Neighborhood Social Cohesion and Smoking among Legal and Unauthorized Brazilian Migrants in Metropolitan Boston

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ABSTRACT Tobacco smoking is estimated to be the largest preventable cause of mortality in the USA, but little is known about the relationship between neighborhood social environment and current smoking behavior or how this may differ by population and geography. We investigate how neighborhood social cohesion and disorder are associated with smoking behavior among legal and unauthorized Brazilian migrant adults using data from the 2007 Harvard-UMASS Boston Metropolitan Immigrant Health and Legal Status Survey (BM-IHLSS), a probabilistic household survey of adult Brazilian migrants. We employ logistic regression to estimate associations between neighborhood social cohesion, neighborhood disorder, and current smoking. We find that neighborhood-level social cohesion is associated with lower likelihood of being a current smoker (O.R.=.836; p<.05), and neighborhood disorder, measured as crime experienced in the neighborhood, is not associated with current smoking. Neighborhood population density, age, being male, and residing with someone who smokes are each positively associated with current smoking (p<.10). The health of participants' parents at the age of 35, being married, and individual earnings are associated with a reduction in the probability of being a current smoker (p<.05). Migrant legal status and length of residence in the USA are not associated with current smoking. Our findings suggest that neighborhood social cohesion may be protective against smoking. Alternatively, neighborhood disorder does not appear to be related to current smoking among Brazilian migrants.

KEYWORDS Disorder, Stress, Tobacco, Social capital, Health disparities, Undocumented immigrant

INTRODUCTION

Tobacco smoking is estimated to be the largest preventable cause of mortality in the USA, accounting for more than 25 % of deaths in men and 15 % in women over the age of 35.[1,2] Cigarettes kill more than half of US lifetime smokers and account for billions in health care costs and lost productivity.[1] According to 2012 National Health Interview Survey (NHIS) data, 17.4 % of US adults currently smoke—15.4 % of women and 19.7 % of men.[3] However, smoking prevalence rates vary considerably across ethno-racial group, socioeconomic status (SES), nativity, and geography.[4–7]

In terms of ethno-racial disparities, non-Hispanic whites and American Indians exhibit the highest smoking rates (19.9 and 20.9 %, respectively), and non-Hispanic blacks, Latinos, and Asians the lowest (15.8, 12.0, and 11.3 %).[3,8,9] Socioeconomically,

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lower SES individuals (who are also often ethno-racial minorities) are more likely to use tobacco and to smoke for longer durations but less likely to complete smoking cessation programs.[8–11] This is somewhat unsurprising when one considers that those employed in lower paying occupations are more likely to be exposed to secondhand smoke—partly due to insufficient workplace-based smoke-free policies.[12,13] Also, lower compared to higher wage smokers appear to smoke for longer durations.[14] The reasons for these ethno-racial and SES disparities are not entirely clear, though greater exposure to sociogeographic stressors (e.g., household, neighborhood, workplace), less access to health-related and financial resources, targeted advertising and promotion by tobacco companies, and the greater likelihood of belonging to a social network that includes other smokers are all considered important contributing factors.[7,15–19]

Although cultural, geographic, and socioeconomic environmental factors influencing the above disparities in smoking behavior have received some scholarly attention, those related to nativity and immigrant legal status have received almost none. This is surprising given that US-born adults are almost twice as likely to smoke compared to foreign-born adult residents of the USA (18.9 and 9.8 %, respectively) according to 2012 NHIS data and that smoking rates among the foreign-born are estimated to rise the longer they reside in the USA.[3,4,10–13] One study, for example, reports that smoking rates are higher among immigrants who have resided in the USA for at least 15 years (12 %) compared to more recent immigrants (5.3 %).[3] There is little agreement regarding why US immigrants increasingly adopt the smoking behaviors of US-born adults over time; however, it has been suggested that (1) this is part of a broader process in which immigrants are exposed and gradually adjust to a new set of US-based customs (acculturation),[5,20] and (2) this is a response to stressors faced in various sociogeographic environments.[7,21]

In this article, we focus attention on the second argument and specifically investigate ways in which neighborhood environment may be associated with smoking among adult Brazilian migrants. But, why study smoking among Brazilian immigrants residing in the Boston metropolitan area?

There are several reasons. First, Brazilian immigrants are a relatively recent Latin American immigrant group in the USA whose smoking behavior has not been studied using representative data, they are concentrated in the Boston metropolitan area, and the 2007 Harvard-UMASS Boston Metropolitan Immigrant Health & Legal Status Survey (BM-IHLSS) data offer a unique opportunity to study how adjusting to US cultural environments over time influences smoking behavior.[22] Importantly, immigrants from any Latin American nation, who are more likely to be lower wage workers and to be employed in workplaces lacking smoke-free policies,[12,23] represent segments of the US population whose smoking behaviors have been understudied. Past research has found that foreign-born Latino men are more likely to smoke compared to their female compatriots and that, viewed collectively, a smaller percent of all foreign-born Latino adults smoke compared to all US-born adults and to other US-born minority groups separately (except for Asians).[24–26] These results should be interpreted with some caution, however, given that Latino immigrants are also more likely to under-report smoking behavior.[27] And, it is important to note when considering factors influencing Latino immigrant smoking, especially "acculturation," which has often been viewed simply as an individual-level adjustment process, that the tobacco industry has developed strategies to market directly to foreign-born Latin American populations in the USA. For example, corporations have run tobacco advertisements in immigrant enclave communities and have funded studies to investigate brand preference among "assimilated" and "nonassimilated" migrants in order to exploit cultural differences in behavior.[28]

Second, a demographic or life course perspective to health and health behaviors suggests that neighborhood or broader cultural conditions experienced as a young adult, child, or even in the womb can have a profound effect on health behaviors later in life.[29] Brazil is the second largest tobacco producer in the world and home to a thriving illegal tobacco trade.[30] Furthermore, tobacco smoking in Latin America has recently been called "pandemic"[31] and appears to be on the rise, particularly among young women. Nevertheless, thanks in part to countrywide smoke-free policies beginning in the 1990s,[31] the smoking prevalence rate in Brazil (18 %) is estimated to be similar to that in the USA (17 %), and a smaller percentage of women compared to men in Brazil smoke (13 and 22 %). So, it is unclear how having previously resided in Brazil may influence current smoking among Brazilian immigrants in metropolitan Boston, but it is interesting that, according to analysis of the 2007 BM-IHLSS data, the smoking prevalence of Brazilian immigrants in metropolitan Boston (17.7 %) falls just between estimates for Brazil and the USA. This is considerably lower than estimated smoking rates in neighboring South American countries such as Chile (34 %) and Argentina (27 %)[32]—a finding that highlights the importance of studying US immigrant smoking behavior separately by country of origin. Although the 2007 BM-IHLSS data do not permit us to estimate directly how early life conditions in Brazil are associated with current smoking among Brazilian immigrants, we attempt to control for this potential environmental influence in our analysis by including a variable capturing the health of respondents' parents when the former were still residing in Brazil as children, and it is important to keep such potential influences in mind when interpreting our results.

Third, using the 2007 BM-IHLSS, we study how neighborhood environmental conditions may influence smoking among Brazilian immigrants not only because most reside in metropolitan Boston and they represent a recent and understudied Latin American immigrant population but also because the cultural and socioeconomic integration process and likelihood of smoking may be influenced by the neighborhoods in which they currently reside.[33–36] For instance, because immigrants often form or reproduce "ethnic enclaves" within neighborhoods,[37] it is reasonable to expect that existing nativity differences in smoking preferences at this geographic level would influence the likelihood of smoking among more recently arrived migrants. Importantly, not only is metropolitan Boston home to the largest number of Brazilian migrants in the USA (49,269 or 7 % of the foreign-born population residing in metropolitan Boston),[38] but also there are neighborhoods that are greatly influenced by Brazilian immigrant culture as seen in the preponderance of Brazilian stores, social clubs, and churches.

In this paper, we use the 2007 BM-IHLSS data to investigate how neighborhood environment is associated with smoking among legal and unauthorized Brazilian migrants. Specifically, we test two hypotheses. First, we hypothesize that neighborhood-level social cohesion is negatively associated with the likelihood that an adult Brazilian migrant is a current smoker. Second, we hypothesize that neighborhood-level disorder is positively associated with the likelihood of an adult Brazilian migrant being a current smoker. We also control for various other neighborhood-, household-, and individual-level factors as explained in the next section.

METHODS

The 2007 BM-IHLSS is a community-based biodemographic migrant household probability sample survey implemented in the Boston-Cambridge-Quincy, MA-NH Metropolitan Statistical Area (BCQ-MSA) in collaboration with the Brazilian Immigrant Center.[22,39–41] It is the first random household sample survey to collect both legal status

and biological data from any foreign-born population in the USA. And, Metropolitan Boston is home to the largest number of immigrants born in Brazil.[42] Data include information from 307 adult foreign-born Brazilian respondents who were randomly selected from 12 census tracts in the BCQ-MSA where at least 7 % of the total population was born in Brazil, and additional information was collected concerning 120 of their US- and foreign-born children. Respondents provided information about migration and legal status, socioeconomic status, social capital, neighborhood characteristics, and health behavior and health (self-reported as well as biological data samples). Individual sample weights were generated following data collection. More detailed information about the BM-IHLSS study design and objectives has been published elsewhere.[22,39,41,41]

Current Smoking Behavior

Current smoking is based on two questions and measured dichotomously; a value of "1" indicates that the adult subject reported smoking at least 100 cigarettes in his or her lifetime and that he or she currently smokes "some days" or "every day."

Neighborhood Environment

We define our neighborhood environmental variables in two ways. For measures such as social cohesion and disorder, respondents were asked to think about "your neighborhood" when responding. For measures including population density and homeownership, we linked the BM-IHLSS data to block-level Summary File 1 (SF1) data from the 2000 decennial census. *Population density* measures the number of residents per square mile by census block while *homeownership* measures the proportion of owner-occupied housing units by block. *Neighborhood disorder* is measured using a dichotomous variable indicating whether a subject or his or her neighbors had experienced personal violence or property damage, had their homes broken into, or had property stolen from them in their neighborhood. *Social cohesion* is a continuous measure ranging from 0 to 12, based on responses to four questions indicating whether subjects (0) strongly disagree, (1) disagree, (2) agree, or (3) strongly agree with four questions about the neighborhood environment—whether neighbors (1) get along with each other; (2) are willing to help each other; (3) share the same values; and (4) know each other.[43]

Demographic Characteristics

Four individual exogenous characteristics are included in the regression models—*Age* is a continuous measure indicating subject years of life. *Sex* is a dichotomous variable equal to "1" for males and "0" for females. *Skin color* corresponds to the New Immigrant Survey Skin Color Scale[44]; specifically, subjects viewed a picture of ten human hands numbered 1–10 with increasingly darker skin pigmentation from left to right along the scale, and they were asked to point to the hand that they felt most resembled their own pigmentation. *Parental health* is a measure from 0 to 2 indicating whether none, one, or both of the subject's biological parents were in very good or excellent health at the age of 35.

Household and Individual Socioeconomic Characteristics

Six variables are used in the models to control for household and individual-level socioeconomic characteristics. *Married* is a dichotomous measure equal to "1" if the subject is currently married. *Household smoker* measures whether any member of the subject's household, other than the subject, currently smokes (1) or not (0). *College* is a dichotomous measure equal to "1" if the subject has graduated from a 4-year college. *Earnings* measures subject earnings from all jobs for the year prior to the survey, and *insured* is a dichotomous variable equal to "1" if the subject claimed to have had some

form of health insurance coverage. *Time in the USA* is a continuous measure indicating how many years a subject has resided in the USA. Finally, *unauthorized* is dichotomous and set equal to "1" if the subject is estimated to have been unauthorized to reside in the USA using the survey-based legal status estimation methodology pioneered in the 1990s by Marcelli and Heer.[45]

Health Status and Behavior

Lastly, we control for selected health risks and behaviors that may correspond with smoking. *Cardiovascular disease risk* is a dichotomous measure set equal to "1" if the subject has ever been diagnosed with high cholesterol or hypertension. Heart disease and cardiovascular incidents are not included here as none of the adults in the sample reported ever having been diagnosed with these. Brazilian immigrants tend to be younger and healthier than the US population on average.[22] Regarding health behavior, *nutrition* is a dichotomous variable equal to "1" if the subject reported eating five servings of fruits or vegetables each day on average. *Alcohol consumption* is a continuous variable indicating how many days the subject reported drinking alcohol in the past year, and *short sleep* is a dichotomous variable equal to "1" if the subject sleeps less than 7 h per night on average.[46–48]

Statistical Analyses

Descriptive and cross-sectional multivariate logistic regression results are reported below. Stata 10 was employed for performing logistic regressions, and Stata's cluster function was used to control for potential bias that may occur as a result of multiple respondents residing in the same census blocks.[49] Three models are fitted for this study—first, we estimate how current smoking is associated with neighborhood and individual exogenous characteristics; in the second model, we add household and socioeconomic characteristics, and in the third model, we further control for health status and various health behaviors. When reporting both the descriptive and regression results, we include the following symbols next to the variable names to indicate the direction of the hypothesized association with current smoking: (+) for a positive association, (–) for a negative association, or (±) for an uncertain hypothesized association. These symbols also denote whether a one-tailed (+ or –) or two-tailed (±) significance test was performed in each case. The estimated change in the probability of smoking associated with a one-unit change in an explanatory variable (from 0 to 1 for a dichotomous variable, and a one standard deviation increase for a continuous variable) is reported for results obtained from each of our three models, as well as odds ratios for the final model. Changes in the probability of smoking due a one-unit change in an explanatory variable were calculated using two conventional formulas often employed by economists: (1) $\beta x \times \mu(y) \times (1 - \mu(y))$ for dichotomous explanatory variables and (2) $(\beta x \times \mu(y) \times (1 - \mu(y)) \times \sigma(\beta x))$ for continuous explanatory variables.[50]

RESULTS

Descriptive Statistics

Table 1 below shows descriptive statistics for all Brazilian migrant adults then separately for current smokers and nonsmokers. Approximately 18 % of Brazilian adults are estimated to be current smokers, similar to the prevalence rate in the US

TABLE 1   2007 BM-IHLSS weighted descriptive statistics ($n = 307$)

		All Adults μ (S.D.)	Non-smoker μ (S.D.)	Smoker μ (S.D.)	Min.	Max.
Outcome variable						
Currently smokes	Currently smokes = 1 if subject smoked at least 100 cigarettes in lifetime *and* currently smokes some days or every day	0.18	0.00	1.00	0.00	1.00
Neighborhood characteristics						
Population density (+)	Number of residents per square mile by census block	23,228.91 (15,628.59)	21,735.93 (14,253.69)	30,150.18 (19,568.61)	1,087.35	81,182.64*
Homeownership (±)	Percent of residents who own their homes by census block	0.36 (0.21)	0.36 (0.21)	0.36 (0.21)	0.01	0.98
Disorder (+)	Disorder = 1 if subject or neighbors experienced personal violence, had their homes broken into, had anything stolen from their property or experienced damage to their personal property in the neighborhood	0.26	0.27	0.21	0.00	1.00
Social cohesion (−)	Index from 0 to 12, indicating whether subjects strongly disagree (0) to strongly agree (3) that neighbors: (a) get along with each other; (b) are willing to help each other; (c) share the same values; and (d) know each other	5.05 (2.28)	5.15 (2.29)	4.59 (2.21)	0.00	12.00
Individual exogenous characteristics						
Age (±)	Subject age in years	33.66 (9.88)	33.35 (9.79)	35.12 (10.24)	19.00	69.00
Male (+)	Male = 1 if subject reported sex as male	0.54	0.52	0.64	0.00	1.00
Skin color (+)	Self-reported subject skin color, measured from lightest (1) to darkest (10)	2.17 (1.35)	2.16 (1.37)	2.24 (1.22)	1.00	7.00
Parental health (−)	Range from 0 to 2 indicating whether 0, 1 or both of subject's parents were reported to be in very good or excellent health at the age of 35	1.01 (0.84)	1.04 (0.84)	0.82 (0.78)	0.00	2.00
Household and socioeconomic characteristics						
Married (±)	Married = 1 if subject was married at time of survey	0.55	0.59	0.40	0.00	1.00*

Variable	Description	Mean (SD)	Mean (SD)	Mean (SD)	Min	Max
Household smoker (+)	Household smoker=1 if any other member of subject's household smokes	0.28	0.21	0.58	0.00	1.00*
College graduate (−)	College graduate=1 if subject received Bachelor's degree	0.12	0.12	0.12	0.00	1.00
Earnings (−)	Subject earnings from all jobs in 2006 (thousands of dollars)	33.21 (22.96)	34.53 (23.46)	27.10 (19.56)	0.00	150.00
Insured (−)	Insured=1 if subject has health insurance	0.40	0.43	0.30	0.00	1.00
Time in the USA (+)	Number of years subject has resided in the USA	5.97 (4.46)	5.95 (4.30)	6.07 (5.21)	0.00	27.00
Unauthorized (−)	Unauthorized=1 if subject is estimated to have been unauthorized to reside in the USA	0.71	0.71	0.72	0.00	1.00
Individual health status and behavior						
Serious psychological distress (±)	Distress=1 if subject's score on the Kessler 6 (K6) scale>12 (range=0–24), indicating serious psychological distress	0.07	0.06	0.09	0.00	1.00
Cardiovascular risk (±)	CV risk=1 if subject has been diagnosed with hypertension or high cholesterol	0.08	0.10	0.02	0.00	1.00
Nutrition (−)	Nutrition=1 if subject consumes an average of five or more fruits/vegetables per day	0.25	0.24	0.28	0.00	1.00
Alcohol consumption (+)	Number of days subject reported drinking alcohol in past year	14.58 (59.24)	13.82 (57.35)	18.09 (67.84)	0.00	365.00
Short sleep (+)	Short sleep=1 if subject reported sleeping less than 7 h per night on average	0.23	0.22	0.29	0.00	1.00
N (weighted)		61,335	50,452	10,883		
N (unweighted)		307	254	53		

*Difference in means is statistically significant, $p<0.05$

adult population as a whole (17.4 %) but twice that of all US foreign-born residents (9.8 %). *Neighborhood Characteristics*: Those who smoke are estimated to reside in neighborhoods with greater population density (~30,000 vs ~22,000 people per square mile) and to have lower social cohesion with their neighbors (4.6 vs 5.2 on a scale ranging from 0 to 12). Homeownership rates are nearly equivalent at 36 %, but surprisingly, smokers are less likely to report neighborhood-level disorder (21 %) than their nonsmoking counterparts (27 %). *Individual Exogenous Characteristics*: Smokers are estimated to be slightly older (35 vs 33 years), more likely to be male (64 vs 52 %), and to have slightly darker skin pigmentation (2.24 vs 2.16). Smokers also reported that fewer than one (0.8) of their parents were in good health at the age of 35 compared to nonsmokers who had at least one parent in good health (1.0). *Household and Socioeconomic Characteristics*: Substantially, fewer smokers are estimated to be married (40 vs 59 % of nonsmokers), and many more appear to reside with someone else who smokes (58 vs 21 %). Smokers also are estimated to have lower earnings than nonsmokers (~$27,000/year vs ~$35,000) and to be less likely to have health insurance (30 vs 43 %), but smokers and nonsmokers seem to share similar educational profiles—12 % of both groups have a 4-year college degree. Both groups are estimated to have similar legal status profiles as well, with 72 % of smokers being unauthorized compared with 71 % of nonsmokers. Consistent with previous literature, smokers are estimated to have resided in the USA slightly longer than nonsmokers (6.1 vs 5.9 years), but the difference is minimal, possibly owing to the relative recency of Brazilian migration to the USA. *Individual Health Status and Behavior*: Brazilian immigrant smokers are estimated to be more likely to have experienced serious psychological distress than nonsmokers (9 vs 6 %) but are less likely to have been diagnosed with hypertension or high cholesterol (2 vs 10 %). Smokers are also estimated to be more likely to have eaten the USDA-recommended daily number of servings of fruits and vegetables (28 vs 24 %), to have consumed alcohol on more days in the previous year (18 vs 14), and to report sleeping fewer than 7 h a night on average (29 vs 22 %).

Importantly, in all descriptive results reported above in Table 1, an asterisk (*) indicates that we are 95 % confident that the reported bivariate relationship between current smoking and the explanatory variable reflects what is true for all adult Brazilian migrants residing in the BCQ-MSA.

Logistic Regression Results

Table 2 below reports logistic regression results for current smoking among all adult Brazilian migrants residing in metropolitan Boston. *Neighborhood Characteristics*: Concordant with our first hypothesis, a 19 % (2.28 unit) increase in the social cohesion index, even after controlling for all other variables in our models, is significantly associated with a 6 % reduction in the likelihood of smoking. And, residing in a census block with about 15,000 more neighbors is associated with an 8 % higher probability of smoking. However, contrary to expectation, neither neighborhood-level disorder nor the homeownership rate is statistically associated with smoking.

Individual Exogenous Characteristics. Age and being male are positively and significantly associated with current smoking, and parental health is negatively and significantly associated with smoking. Specifically, for every additional decade (9.9 years) of life, there is an estimated 7 % greater probability of being a current smoker; men are approximately 9 % more likely to smoke, and having at least one

TABLE 2 Logistic regression of current smoking on neighborhood characteristics, 2007 BM-IHLSS (n=307)

	Model 1			Model 2			Model 3			
	β	S.E.	Prob.	β	S.E.	Prob.	β	S.E.	Prob.	O.R.
Neighborhood characteristics										
Population density (+)	0.00004	(0.000)	9.53 %***	0.00004	(0.000)	8.87 %***	0.00004	(0.000)	8.33 %	1.000***
Homeownership (±)	1.350	(0.917)	4.16 %	0.946	(0.977)	2.91 %	0.630	(0.953)	1.94 %	1.878
Disorder (+)	−0.699	(0.378)	−10.20 %	−1.024	(0.409)	−14.95 %	−0.978	(0.404)	−14.27 %	0.376
Social cohesion (−)	−0.131	(0.079)	−4.35 %**	−0.181	(0.088)	−6.02 %**	−0.180	(0.086)	−5.98 %	0.836**
Individual characteristics										
Age (±)	0.022	(0.019)	3.11 %	0.042	(0.020)	6.01 %**	0.046	(0.021)	6.59 %	1.047**
Male (+)	0.622	(0.334)	9.08 %***	0.701	(0.380)	10.23 %***	0.592	(0.453)	8.65 %	1.808*
Skin color (+)	0.046	(0.151)	0.91 %	−0.002	(0.151)	−0.04 %	0.058	(0.160)	1.13 %	1.059
Parental health (−)	−0.325	(0.183)	−3.97 %***	−0.387	(0.207)	−4.72 %***	−0.361	(0.207)	−4.41 %	0.697**
Household and socioeconomic characteristics										
Married (±)				−0.720	(0.310)	−10.51 %***	−0.683	(0.329)	−9.96 %	0.505**
Household smoker (+)				1.608	(0.385)	23.47 %***	1.739	(0.451)	25.38 %	5.690***
College graduate (−)				0.321	(0.520)	4.68 %	0.417	(0.532)	6.08 %	1.517
Earnings (−)				−0.019	(0.012)	−6.48 %*	−0.018	(0.011)	−5.95 %	0.982**
Insured (−)				−0.551	(0.471)	−8.04 %	−0.504	(0.478)	−7.36 %	0.604
Time in the USA (+)				0.023	(0.046)	1.51 %	0.023	(0.046)	1.53 %	1.024
Unauthorized (−)				−0.044	(0.351)	−0.64 %	0.002	(0.401)	0.03 %	1.002
Health status and behavior										
Serious psychological distress							0.018	(0.594)	0.26 %	0.26 %
Cardiovascular risk (±)							−1.841	(1.289)	−26.87 %	0.159
Nutrition (−)							0.126	(0.568)	1.85 %	1.135
Alcohol consumption (+)							0.001	(0.003)	0.93 %	1.001
Short sleep (+)							0.519	(0.460)	7.57 %	1.680
Constant term (+/−)	−3.084	(0.918)		−2.862	(0.896)		−3.201	(1.043)		
Concordant Pairs	0.824			0.867			0.874			
Prob > chi2	0.000			0.000			0.000			
Pseudo R2	0.099			0.230			0.252			

*$p \leq .10$

**$p \leq .05$

***$p \leq .01$

parent who was healthy at the age of 35 is associated with a 4 % lower likelihood of smoking. Skin color is not estimated to be associated with smoking.

Household and Socioeconomic Characteristics. Being married is associated with a 10 % lower likelihood that someone is a current smoker, and sharing a household with at least one other person who smokes is associated with a 25 % greater likelihood of smoking (the largest normalized association in our study). Additionally, for every additional $23,000 in annual earnings, there is a 6 % reduction in the probability of being a current smoker. Education and health insurance coverage are not significantly associated with smoking, however. And, neither time residing in the USA nor legal status is significant. Likewise, previous analyses not reported here revealed that English language proficiency is unimportant, suggesting that typical acculturation measures may not be particularly salient for explaining smoking in this population.

Individual Health Status and Behavior. Although none of our health status or behavior variables are statistically associated with smoking, their inclusion in our third model modifies the substantive or statistical significance of some other statistically significant variables (e.g., population density, age, sex, parental health, household member who smokes).

DISCUSSION

Past research has demonstrated the perils of tobacco use, but smoking has not been adequately studied in vulnerable populations, such as recent US immigrants and other groups in which particular environmental stressors may enhance the probability of using smoking as a coping mechanism or interfere with smoking cessation efforts. Our study is novel for investigating current smoking among a specific foreign-born population with a high proportion of unauthorized residents (71 %) and focusing on sociogeographic in addition to individual-level acculturation factors.[41] And, although multivariate regression results confirm our second main hypothesis that neighborhood-level social cohesion is negatively associated with smoking and thus may reduce the likelihood of smoking, they are inconsistent with our first that neighborhood-level disorder is positively associated with smoking. It is possible that the measure of neighborhood-level disorder we employ, which focuses more on acute experiences of crime and personal violence, is less important than other metrics for explaining smoking behavior. For example, perhaps more chronic measures of neighborhood disturbance, such as noise pollution, physical disorder, or crowding will prove to be more important. This seems plausible in light of our finding that population density is estimated to be positively and significantly associated with smoking.

   Although recommending practical policy interventions that may capitalize on the relationship between neighborhood-level social cohesion and smoking remains a challenge, we suggest three promising possibilities for making the best use of these and similar findings. First, there has been much attention recently to the ways in which neighborhood built environments influence health behaviors, but much less attention has been paid to the built environment's influence on the propensity for social interaction in local areas. This is a potentially rich area of study given what we and others have found regarding the protective nature of neighborhood-level

social capital. It may be that small changes to neighborhood environments, such as carving out areas for green space or limiting the concentration of alcohol and tobacco outlets,[51] could prompt further engagement between neighbors. Second, community-based interventions in Latino communities that involve *promotoras* (typically adult female community members who receive training to provide basic behavioral health education to neighbors) have shown promise with respect to various health behaviors, including smoking cessation.[52,53] Increasing these efforts and rigorously evaluating their effectiveness may prove useful, especially among immigrant populations lacking health insurance and a usual source of medical care.[19] Third, and perhaps most difficult, focusing on so-called urban renewal[7] in local planning could alter perceptions and structures of troubled neighborhoods in which social interaction is stifled. The challenge in attempting to revitalize communities is to balance respect for the existing resident population with alterations designed to increase neighborhood safety, walkability, and aesthetic appearance. There are a few novel experiments that have tried to achieve this balance,[54] but it is a formula in need of more tinkering and future research would do well to explore residents' perceptions of revitalization efforts and track long-term health trajectories in its wake.

Study Limitations
This study is limited by the cross-sectional design of the 2007 Harvard-UMASS BM-IHLSS; it is not possible to determine whether a statistically significant neighborhood characteristic has a causal effect on current smoking. Furthermore, these data represent the population of Brazilian migrants residing in New England in 2007, and the extent to which the results can be generalized to Latin American or other migrants residing elsewhere in the USA is unclear. Nevertheless, our results suggest that social cohesion in particular may be protective against smoking, at least for Brazilian migrants. The study is further limited by a lack of measures designed to capture objective aspects of the neighborhood, including built environment characteristics and concentration of tobacco outlets and advertisements. However, we are able to proxy physical disorder to some extent by including census block population measures and a measure of self-reported disorder that addresses issues of neighborhood safety and crime.

Conclusion
The 2007 Harvard-UMASS BM-IHLSS is the first representative study of Brazilian migrants in the USA that includes comprehensive measures of neighborhood characteristics along with immigrant legal status data. Our findings suggest that neighborhood-level social cohesion may be an important buffer against smoking behavior. However, there remains a lack of research on the particular properties of neighborhood environments that may promote cohesion, which may be important for understanding how to capitalize on this protective measure. Future work would also do well to evaluate different measures of neighborhood disorder for their relationship to smoking, including more readily observable traits, such as physical signs of disorder and tobacco availability and advertising density. It would also be useful to investigate sociogeographic influences on smoking in other immigrant and low income or minority populations.

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