Published in final edited form as:

Cult Health Sex. 2016 October ; 18(10): 1107–1121. doi:10.1080/13691058.2016.1155751.

Pre- to Post-Immigration Sexual Risk Behaviour and Alcohol Use among Recent Latino Immigrants in Miami

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Abstract

Retrospective pre-immigration data on sexual risk and alcohol use behaviours was collected from 527 recent Latino immigrants to the USA, ages 18–34. Two follow-up assessments (12 months apart) reported on post-immigration behaviours. Using a mixed model, growth curve (MMGC) analysis, a six level sexual risk change variable was constructed combining measures of sexual partners and condom use. MMGC was also used to examine associations between changes in sexual risk behaviour and changes in alcohol use and for testing interaction effects of gender and documentation status. Results suggest individuals with high sexual risk behaviour at pre-immigration converge to low/moderate risk post-immigration, and those who were sexually inactive or had low sexual risk at pre-immigration increased their risk post-immigration. Individuals with moderately higher initial but decreasing sexual risk behaviour showed the steepest decline in alcohol use, but their drinking at time 3 was still higher than individuals reporting low sexual risk at time 1. On average, men drank more than women, except among women in one of the highest sexual risk categories at time 1—they seemed to drink as much, if not more, than men. Undocumented men reported more frequent drinking than documented men. In contrast, undocumented women reported lower alcohol use than documented women.

Keywords

Latino immigrants; Sexual risk behaviour; Alcohol use; Pre- to post-immigration trajectories; USA

US Latinos account for over one-fifth of all new HIV infections in the USA, with rates almost three times higher than non-Hispanic Whites (Centers for Disease Control and Prevention 2012a). Latina women are particularly vulnerable to HIV infection, as more than three-quarters of new infections are attributed to sexual contact with men (Centers for Disease Control and Prevention 2012b). Binge drinking and heavy alcohol use are documented risk factors for STI transmission by decreasing inhibitions and increasing sexual risk behaviours (Sionean et al. 2014). Nationally, Latino men report higher

percentages of heavy and episodic drinking, which contribute to disproportionate alcohol-related problems such as HIV infection and cirrhosis of the liver (National Institute on Alcohol Abuse and Alcoholism [NIAAA] 2013). While historically Latina women report less alcohol use than their male counterparts, recent evidence suggests shifts in their drinking patterns, whereby Latina women may drink as much, if not more, than Latino men (NIAAA 2013).

Migration is often considered a risk factor for the acquisition of HIV and other STIs (Deane, Parkhurst, and Johnson 2010), mainly through increased alcohol (Lara et al. 2005; Szaflarski, Cubbins, and Ying 2011) and illicit drug use (Organista and Kubo 2005) and sexual risk behaviour (Alderete et al. 2000; Gindi, Erbelding, and Page 2010; Kissinger et al. 2008; Organista and Ehrlich 2008; Organista and Kubo 2005). In Latino immigrants, experiences of family separation, pervasive loneliness and isolation, as well as depression and anxiety increased substance use post-immigration, which in turn contributed to a higher likelihood of infrequent condom use, casual sex, and engagement in sex work (Kissinger et al. 2008; Mills et al. 2013; Organista and Ehrlich 2008; Organista and Kubo 2005; Rhodes et al. 2009; Winnett et al. 2011).

Pre-to Post-Immigration Changes in Risk Behaviour

Research on health assimilation is often limited by the use of cross-sectional data to examine health behaviour (Teitler, Hutto, and Reichman, 2012). A number of studies have used retrospective, pre-immigration sexual risk and substance use histories to better understand how the context and environment in the USA may increase risk-taking, especially among individuals who do not report sexual risk and substance use behaviours prior to immigration (Mills et al. 2013; Sastre et al. 2015; Sanchez et al. 2014). Mills and colleagues (2013) examined pre-to post-immigration sexual risk and alcohol behaviour changes among Latino migrant men in the context of Post-Hurricane Katrina in New Orleans. In their research, environmental stressors such as family separation, cultural changes and language barriers were associated with an increase sexual risk taking (commercial sex, same sex encounters) and drug use (specifically crack cocaine) post-immigration; however binge drinking behaviours were constant during the transition. Findings from research by Mills et al. 2013 may be unique given that the increased Latino immigrant population in New Orleans was largely focused on rebuilding following Hurricane Katrina. However, New Orleans is not a traditional immigrant receiving context, which may be associated with greater challenges for recent Latino immigrants in this host community.

Using data on recent Latino immigrants in Miami, Florida, researchers examined pre- to post-immigration condom use, number of sexual partners and alcohol use. In contrast to research by Mills and colleagues (2013), Sastre and colleagues (2015) found that Latino men reported fewer sexual partners post-immigration and both Latino men and women reported a decline in condom use. However, contrary to Latino men, Latina women demonstrated an increased number of sexual partners (Sastre et al. 2015). Sanchez and colleagues (2014) found similar results in alcohol use from pre- to post-immigration. Overall, there was a significant decline in alcohol use from pre-to post-immigration—with a steeper decline in alcohol use among Latino men compared to Latina women. Since Miami

has a long history of receiving diverse Latino immigrant groups, especially in comparison to New Orleans, these more favourable findings may reflect stronger social supports and existing social infrastructure in the receiving environment.

Health disparities researchers have found consistent evidence that risk factors for diseases, such as HIV, do not occur in isolation; rather, they tend to be synergistic (Singer et al. 2006). The present study builds on previous research by documenting the *co-occurrence* of change in sexual risk behaviour and alcohol use from pre- to post-immigration among recent Latino immigrants who immigrated from Latin America or the Caribbean to Miami, Florida. In this study, we asked two primary research questions: (1) how does sexual risk behaviour change from pre-immigration to post-immigration, and (2) are changes in sexual risk behaviour associated with changes in alcohol use over time? Secondary research questions were included to test interaction effects of key variables identified in previous literature: (3) do changes in sexual risk behaviour and alcohol use differ by gender, and (4) do changes in sexual risk behaviour and alcohol use differ by documentation status? We hypothesise that individuals as a whole will decrease their sexual risk and alcohol use post-immigration. However, for individuals whose sexual risk behaviour increased, we hypothesise that this will also be associated with an increase in alcohol use. Based on previous research, these associations will likely be influenced by both gender and documentation status.

Methods

Procedures

The present investigation is a secondary analysis of data collected as part of the Recent Latino Immigrant Study, a longitudinal investigation funded by the National Institute of Minority Health and Health Disparities (P20MD002288). The Recent Latino Immigrant Study is one of the first investigations to document pre-immigration alcohol and HIV risk behaviour in a sample of recent young adult Latino immigrants, examining the underlying socio-cultural factors associated with trajectories of risk after immigration. The study collected three waves of survey data (baseline and two annual follow-ups). During the baseline assessment (ages 18–34; T₁), retrospective data were obtained. Two follow-up assessments (T₂ & T₃), 12 and 24 months later, collected post-immigration data. The study protocol was reviewed and approved by the institutional review board at Florida International University in Miami, Florida.

Participants were recruited using respondent-driven sampling. This technique is an effective strategy in recruiting participants from difficult-to-reach populations (Salganik and Heckathorn 2003), such as undocumented or recent immigrant (De La Rosa et al. 2012). Each participant (*the seed*) was asked to refer three individuals in his/her social network who met eligibility criteria. Seeds were recruited via flyers posted in Miami-Dade County neighbourhoods with substantial Latino populations, during Latino health fairs in Miami-Dade County, and through Latino Community Health Centres. This procedure was followed for a maximum of three legs per seed.

Sample

Participants were Latino immigrants, 18–34 years old, who recently immigrated (approximately one year prior to baseline assessment) to Miami, Florida from a Latin American or Caribbean country. At baseline (T₁), 527 participants were enrolled and assessed. At T₃, 479 participants were retained (91% retention rate). Bilingual research staff conducted the surveys using computer-assisted personal interviewing (CAPI) technology. All surveys were conducted in Spanish and were completed in approximately one-hour. Participant compensations were \$50, \$30, and \$60 for T₁, T₂, and T₃, respectively and were completed in confidential, safe locations agreed upon by the interviewer and participant. Most interviews were conducted in the participant's home (65%), followed by a restaurant/coffee shop (20%), and at another public place (15%).

Measurement

Sexual Risk Behaviour—Sexual risk behaviour was constructed using two indicators. One indicator was the number of partners in the 12 months prior to survey, and the other was the frequency of condom use (1=always used condom, 2=sometimes used condom, 3=never used condom). The sexual behaviour risk variable had six levels, with higher value indicating more risk (0=no sex partner in the past 12 months, 1= always used a condom, 2=single partner and sometimes used condom, 3=single partner and never used condom, 4=two or more sex partners and sometimes used condom, 5=two or more sex partners and never used condom). The sexual risk variable reflected the degree of risk behaviour and was based on previous research with adolescents (Fisher et al. 2014). The distribution for the sexual behaviour risk variable was relatively symmetric in all three waves.

Alcohol Use—Alcohol use was measured by the World Health Organization's Alcohol Use Disorders Identification Test (AUDIT) and was assessed at each of the three waves. The AUDIT is a very reliable and simple screening tool, which is sensitive to early detection of risky and high risk drinking. It has three questions on alcohol consumption (questions 1–3), three questions related to drinking behaviour and dependence (questions 4–6), and four questions targeting the consequences or problems related to drinking (questions 7–10). Questions 1 to 8 are scored on a five-point scale from 0–4. Questions 9 and 10 are scored on a three-point scale. The AUDIT assesses alcohol use in the last 12 months and higher scores indicate more alcohol use. In the present study, the AUDIT was included as an ordered, discrete variable. The frequencies indicated the distribution of alcohol use was positively skewed.

Covariates—Covariates included income and age as continuous variables. Marital status had six categories: married, separated, common law/living as married, divorced, single/never married, and widowed. Gender (male/female) and documentation status (legal/undocumented) were included as moderating variables.

Data Analysis Plan

To answer the first research question, how does sexual risk change from pre-migration to post-migration, we used a mixed model, growth curve analysis. The growth curve modelled the three time points as a linear function of time with two parameters: an intercept and a

slope. The intercept represents the level of risk at Time 1 and the slope represents the change in sexual risk behaviour from Time 1 (pre-immigration) to Time 3, measured at Time 1. An unstructured variance-covariance matrix was posited to allow variances for the slope and intercept to differ. This model estimates a slope and an intercept value for each subject. We then categorised each subject based on the slope and intercept of sexual behaviour (condom use and number of sexual partners). The resulting values are relative to the mean intercept and slope and the analysis provides a significance test for the intercept (different from the mean or not) and the slope (different from the mean or not). To answer the second research question, how does sexual risk behaviour change associate with alcohol use over time, we conducted a repeated measures, nonlinear mixed model of alcohol by sexual risk categories. We also tested differences across sexual risk behaviour categories on several demographic variables in order to determine if it was necessary to control for those variables in the model. Income, age, and marital status were included as potential covariates. For the third and fourth research questions, the main and interaction effects of gender and documentation status were tested using a repeated measures, nonlinear mixed model. Finally, although we tested our research questions using a mixed model, growth curve analysis with maximum likelihood estimation, and the parameters of the model are unbiased under the assumption that data are missing at random, we did examine patterns of missingness on condom use, number of sexual partners, and alcohol use and the covariates. We found no differences in the baseline variables between those with or without missing data at the later time points.

Results

Descriptive analyses

Most participants in the sample were male (54.6%). The immigrant sample was mostly from North America (45.6%), followed by Central America (27.3%) and South America (27.1%). Cuban origin (42.1%), Columbian (17.7%) and Honduran (12.5%) immigrants were the largest Hispanic subgroups in the sample (A full list of the countries of origin represented in the sample are presented in Table 1). The sample was fairly representative of the Miami-Dade County Latino immigrant community, which is 52.7% Cuban, 16.8% South American, and 13.1 % Central American (U.S. Census Bureau 2011). Most participants reported having legal documentation to live in the USA (67.4%). Over half of participants reported at least some training/or college education or above.

Most participants across all three-time points reported some sexual activity. The number of participants with one partner increased across time: 60.65%, 78.08%, and 86.93% respectively. Condom use also declined across waves, from 34% at Time 1 reporting having sex and never using a condom to 53% at Time 3. Combining the number of sex partners and condom use status, most sexual risk behaviour was reported at Time 1, prior to immigration. At Time 1, 14.45% of participants had two or more sex partners and sometimes used a condom, and this number decreased to 8.22% at Time 2 and 4.13% at Time 3. Few participants reported having multiple partners and never using a condom. Across all three waves, 17 respondents (3.2%) affirmed testing positive for an STI and 4 respondents (0.8%) reported they had HIV/AIDS.

Mixed Models of Growth Curve Analyses

The first mixed model identified five sexual behaviour risk categories. The respondents whose intercept and regression coefficients were not significantly different from the average (overall mean intercept was 2.2438 and slope was 0.1279) were placed into Category 1. Category 1 indicated the typical initial status and change of sexual behaviour risk in the sample. The typical behaviour suggests most participants demonstrated moderate risk (i.e. one partner and sometimes used condom; one partner and never used a condom) behaviour at Time 1, with a very slight increase in the slope over time. The intercept in Category 2 is higher than the typical category (although not significantly higher) and the slope is significantly more negative than the typical group. This suggests that participants in Category 2 are declining in sexual risk behaviour over time.

At Time 1, Category 3 had lower sexual risk behaviour than Category 1, although not significantly so, but increased in sexual risk behaviour over time significantly more than Category 1. In Category 4, individuals participated in significantly higher risk behaviour than the typical group at Time 1, but sexual risk behaviour declined significantly from Time 1 to Time 3. In Category 5, participants were significantly lower in sexual risk behaviour than participants in Category 1 at baseline. However, participants in Category 5 increased significantly more in sexual risk behaviour over time than those participants in Category 1. Interestingly, participants in the sample with high initial sexual risk behaviour did not increase over time, nor did participants who had a lower level of initial sexual risk behaviour significantly decrease in their sexual risk behaviour over time.

The relation between sexual risk categories and gender was significant (χ^2 (4) = 46.38; $p < .0001$) indicating that the proportion of men and women differed by category. The proportions of men and women are about even for sexual risk Categories 1 and 5, but there are significantly more men in Categories 2 and 4, and significantly more women in Category 3. Thus, men are more likely than women to have a higher level of sexual risk behaviour at Time 1 but decline in risk over time, whereas women are more likely than men to show a lower level of sexual risk behaviour at Time 1 but an increase over time. However, there are approximately equal proportions of men and women in Category 5, which has the lowest level of sexual risk behaviour at Time 1 but the greatest increase over time, and in Category 1, which is closest to average for level and change in sexual risk behaviour over time.

In the second mixed model, we examined the relation between alcohol use and sexual risk behaviour change over time. First, we tested whether the covariates were significantly related to sexual risk. Age, income, and marital status were not significantly related to sexual risk and were therefore excluded from the mixed model. Because the distribution of the AUDIT measure was positively skewed, we used a generalised, nonlinear mixed model assuming a Poisson distribution with a log link function. There were three predictors for the model: group, time, and the group by time interaction. The group effect was significant [F (4, 522) = 12.79, $p < .0001$] as was the time effect [F (2, 867) = 12.46, $p < .0001$]. However, these must be interpreted by considering the interaction, which was also significant [F (8, 867) = 2.01, $p = .0430$]. The average alcohol use at Time 1 was higher than at Time 2 or Time 3, but there were no differences in alcohol use between Time 2 and Time 3. Category 1 (the typical group) did not differ significantly from Categories 3 and 5 but was significantly

lower in alcohol use than Categories 2 and 4. Category 2 did not differ from Category 4 and Category 3 did not differ from Category 5. We compared differences in sexual risk behaviour categories by alcohol use at Time 2 and Time 3, compared to Time 1. At Time 2 and Time 3, only Category 4 (which had the highest initial risk, but greatest decline over time) differed from Categories 1, 3, and 5. This suggests that Category 4 is not decreasing in alcohol use as much as Category 2 over time. Figure 1 shows the interaction of time by sexual risk behaviour category on alcohol use.

Because previous research suggests differences in sexual risk behaviour and alcohol use by gender and documentation status (Sastre et al. 2015; Sanchez et al. 2014), we tested the main and interaction effects of these variables in the next model. In the third mixed model, the three-way interaction of time by sexual risk behaviour categories by gender was not significant ($p=0.7335$) nor was the time by gender interaction ($p = 0.2089$). However, we found that the gender ($p < 0.0001$) and the gender by sexual risk categories interaction ($p = 0.0005$) were significant. The resulting model included all significant predictors, sexual risk behaviour categories ($p < 0.0001$), time ($p < 0.0001$), the sexual risk behaviour categories by time interaction ($p = 0.0429$), gender ($p < 0.0001$), and the sexual risk behaviour categories by gender interaction ($p = 0.0005$). The results indicated that on average men reported more drinking than women. However, in sexual risk behaviour Category 4, women seem to drink as much, if not more, than their male counterparts. This difference was significant despite the small sample size of women ($n=3$) in Category 4. Figure 2 shows the difference in intercepts by gender and sexual risk category. Because gender by sexual risk by time interaction was not significant, this result is consistent across the three time points.

The fourth mixed model included the variables from the previous model (category, time, gender, category by time, and category by gender) plus documentation status and the interactions of documentation status by each of the other variables. Documentation status was a time varying covariate as it may change across time. We first examined the interactions by documentation status with the other variables. None of the three way interactions were significant so we removed these from the model. Of the two way interactions, time by category [$F(8, 8610) = 1.97, p = 0.0479$] and category by gender [$F(4, 517) = 5.56, p = 0.0002$] remained significant. In addition, we found that the documentation status by gender interaction was also significant [$F(1, 89) = 5.02, p = 0.0276$]. In other words, all of the previous effects were still significant when we added documentation status to the model but the gender differences were moderated by documentation status as well as sexual risk behaviour category. Because the interaction with time was not significant, this effect is consistent across all three-time points (see Figure 3). The means of alcohol use were higher in men compared to women, although the magnitude of the difference was larger in the undocumented participants. Figure 3 shows the difference in intercepts by gender and documentation status.

Discussion

Migration is often considered a risk factor for HIV/STI infections (Deane, Parkhurst, and Johnson 2010), especially for immigrant men who engage in other risk behaviour like alcohol use (Mills et al. 2013; Organista and Kubo 2005; Rojas et al. 2014). The primary

purpose of the current study was to examine the co-occurrence of sexual risk and alcohol use and to determine whether changes in one risk behaviour influenced changes in the other from pre- to post-immigration. Since health disparities researchers have consistently found that risk behaviours do not occur in isolation (Singer et al. 2006), taking a multi-risk approach to understanding post-immigration behaviour change is critical to prevention—especially with a hard-to-reach population such as recent Latino immigrant.

In research question one, how does sexual risk behaviour change from pre- to post-immigration, findings suggest that Latino immigrants converged to the middle over time. On average, participants who were risky at Time 1 reported being with a single partner and sometimes or never using a condom at Time 3. On the other hand, participants who reported no sexual contact or sex with one partner and always used a condom, increased in risk to one partner and sometimes or never using a condom. In general, by Time 3, most participants in the sample were with one partner.

These findings are in line previous research on Latino immigrants in Miami. Sastre et al. (2015) studied condom use and the number of sexual partners from pre- to post-immigration and found that men decreased in condom use and the number of sexual partners, whereas women increased in the number of sexual partners and decreased in condom use from pre- to post-immigration. They hypothesised that these changes were related to relationship type, with those in stable relationships reporting less frequent condom use. However, because they modelled condom use and number of partners separately, it was not possible to draw conclusions about individual change in behaviour. Our findings support previous research that Latinos in a committed relationship often report patterns of low condom use (Brady et al. 2009; Pulerwitz et al. 2002); in general both men and women in the current study who report sometimes or never using a condom also report one partner at Time 3.

Yet, our findings do not align with previous research by Mills et al. (2013) on Latino migrants in post-hurricane Katrina, New Orleans. In their study, sexual risk behaviours, such as engaging in commercial sex and same sex encounters, increased post-immigration. Differences in the sexual risk outcomes between studies may be explained by the prevalence of individuals in the Miami sample who emigrated to be with their partners or, if not, partnered soon after arriving in the USA. Additionally, the environmental and community supports in Miami versus New Orleans are quite different. The presence of ethnic enclaves and community supports in Miami may help buffer the stresses, and sometimes traumatic, experiences in migration and may encourage more healthy coping strategies.

For research question two, are changes in sexual risk behaviour associated with changes in alcohol use over time, we found that the change in sexual risk behaviour was related to the change in alcohol use from pre- to post-immigration. Like with sexual risk behaviour, alcohol use, on average, decreased across the entire sample. However, the decline in alcohol use varied and was related, at least in part, to the degree of sexual risk behaviour at pre-immigration and the change in sexual risk behaviour over time. Alcohol use was highest at Time 3 for individuals that demonstrated higher sexual risk behaviour in their country of origin. For example, the typical category and the two categories that reported the lowest sexual risk behaviour at Time 1 (Categories 3 and 5) also reported low alcohol use at Time 1.

In these categories, the reported alcohol use changed very little over time. In contrast, individuals with moderate and high sexual risk behaviour at Time 1 declined in alcohol use more than individuals in the typical and low sexual risk behaviour categories. Although we see the steepest decline in sexual risk behaviour in Category 4 individuals, their decrease in alcohol use was lower than individuals who reported moderate initial sexual risk behaviour and a moderate decline over time (Category 2).

Findings from our study on alcohol use are consistent with previous research. Mills and colleagues (2013) found that Latino migrants did not increase binge-drinking behaviour post-immigration. Although the present study examined alcohol use not binge drinking, findings are consistent in that on the average there was no increase in alcohol use. This finding of lower alcohol use post-immigration was also consistent in research by Sanchez and colleagues (2014). Yet, unlike in previous research, we examined alcohol use within the context of another risk behaviour: sexual risk. With respect to both sexual risk and alcohol use, the findings are congruent with the assertion that health behaviours often improve—at least initially—after arrival in the USA (Jasso et al. 2004; Teitler, Hutto and Reichman 2012).

Finally, with research to the moderating effects of gender and documentation status (research questions 3 and 4), women were less risky in their alcohol use than their male counterparts. One exception was in the category of women who initially reported higher sexual risk at pre-immigration with a fast decline in sexual risk post-immigration. In Category 4, women consumed more alcohol than their male counterparts. Although this sample of women was very small, there was a significant association between pre-immigration sexual risk and alcohol use post-immigration.

As hypothesised, the differences observed in alcohol use post-immigration between men and women were moderated by documentation status. Undocumented men reported more frequent drinking than documented men. However, the difference between undocumented and documented women was contrary to what was observed in the male population: undocumented women reported less drinking than documented women. Differences in male drinking by documentation status may be related to a number of factors, including lower income and educational level and higher acculturative stress in undocumented immigrants (Finch and Vega 2003). Although not tested in the present study, we hypothesize that this may be the result of undocumented women adhering to more traditional cultural, familial, and gender role expectations. Further research is needed to discern whether these factors, among others in undocumented men, account for higher alcohol use observed in this subpopulation, and for women, discern whether the influence of gender roles and expectations—relative to documented women—are a driving factor for their low alcohol use rates 2 years post-immigration.

In sum, accounting for the social and cultural contexts that may be conducive to derailing or supporting the initial decline in alcohol and sexual risk behaviour during this new transitional period is critical to prevention efforts for both sexual transmitted infections and alcohol disorders and consequences. The focus on how these two risk behaviours changed from pre- to post-immigration—a transition period very difficult to follow—makes a

significant contribution to the literature given the dearth of research that uses longitudinal data to examine multiple risk behaviours concurrently. However, these contributions should be interpreted with knowledge about the contextual and methodological limitations of the study.

Miami is home to a large Caribbean and Central and South American population, and is a city that has one of the most diverse Latino populations in the USA (Schwartz et al. 2014). Latinos in the Miami area experience more political and economic advantages compared to Latinos in other cities with large immigrant populations (Stepick and Stepick 2002). Because of the bicultural environment of Miami, immigrants may perceive lower levels of discrimination and acculturative stress than immigrants in other cities in the USA (Sanchez et al. 2014) and as such, this may partially influence decreases in their sexual risk behaviour and alcohol use. However, Latinos in the Northwest and Southwest (e.g. Mexicans) and in the Northeast (e.g. Dominicans) may have different experiences with integration and acculturation. Elevated experiences with discrimination and acculturative stress, as well as fewer social and economic opportunities, may compromise well-being and therefore increase sexual risk and alcohol use behaviours. Future studies could compare the stressors associated with sexual risk and alcohol use in traditional and non-traditional immigrant contexts to better understand how environmental context is related to these outcomes.

Turning to methodological limitations, we could not answer the question about whether having multiple partners but always using a condom was more risky than having one partner but only sometimes using a condom. An examination of partners by condom use at each time point revealed that there were 14 participants with multiple partners at Time 1 who always used a condom (44 with one partner), 3 with multiple partners (36 with one partner) who always used a condom at Time 2, and 6 with multiple partners who always used a condom at Time 3 (24 with one partner). It should be noted that those who report multiple partners and always use a condom are not necessarily risk free but hypothetically would be less risky than someone who sometimes and never uses a condom. However, we did not collect data on participants' condom use practices; for example, timing and effectiveness of condom use. As such, these latter factors could increase risk and therefore the degree of risk may be underestimated in the study sample. Information about a participant's sexual risk and alcohol use behaviour was captured by personal interview rather than a self-administered or computer assisted survey instrument. As such there is a risk for social desirability bias, which may be more pronounced for female participants.

Other potential limitations included recruitment methodology, attrition bias, and the use of a retrospective measure of substance use to assess pre-immigration behaviour. While respondent driven sampling is a preferred method to recruit hidden populations, such as undocumented immigrants, the respondents may not be independent of one another. The information, such as how the participants were related to one another, was not collected. Thus, the weighting procedures, which are suggested for respondent driven sampling, could not be executed. As such, the true p-values may be larger than are reported; however, we do not know the degree to which they may be influenced because we do not know the relationship between the respondents. The impact of not weighting the data may have contributed to type 1 errors. However, a type 2 error, whereby we assume there is not an

important relation when there is, may disrupt the development of preventative interventions that would assist in addressing sexual risk and alcohol use behaviours. In contrast, a type 1 error, whereby we assume there is a relation when there is not, may lead to further research that would contradict the present results. The present study is a secondary data analysis and the findings are meant to inform future data collection and intervention efforts with Latino immigrant populations.

With respect to measurement, pre-immigration sexual risk behaviour and alcohol use data were collected retrospectively, making this information susceptible to errors in recollection. Although we utilized widely accepted and validated measures for collecting information about past history of substance abuse and sexual risky behaviours, there is the potential for inaccuracies in recollection (Dolman and Hawkes 2005). Finally, although participant retention was maintained in the present study, certain findings (or lack thereof) could have been influenced by attrition bias, especially in the second wave of data collection, which experienced the highest attrition rate.

Despite the limitations above, the present study addresses a fundamental gap in the literature by focusing on multiple, co-occurring factors that contribute to HIV risk in Latino immigrants, including condom use, multiple sexual partners, and alcohol use. The growing US Latino population, and their concentration in US urban cities, highlights the important public health significance of focusing on both pre-immigration and post-immigration behaviours. Identifying how these findings are different by gender and documentation status will inform preventive interventions that can be tailored to address the service needs of this population. Future research is needed to comprehensively examine how shifts in the environmental context impact these risk behaviour patterns among Latino immigrants over time—expanding beyond the first two years post-immigration.

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Figure 1.
AUDIT Scores by Sexual Risk Group and Time

Figure 2.
AUDIT Scores by Sexual Risk Group and Gender

Figure 3.
AUDIT Scores by Gender and Documentation Status

Table 1

Demographics of respondents at baseline (N=527)

Variables	Categories	N (%)	Mean (Std)
Gender	Female	239 (45.4)	
	Male	288 (54.6)	
Age	18–23 years old	151 (28.7)	
	24–29 years old	179 (33.9)	
	30–34 years old	197 (37.4)	
	Total		26.95 (4.98)
Country of Birth	Cuba	222 (42.1)	
	Columbia	93 (17.6)	
	Honduras	66 (12.5)	
	Nicaragua	46 (8.7)	
	Guatemala	18 (3.4)	
	Peru	15 (2.8)	
	Venezuela	14 (2.7)	
	Mexico	11 (2.1)	
	El Salvador	10 (1.9)	
	Argentina	10 (1.9)	
	Dominican Republic	7 (1.3)	
	Ecuador	4 (0.8)	
	Costa Rica	3 (0.6)	
	Bolivia	3 (0.6)	
	Uruguay	3 (0.6)	
	Panama	1 (0.2)	
	Chile	1 (0.2)	
Months have been in the USA	1 – 6 months	250 (47.4)	
	7 – 12 months	271 (51.5)	
	More than 12 months	6 (1.1)	
	Total		6.75 (3.13)
Documentation Status	Legal immigrant	355 (67.4)	
Marital Status	Married	109 (20.7)	
	Separated	43 (8.2)	
	Common Law/ Living as Married	71 (13.5)	
	Divorced	21 (4.0)	
	Single/Never Married	282 (53.5)	
	Widow	1 (0.2)	
Employed	Yes	251 (47.6)	
Types of Employment	Temporary	124 (49.4)	

Variables	Categories	N (%)	Mean (Std)
	Permanent	117 (46.6)	
	Other	10 (4.0)	
Total Annual Household Income in the USA			5042.06 (5151.78)
Average Annual Household Income prior to USA			5001.95 (11030.13)
Highest Education Grade	Less Than High School	97 (18.4)	
	High School Diploma	151 (28.7)	
	Some Training/College after high school	178 (33.8)	
	Bachelor's Degree	85 (16.1)	
	Graduate /Professional Studies	16 (3.0)	
Language Proficiency	Speak English Well	72 (13.6)	
	Speak Spanish Well	517 (98.1)	

Table 2

Descriptive analyses of key variables across time

Variable	Categories	Time 1	Time 2	Time 3
		N (%)		
Sexual Partner	No Sex	87 (16.35)	32 (6.02)	28 (5.26)
	One Partner	319 (59.96)	285 (53.57)	379 (71.24)
	Multiple partner	120 (22.56)	48 (9.02)	29 (5.45)
	Missing data	6 (1.13)	167 (31.39)	96 (18.05)
Condom Use	Always used condom	58 (10.90)	77 (14.47)	30 (5.64)
	Sometimes used condom	231 (43.42)	268 (50.38)	204(38.35)
	Never used condom	151 (28.38)	150 (28.20)	265(49.81)
	Missing data	92 (17.30)	37 (6.95)	33 (6.20)
Sexual Behaviour Risk	0= no sex partner in the past 12 months	87 (16.35)	32 (6.02)	28 (5.26)
	1= always used a condom	58 (10.90)	39 (7.33)	30 (5.64)
	2= one partner and sometimes used condom	154 (28.95)	119 (22.37)	95 (17.86)
	3= one partner and never used condom	121 (22.74)	130 (24.44)	260 (48.87)
	4= two or more sex partners and sometimes used condom	76 (14.29)	30 (5.64)	18 (3.38)
	5= two or more sex partners and never used condom	30 (5.64)	15 (2.82)	5 (0.94)
	Missing data	6 (1.13)	167 (31.39)	96 (18.05)
Mean (Standard deviation)				
Alcohol Behaviour	AUDIT	5.7 (6.1)	4.2 (4.7)	4.1 (4.6)
Missing data		0 (0.00)	121 (22.74)	53 (9.96)

Table 3

Frequencies of sexual behaviour risk categories by gender (N=527)

Sexual Risk Behaviour Change	Intercept	Slope	Female	Male
	Mean (Standard Deviation)		n (% within Gender)	
1=typical change over time (n=358, 67.93%)	2.28 (0.40)	0.11 (0.15)	172 (71.97)	186 (64.58)
2=Moderately high at Time 1 with a moderate decline over time (n=42, 7.97%)	3.07 (0.11)	-0.19 (0.05)	5 (2.09)	37(12.85)
3=Moderately low risk at Time 1 with a moderate increase in risk over time (n=71, 13.47%)	1.44 (0.17)	0.45 (0.05)	45 (18.83)	26 (9.03)
4=Higher initial risk with the fastest decline in risk over time (n=31, 5.88%)	3.55 (0.21)	-0.38 (0.10)	3 (1.26)	28 (9.72)
5=lowest initial risk with fastest increase in risk over time (n=25, 4.74%)	0.98 (0.15)	0.65 (0.08)	14 (5.86)	11 (3.82)
Total			239 (45.35)	288 (54.65)