negative | 65.85 | 1.0 | 1.0 | 31.71 | 1.0 | 1.0 | 43.90 | 1.0 | 1.0 | 46.34 | 1.0 | 1.0 |
| Neutral | 77.48 | 1.76(0.78–3.95) | 2.25(0.84–6.05) | 42.34 | 1.70(0.76–3.80) | 1.69(0.68–4.24) | 51.85 | 1.59(0.75–3.39) | 1.60(0.67–3.80) | 50.00 | 1.24(0.59–2.61) | 1.33(0.56–3.18) |
| Positive | 80.52 | 2.27(1.03–5.01)* | 1.98(0.70–5.54) | 44.16 | 2.05(0.95–4.44) | 1.92(0.76–4.89) | 62.50 | 2.63(1.26–5.48)** | 2.95(1.21–7.17)* | 63.82 | 2.19(1.06–4.51)* | 2.45(1.00–5.99) |

[a] aOR represents the adjusted model that controlled for all of the covariates

[b] Responses of "unsure" to these items were recoded as "no" in this model

*$p < .05$; **$p < .01$

vulnerable to poor health outcomes due to sociodemographic factors, the migration experience classes may facilitate identification of strategies to support immigrants in coping, responding, and understanding their migration process experience to be a more positive one. This multilevel approach may shape immigrants' health outcomes and health-related behaviors.

The results also revealed that the experience of the migration process was associated with HIV testing behaviors, but only future HIV testing behaviors. Latino immigrants in the positive experience class were more likely to intend to get an HIV test in the next 12 months. Although cross-sectional data cannot formally examine the longitudinal nature of the migration process and its influence on health, this finding corroborates previous research suggesting the possible associations between HIV risk and migration [15, 17, 19]. Distinct from previous research, this study highlights the importance of taking immigrants' experience from different migratory stages into consideration, rather than assuming immigrants who share the same migratory stage also share the same overall migration experience.

Health behaviors are influenced by a hierarchy of factors, including individual characteristics, features of the proximal context, and broader structural factors [29]. As participants shared the same community environment and overall structural factors, the lack of significant differences in past or current HIV risk or preventive behaviors by migration experience class may be expected. However, taking the continuity of the migration experience into consideration, the migration experience may contribute to immigrants' outlook towards the future. As a result, Latino immigrants with a positive migration experience may be more likely to adopt positive health behaviors in the future.

## Limitations

This study is not without limitations. First, as a cross-sectional study, causality cannot be determined, and we are not able to illustrate the continuous picture of the migration process and the influence of the migration experience at each migratory stage on HIV testing behaviors. For this reason, the current study is focused on immigrants' overall experience across each stage of migration. Second, important to note is the potential bias resulting from socially desirable responding. We assessed for social desirability using two validated measures of socially desirable response tendency [30, 31]. While these variables were negligibly correlated to the target outcomes of the study, social desirabilities of responses are still important considerations for interpreting study findings. Third, HIV testing behaviors are associated with contextual factors at the community and regional level. We collected data from Latino immigrants in the same community and were thus unable to compare the effect of community environments on the

overall migration experience. Further, this study was conducted with a sample of Latino immigrants in Corona, Queens, and may not be generalizable to other immigrant populations. However, this study design sheds light on the differences between migration experiences among immigrants who shared the same space and time. Future studies may diversify samples at different stages of migration or from different regions, including other urban contexts. Also important to note is that the vast majority of participants reported being heterosexual. Given elevated HIV risk among sexual minority populations such as gay and bisexual men, future studies may focus specifically on sexual minority immigrant groups that are most affected by HIV. Moreover, longitudinal and panel data are crucial for further understanding the confluence of diverse migration experiences on various health outcomes.

## Conclusion

The current study aimed to advance knowledge about the migration process and HIV testing and risk behaviors among Latino immigrants in the USA. We developed an innovative framework to understand and operationalize immigrants' experience across different stages of the migration process and examined the associations between migration experience, sociodemographic characteristics, and health outcomes.

This is among the first studies to the authors' knowledge that sought to understand the influence of immigrants' experiences across each stage of migration on HIV risk or preventive behaviors. The results highlight the role of personal agency in health promotion programs and suggest the need for paradigmatic transformations in addressing immigrants' health issues. Specifically, the study suggests that facilitating positive migration experiences may present strategies to nurture immigrants' capacities to adopt positive health behaviors, including HIV testing.

A focus on the migration experience may demonstrate ways to develop proactive strategies to support Latino immigrants in addressing their negative migration experience or promoting positive migration experiences. These future-oriented strategies are exceptionally promising based on this study.

This study is timely given the current socio-political climate and ostracizing policies towards immigrant populations in the USA. Study findings may guide policy development by demonstrating factors that shape migration experiences and the importance of facilitating positive experiences to promote positive health behaviors and outcomes in the USA. Finally, the results of this study have implications for migrant health, globally. The framework can be applied to other migrant populations, health issues, and migrant destinations around the world. By examining immigrant health with a processual perspective, this study demonstrates approaches for promoting immigrant health that move beyond the context of immigrants' destination countries.

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## Compliance with Ethical Standards

The study was reviewed and approved by the Institutional Review Board at New York University. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments.

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.



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