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Household Density among Undocumented Mexican Immigrants in New York City

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Abstract *Background* High household density increases exposure to communicable diseases, psychological distress in adults, and poor long-term health in children. High residential density, which may be a mediator of poor health, is common among immigrants. *Methods* We used data from a pilot survey among Mexican immigrants in New York City. Respondents were recruited through venue-based sampling in neighborhoods with large Mexican populations. *Results* Among respondents that reported being undocumented ($N = 404$), the mean number of people per room (PPR) of residence was 2.2. In multivariate analyses, living in conditions of >2 PPR was positively associated with living with one's children (OR = 2.3, 95% CI = 1.4–3.9), having experienced food insecurity in the past 6 months (OR = 2.0, 95% CI = 1.1–3.6), and language discrimination (OR = 2.3 compared to other forms of discrimination, 95% CI = 1.2–4.4). *Conclusions* Undocumented Mexican immigrants, particularly those who are linguistically marginalized and experience food insufficiency, live in conditions of marked household density in NYC.

Keywords Undocumented immigrants · Mexicans · Housing · High residential density · Economically marginalized

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Background

The deleterious health effects of housing conditions—e.g., mold, pest infestation, unsafe drinking water, asbestos—have been well documented [1–3]. The health effects of high household density—defined as the number of occupants per room or square foot—are much less clear. While studies have found associations between high household density and negative health outcomes [4–8], the causal relationship is highly debated and other studies have shown low household density may not be associated with positive health outcomes [9–11].

Foreign-born and minority residents of the U.S. experience markedly denser and poorer housing conditions than native-born residents [12–14]. In New York City (NYC), foreign-born residents are more likely than native-born to live in denser conditions, in structures of

poorer quality with maintenance deficiencies, and to contribute a larger proportion of household income to housing costs. In particular, immigrants who live with children under age 18 and other unrelated individuals, have less than a high school education, and receive public assistance, are more likely to live in conditions of high household density and poorer quality housing [12]. In another analysis, it was shown that the foreign-born, particularly Hispanic, Asian, and more recent immigrants were more likely to be living in crowded conditions than other groups [10].

The foreign-born, among whom housing conditions have consistently been worse, have also increased in population—by 57% between 1990 and 2000 [15]. The number of undocumented persons entering the United States has overtaken the number entering legally [16] and Mexicans make up the largest proportion of both groups: in 2005 Mexicans accounted for 56% of the estimated 11.1 million undocumented persons living in the United States [17]. In 2006, NYC was home to 3 million foreign-born residents, of which an estimated 169,500 were from Mexico [18], representing a growth of 275% between 1990 and 2000 [19]. Unofficial estimates of the actual size of the NYC Mexican population suggest that the real number may have been closer to 300,000 in 2000. Like Mexicans in other parts of the United States, a substantial portion of Mexicans in NYC are believed to be undocumented [20]. Meanwhile, newly arrived immigrants to NYC face one of the least affordable housing markets in the United States, with among the lowest vacancy rates and highest housing costs in the nation [21, 22]. This may put the expanding population of undocumented Mexican immigrants at particular disadvantage with regard to housing options, and at risk of health problems associated with poor housing.

To date, little has been reported on the health or living conditions of the quickly expanding Mexican-born population in NYC. In this paper, we begin to fill this gap by describing household density and its correlates among a sample of undocumented Mexicans in NYC.

Methods

Sample

The sampling frame consisted of adults (aged 18 years or older) from all five boroughs of NYC who reported being born in Mexico. Participants were recruited from 12 communities with large populations of Mexican immigrants according to the U.S. Census, as described previously [23]. The neighborhoods selected were: the South Bronx, Chelsea, East Harlem, the Lower East Side, Astoria, Elmhurst, Jackson Heights, North Corona, Bushwick, Sunset Park, Williamsburg, and Port Richmond.

Outreach workers, trained in the data collection requirements of the study, recruited potential participants between October 2004 and December 2004 using street outreach techniques common in research involving immigrant populations [24–26] and other hard-to-reach populations [27, 28]. Outreach workers positioned at pre-identified venues with heavy foot traffic solicited participation by distributing fliers and engaging people in conversations about the objectives, inclusion criteria, and the voluntary nature of the study. Participants qualified for the study if they reported being 18 years of age or older, were born in Mexico, and were currently living in NYC. Interviews were conducted in English or Spanish by trained, supervised interviewers. The Institutional Review Board at the New York Academy of Medicine and the University Committee on Activities Involving Human Subjects at New York University approved the study and all study subjects provided oral consent at the time of the interview. In order to preserve participants' anonymity, no personal identifiers (e.g., name, address, etc.) were collected from participants.

Measures

We asked about demographic characteristics, including age, gender, marital status, level of education, and number of children. Respondents were asked about their legal status in the United States and the year they entered the U.S. Respondents reported the total income earned in the formal economy (i.e., "on the books" income where taxes are taken out, including public assistance) and in the informal economy (i.e., "off the books" income on which taxes were not paid). We also asked respondents if they had worked as day laborers, had been homeless, and how much money they sent to family or friends in Mexico.

Household density was determined by the number of adults and minors who lived in the same house, apartment, or rented room where the respondent had slept most of the time in the past 6 months, and the number of rooms in that apartment or house (excluding bathrooms). We calculated mean people per room (PPR) and the prevalence of greater than one PPR and two PPR (the median in this simple). In the U.S. standards for "crowding" and "severe crowding" set by the federal government have decreased over the past century as household density itself has decreased, and are currently 1 PPR and 1.5 PPR, respectively [10, 29]. However, there exists great variability in measures and standards among researchers and housing authorities even within the United States [9, 29]. A higher cut-off may help identify households with more severe housing problems [9, 10]. We therefore chose 2 PPR as a cut-off based on the

high level of household density among Hispanic immigrants and the high median PPR in our sample (2 PPR). A lower cut-off (e.g., 1 or 1.5 PPR) would lump those in moderately dense conditions with those in very dense conditions. In addition to PPR, we asked respondents if the house or apartment where they slept most of the time was their own, a parent's, a spouse's or someone else's.

We assessed respondents' health status by asking about the number of days that poor physical or mental health limited usual activities in the past 30 days [30–32]; health status responses ranged from zero, 1–5, or greater than 5 days of poor physical or mental health. We also asked respondents if they were covered by any health insurance during the past 6 months.

We defined food insufficiency as periods of time when respondents experienced hunger but were unable to afford food. Food insufficiency was measured with a single item, and respondents were asked whether they had experienced periods in the last 6 months when they were hungry, but were unable to eat because they could not afford enough food. Although there is substantial debate in the literature over how to best measure food insecurity and hunger [33, 34], several studies have shown that single item measures of food insufficiency are predictive of dietary, mental, and physical health outcomes [34–37].

We assessed levels of acculturation using a modified version of the Welfare Reform Baseline Interview acculturation module, based on a scale developed for use among Hispanic populations [38]. Linguistic acculturation was assessed using a seven-item scale that asked about the preference for other languages as compared to English in a variety of contexts. We assessed social acculturation using a four-item scale that asked about preference for Mexican, Latino, or Hispanic groups as compared to other groups in a variety of social contexts. The combined acculturation scores were summed and divided into tertiles for analysis. To evaluate social support we asked about emotional support (e.g., "someone to love you and make you feel wanted"), instrumental support (e.g., someone to help you if you were confined to bed"), and appraisal support (e.g., "someone to give you good advice in a crisis") in the past 6 months [39]. We summed responses and divided the combined social support score into tertiles for analysis. Respondents were asked if they had ever been discriminated against, prevented from doing something, or been hassled or made to feel inferior because of age, race, language, immigrant status, sex, sexual orientation, poverty, drug use, having been in jail or prison, religion, mental illness, physical illness or disability, or other reason. We asked respondents to identify the form of discrimination that impacted their life the most and categorized this as either "none" or discrimination relating to race, language, immigrant status, or other.

Statistical Analyses

We calculated the prevalence of more than 2 PPR among participants who reported being undocumented. Bivariate associations were examined for categorical variables using chi-square tests of association, and where chi-square tests were not valid, Fisher's exact test was used. The reference group in bivariate analysis was those participants that reported living in conditions of $\leq$2 PPR. Variables that were significant at the $P \leq 0.1$ level in the bivariate analysis were included in multivariable stepwise logistic regression: gender, education, number of children, if children are living with subject, number of days poor physical or mental health limited activities in past 30 days, food insufficiency in the past 6 months, total number of adults and minors in household, where subject lives most of the time, level of linguistic acculturation/preference, level of social acculturation/preference, form of discrimination that most impacted life, and having problems because foreign born in past 6 months. Variables were retained in the final stepwise model if they were significant at the $P \leq 0.05$ level, using Wald P-values. We performed all analyses using SAS version 8.2 [40].

Sample Characteristics

We recruited 505 persons for this study. Of the 445 participants with household density data, 9.2% reported documented migration status. Among documented subjects, 26.8% lived in conditions of >2 PPR, compared to 37.6% of undocumented subjects. Documented status was not found to be significant in predicting household density in bivariate or multivariate analysis. We, therefore, restricted analyses for this study to the 404 respondents who were undocumented immigrants and lived in a house, apartment or rented room. Table 1 details the sample characteristics. The median age was 30 years (IQR = 25–38), 29.6% of respondents were female, 51.2% of respondents were married, and 67.3% of the sample had at least one child. Approximately 83% of respondents had not completed high school. Median years living in the United States were 5 (IQR = 3–10). The formal economy was a source of income for only 32.3% of respondents over the past year, while the informal economy was an income source for 66.8%, and 23.3% of respondents reported working as day laborers in the past 6 months. Remittances were sent to family or friends in Mexico by 85.9% of respondents, sending a median amount of US$ 400 per month (IQR = 200–800).

Household density was high, with 82.5% living with more than 1 PPR, 37.6% living with more than 2 PPR, and 27.7% living with six other people (adults and children) or more (Table 2). In terms of health, 10.4% of respondents reported that poor physical or mental health limited their

Table 1 Socio-demographic characteristics by people per room ($N = 404$)

	Total		>2 People per room		≤2 People per room		*P*-value
	N 404	Percent	*N* 152	Percent 37.6	*N* 252	Percent 62.4	
Gender							0.04
Male	283	70.4	98	34.6	185	65.4	
Female	119	29.6	54	45.4	65	54.6	
Median age (interquartile range)	30	(25–38)	30	(25–38)	30	(24–38)	0.8
Education (highest level completed)							0.04
Less than high school	334	82.7	128	38.3	206	61.7	
High school or GED	41	10.2	19	46.3	22	53.7	
At least some college	29	7.2	5	17.2	24	82.8	
Marital status							0.2
Single	163	40.4	55	33.7	108	66.3	
Married	207	51.2	86	41.6	121	58.5	
Divorced, separated, widowed, other	34	8.4	11	32.4	23	67.7	
Children							<0.01
None	131	32.7	34	26	97	74.1	
1	63	15.7	28	44.4	35	55.6	
2	90	22.4	30	33.3	60	66.7	
3	59	14.7	29	49.2	30	50.9	
>3	58	14.5	30	51.7	28	48.3	
Children living with subject							0.02
No	135	49.8	49	36.3	86	63.7	
Yes	136	50.2	68	50	68	50	
Median years in US (interquartile range)	5	(3–10)	5	(2–9)	5	(3–10)	0.4
Homeless in last 6 months							0.7
No	34	70.8	15	44.1	19	55.9	
Yes	14	29.2	7	50	7	50	
Ever homeless							0.2
No	354	87.6	129	36.4	225	63.6	
Yes	50	12.4	23	46	27	54	
Legal income							0.1
No legal income	236	67.8	96	40.7	140	59.3	
Any legal income	112	32.3	36	32.1	76	67.9	
"Off the books" income							0.7
No "off the books" income	107	33.2	41	38.3	66	61.7	
Any "off the books income"	215	66.8	87	40.5	128	59.5	
Day labor							0.9
No	310	76.7	116	37.4	194	62.6	
Yes	94	23.3	36	38.3	58	61.7	
Remitted money to home country							0.4
No	57	14.1	24	42.1	33	57.9	
Yes	346	85.9	127	36.7	219	63.3	
Median $ remitted monthly (interquartile range)	400	(200–800)	400	(200–680)	400	(200–800)	

usual activities for at least six of the past 30 days. Only 11% had access to health insurance in the previous 6 months and 28.8% reported food insufficiency in those same 6 months (Table 2). Some form of discrimination was reported by 61% of respondents. The most frequently reported form of discrimination that most affected their life was language (25.6%), followed by immigrant status (16.5%), race (13.2), and other (5.8%) (Table 3).

Table 2 Reported health and housing by people per room ($N = 404$)

	Total		>2 People per room		≤2 People per room		*P*-value
	N 404	Percent	*N* 152	Percent 37.6	*N* 252	Percent 62.4	
Days physical health not good in past 30 days							0.6
0 days	235	59.1	89	37.9	146	62.1	
1–5 days	97	24.4	34	35.1	63	65	
>5 days	66	16.6	28	42.4	38	57.6	
Days mental health not good in past 30 days							0.5
0 days	210	52.9	83	39.5	127	60.5	
1–5 days	113	28.5	37	32.7	76	67.3	
>5 days	74	18.6	29	39.2	45	60.8	
Days poor physical or mental health limited activities in past 30 days							0.08
0 days	312	78.8	115	36.9	197	63.1	
1–5 days	43	10.9	12	27.9	31	72.1	
>5 days	41	10.4	21	51.2	20	48.8	
Health insurance coverage last 6 months							0.4
No	357	89	131	36.7	226	63.3	
Yes	44	11	19	43.2	25	56.8	
Food insufficiency in last 6 months							0.06
No	287	71.2	100	34.8	187	65.2	
Yes	116	28.8	52	44.8	64	55.2	
Total adults and children living in household							<0.01
1–2	40	9.9	0	0	40	100	
3	38	9.4	6	15.8	32	84.2	
4	83	20.5	11	13.3	72	86.8	
5	75	18.6	31	41.3	44	58.7	
6	56	13.9	16	28.6	40	71.4	
>6	112	27.7	88	78.6	24	21.4	
Where do you live most of the time?							0.02
Someone else's house/apt	115	28.5	54	47	61	53	
Own, parent's, spouse's, or rented room	289	71.5	98	33.9	191	66.1	

Bivariate Analyses

In bivariate analyses women ($P = 0.04$, Table 1), those with a high school education or less ($P = 0.04$), those with more children ($P < 0.01$) and those living with their own children ($P = 0.02$) were more likely to report living in households with more than 2 PPR. As seen in Table 2, higher household density was reported by those who had experienced food insufficiency in the past 6 months ($P = 0.06$), and by those whose physical or mental health had limited their activities for at least 6 days in the past 30 days ($P = 0.08$). Respondents living in someone else's house or apartment were more likely to report more than 2 PPR compared to those living in a spouse's, parent's, one's own home, or in a rented room ($P = 0.02$). Not surprisingly, households with greater numbers of both adults and minors were more likely to have more PPR ($P < 0.01$). Lower levels of both linguistic ($P = 0.01$, Table 3) and social ($P = 0.03$) acculturation were associated with higher household density, as were language discrimination as the form of discrimination that most impacted life ($P = 0.02$) and problems related to being foreign-born ($P = 0.08$).

Multivariate Analyses

In the multivariate model (Table 4), living with more than 2 PPR was associated with living with one's own children (OR = 2.3, 95% CI = 1.4–3.9), experiencing food insufficiency in the past 6 months (OR = 2.0, 95% CI = 1.1–3.6), and language discrimination as the form of discrimination that most impacted one's life (OR = 2.3 compared to discrimination based on race, immigrant status and other forms, 95% CI = 1.2–4.4).

Table 3 Acculturation, social support, and discrimination by people per room ($N = 404$)

	Total		>2 People per room		≤2 People per room		*P*-value
	N	Percent	*N*	Percent	*N*	Percent	
Linguistic acculturation/preference							0.01
Lowest level	93	25.2	47	50.5	46	49.5	
Moderate level	117	31.7	46	39.3	71	60.7	
Highest level	159	43.1	50	31.5	109	68.6	
Social acculturation/preference							0.03
Lowest level	160	43.2	74	46.3	86	53.8	
Moderate level	103	27.8	33	32	70	68	
Highest level	107	28.9	36	33.6	71	66.4	
Social Support							0.5
Low	170	44	68	40	102	60	
Medium	148	38.3	55	37.2	93	62.8	
Highest level	68	17.6	22	32.4	46	67.8	
Form of discrimination that most impacted life							0.02
Not discriminated against	154	39	49	31.8	105	68.2	
Race	52	13.2	15	28.9	37	71.2	
Language	101	25.6	51	50.5	50	49.5	
Immigrant status	65	16.5	27	41.5	38	58.5	
Other	23	5.8	7	30.4	16	69.6	
Problems b/c foreign born in past 6 months							0.08
No	327	81.8	116	35.5	211	64.5	
Yes	73	18.3	34	46.6	39	53.4	

Table 4 Final stepwise regression model for association between frequency of >2 PPR and living with children, food insufficiency and discrimination[a] ($N = 276$)

Likelihood of crowding	OR	95% CI	Wald *P*-value
Live with own children			<0.01
No	1.0	–	
Yes	2.3	1.4–3.9	
Food insufficiency in last 6 months			0.02
No	1.0	–	
Yes	2.0	1.1–3.6	
Form of discrimination that most affected life			0.04
Not discriminated against	1.0	–	
Race	0.6	0.3–1.5	0.05
Language	2.3	1.2–4.4	0.02
Immigrant status	1.2	0.6–2.6	0.9
Other	1.7	0.5–5.4	0.5

[a] Included variables with $P \leq 0.1$ in bivariate table

Discussion

Undocumented Mexican immigrants in NYC experience extremely high household density: 82.5% of the sample population lived with more than 1 PPR, and 37.6% lived with more than 2 PPR. We found the likelihood of higher household density to be associated with food insufficiency, language discrimination, and the presence of one's children in the home. These correlates, coupled with low income and lack of legal immigrant status, suggest that this group faces multiple barriers to health and well-being.

Household density in this sample is many times greater than national and New York City levels. Nation-wide, 2.4% of households had more than 1 PPR in 2005, a figure that has held relatively steady for the past 20 years [29]. This figure is much higher among foreign-born households in the United States, of which 15.2% had more than 1 PPR [14]. The high household density in this sample can in part be understood within the context of other characteristics of the sample shown elsewhere to be associated with higher levels of household density—being Mexican-born, primarily young and recent immigrants, and living in NYC. Among all ethnic groups, Mexican-born householders live in the densest conditions—28.2% of Mexican-born U.S. residents lived with more than 1 PPR in 2001, compared to 11.9% of other Latin Americans and 9% of Asians [14]. Younger people and more recent immigrants have also been shown to live in denser conditions [10].

Being renters, and living in NYC appear to further contribute to household density—nation-wide 5% of

renters live with more than 1 PPR, and in NYC that increases to 11.2% [41, 42]. High housing costs and low vacancy rates in NYC most likely lead to greater numbers of people residing in smaller apartments. Additionally, the Mexican population in NYC is newer and less established than other immigrant groups in the city or the Mexican-born elsewhere in the United States. Newly arrived immigrants often depend on social networks for housing and other resources and support [43–45], but if those networks are also relatively new, resources may be limited. Undocumented immigrants are not eligible for public housing programs or subsidies, and they may also have limited access to credit, references, or formal employment arrangements that are often necessary to apply for private housing, thus limiting their housing options.

Language discrimination as the form of discrimination that most impacted one's life was associated with more than 2 PPR. In NYC in 2000, 23.7% of the population was not English proficient [19]. A number of studies have pointed to English proficiency and language discrimination as barriers to homeownership and housing access among immigrants [46–49]. As almost 57% of study participants indicated low or moderate linguistic acculturation, low English proficiency may be an additional barrier to housing, and discrimination may have been perceived more strongly by those who experienced limitations in housing or employment options. Education may also factor into housing options: another study among foreign-born renters in NYC found not having a post-secondary education to be associated with greater household density [12]. In our sample, while a greater percentage of respondents who completed or attended some high school live in conditions of >2 PPR compared to those without secondary schooling (38.3% vs. 46.3%), this is not the case for those with at least some college, who tended to live in less dense conditions (17.2% > 2 PPR).

The prevalence of food insufficiency in this sample is almost ten times higher than the USDA's national prevalence estimates of "food insecurity with hunger," a similar measure of periods of not enough nutritional intake (28% vs. 3–4%) [50], and consistent with estimates recorded among legal immigrants and Hispanics [51–54]. This population could be at high risk for related negative health outcomes, including poor physical and mental health, particularly among women and children [37, 55–57]. The association of food insufficiency with higher household density among households that include children, and a higher proportion of women who live with more than 2 PPR suggest that these problems may disproportionately affect women and children. An array of health risks for children have been associated with high household density [58–60], but causal relationships are unclear precisely because of compounding factors like food insufficiency among low income populations.

This study is limited in several ways that should be acknowledged. First among them is the difficulty in capturing an accurate measure of household density. Methods vary widely, and while our calculation of PPR is among the most common, it is far from comprehensive, as both people and rooms have dimensions beyond simple numerical counts. We had no measure of space (e.g., square footage), which would account for variations in size of homes with the same number of rooms. Additionally, we lacked information on the composition of households besides the presence of children. For instance, the age of the children could be important to consider, as the impact of infants and toddlers may differ from that of older children and teenagers. Likewise, the relationships between cohabitants (e.g., partners or siblings) were not recorded, nor was any measure of perceived crowding. However, our calculation of PPR provides a rough measure of the household density of the sample, allowing not only comparison within our sample but also with other populations.

Second, we used venue-based sampling and were unable to calculate a response rate. Potential participants' fear or discomfort divulging personal information, particularly about legal status, precluded collection of demographic data or determination of eligibility among non-respondents. We identified diverse venues using qualitative and quantitative information, but it is impossible to assess whether this method resulted in a representative sample of all undocumented Mexican immigrants living in NYC because limited information is available on the properties of the sampling frame (i.e., all undocumented Mexican immigrants in NYC) itself. However, as described elsewhere, our sampling method may have provided a more representative sample than alternative recruiting methods might have. The fact that 85% of persons recruited for this study were indeed undocumented immigrants suggests that we were successful in identifying areas where undocumented immigrants congregated and in recruiting undocumented immigrants to participate in this study. Furthermore, the demographic profile of our sample is consistent with what is known about undocumented Mexican immigrants living in NYC [19, 20].

Third, it is possible that undocumented immigrants may underreport key areas of concern, among them legal status and our key variables, food insecurity and language discrimination. In anticipation of this possibility, we used in-person anonymous interviews that in past research have been proven to be an effective approach to establishing the trust necessary to elicit accurate responses to inquiries about sensitive topics, such as legal status [61]. And finally, the cross-sectional design of our survey does not capture temporal changes in household density such as age and legal status changes.

Despite these limitations, it is clear that undocumented Mexicans live in much denser conditions than other U.S.

residents. Future studies should investigate the ways in which household density impacts—either negatively or positively—on physical and mental health. The debate around the causal relationship between density and health also calls for a closer look at perceptions of 'overcrowding,' particularly for immigrant groups that may have experienced housing situations in their home countries that varied greatly from U.S. norms. Even as the effects on health of household density are uncertain, density may be an indicator of other more severe housing problems of affordability and quality [62]. Any response to the housing needs of undocumented immigrants should also consider their access to other basic necessities, particularly food and language services. As crossing the border becomes more difficult and more undocumented immigrants remain in the United States and form families here, housing problems are likely to become more severe among this population. Barring radical policy changes, the exclusion of undocumented immigrants from government subsidies and services puts responsibility on local communities to creatively respond to the housing needs of newly arrived immigrants.

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