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Duration of US residence is associated with overweight risk in Filipino immigrants living in NY metro area

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Abstract

We examined the association between years living in the US and overweight risk among a community sample of Filipino adult immigrants living in the New York (NY) metropolitan area. We found a significant and adverse association between years living in the US and overweight risk. Compared to Filipinos who lived in the US less than 5 years, those who lived in the US 10 years or longer had a higher overweight risk; this association was only present among Filipinos who migrated to NY metropolitan area at 30 years or younger. Studies on causal mechanisms explaining this pattern are needed.

Keywords

Obesity; Filipinos; Assimilation

INTRODUCTION

Obesity is increasing in the US[1,2] and in many regions around the world including Asia[3,4] and Latin America[5] due to increasing wealth and urbanization.[6,7] These two regions represent the largest contributors of immigrants to the US.[8] Because immigrant populations experience rapid change in exposures they provide a unique opportunity to study the association between environmental change and obesity risk.

Immigrants are a large and dynamic segment of the US population. Between 1990 and 2010, the foreign-born population in the US more than doubled from 19.8 million to 40 million.[9] It has been projected that 87% of the population growth between 2005–2050 will be driven by immigrants and their children.[10] Further, recent data indicate that Asia has now replaced Latin America as the major region of origin for the foreign-born population in the US. For example, among foreign-born population arriving 2008 or later, over 40% originate from Asia, compared to 25% from Mexico or Central America.[8]

Immigrant health advantage

It is well-documented that immigrants arrive with a health advantage despite an adverse social and economic profile.[11] Although this immigrant health advantage was originally developed from studies of Latinos[11], it has also been shown to apply to most immigrant groups in the US.[12] One of the two leading explanations for this immigrant advantage is that immigrants may compose a selected group who are healthier than the counterparts in the country of origin.[13] A second explanation is that the cultural orientation that immigrants bring with them to the US is protective and buffers them from adverse health outcomes. It has been suggested that the protective culture of immigrants encourages healthy behaviors and strong social support systems; facilitates access to health information and health systems; and reinforces positive health norms.[14] For example, strong evidence suggests that the body mass index (BMI) of recent immigrants is lower, when compared to US natives.[15,16] Supporting this pattern are studies showing higher fruit and vegetable intake[17] and certain forms of physical activity[18] among immigrants relative to US born individuals. However, studies also suggest that this initial health advantage erodes over time, a process sometimes referred to as “unhealthy assimilation”.[15]

Focus on Filipino immigrants to US

There are 3.4 million Filipinos (who report this ethnic group alone or in combination) living in the US.[19] Filipinos are the second largest Asian ethnic sub-population in the US (to Chinese)[20] and among the foreign-born, are the third largest national origin group.[21] The third largest concentration of Filipino immigrants in the US is found in NY metropolitan area, after Los Angeles and San Francisco metropolitan areas.[22] According to the latest ACS 2012 data, there were 221,031 Filipinos living in the NY metro area.[23] However, majority of health research on Filipinos has originated on the West Coast.[24–26]

Existing research indicates an unusually high burden of chronic conditions, including obesity, in US Filipinos. In a 2014 population-based study in California, Filipinos had the highest adjusted rates of overweight compared to all other racial/ethnic groups in California;

rates were equivalent to 7 out of 10 Filipino adults living in California being overweight or obese.[24] According to the National Health Interview Surveys, obesity prevalence tripled for Filipinos between 1992 and 2011.[27] Consistent with this trend are findings that Filipinos carry a disproportionate burden of both diabetes and hypertension.[26,28–34] This chronic disease burden is also supported by evidence that relative to non-Hispanic whites, Filipinos (as well other US Asian populations) carry a significantly higher risk of adverse metabolic outcomes, over the range of BMI,[35] calling for Asian-specific BMI cutoff points for defining overweight and obesity and screening for metabolic risk.[36,37]

Study rationale and objective

The obesity burden in US Filipinos is poorly understood. Our study aims to examine whether increased time in the US is associated with an increased risk of obesity. Several studies have examined this question and have found that longer US residence is associated with increased risk of obesity in US immigrants.[16,38–40] Some studies have focused on Asian populations, but have relied on nationally representative datasets, making it challenging to stratify by country of origin.[16] Aggregated analyses in Asians may mask any heterogeneity that exists among the different ethnic populations.[41,42] Thus, it is unknown whether the positive association between years in the US and obesity risk documented in previous research is present in US Filipinos, a population whose unique cultural history and migration experience might give rise to a different relationship.

First, Filipinos originate from a country undergoing rapid transitions in nutrition and physical activity[4,43], and consequently have experienced an alarming growth in obesity.[4] These transitions are occurring throughout the developing world where the pace of urbanization has been especially rapid with evidence of higher obesity rates in more urbanized areas.[6,7,44] Because the Philippines is already experiencing rapid growth in obesity, substantial increases in obesity might have occurred prior to migration to US.[45] Second, having migrated to the US from the Philippines, a country with over 4 decades of US colonial rule[46], many Filipinos arrive with high levels of English proficiency[18] and begin their US acculturation process prior to migration.[46] Filipinos in US are often described as transnational because of fluid migration between the Philippines and the US and even resettlement back in the home country.[47] At the same time, the existence of Filipino enclaves in the NY metro area and the interaction of native minority and immigrant subcultures of NYC create an environment that might lead to preservation of selected traditions and behaviors of the origin country and/or diverse paths to adaptation into US society.[48,49] Thus given the lifestyle shifts already occurring in the Philippines and the unique cultural experience of Filipino immigrants, the US environment might influence obesity risk differently than what is suggested by existing studies on obesity risk in US immigrants.[50]

The purpose of this paper is to examine the presence and nature of association between years living in the US and overweight/obesity risk among a community sample of Filipino immigrants living in the New York metropolitan area, which no prior study has done. In a 2010 systematic review of time in the US and obesity among US immigrants, out of 15 studies conducted through 2008, only one study reported stratified data on Filipino adults;

however this study did not present detailed analysis on time in the US and obesity risk by country of origin.[16] To our knowledge only one study published after the 2010 review presents data on Filipinos separately; this study finds a positive association between increasing generations and obesity risk using data from a national sample.[51]

METHODS

Study Sample

Data for this study were obtained from the recruitment phase of community-based participatory research study funded by the National Institutes of Health National Institute of Minority Health and Health Disparities, entitled Project AsPIRE (Asian American Partnership in Research and Empowerment), between 2006 and 2012. The goal of Project AsPIRE was to improve hypertension management through a community health worker (CHW) intervention among Filipinos in the New York metropolitan area. Venue-based sampling methods were used for participant recruitment, which occurred at various community-based organizations, faith-based organizations, cultural associations, and other locations in Queens, New York and Jersey City, New Jersey (NJ). Trained bilingual staff explained the screening, obtained informed consent, and administered a survey to each participant. CHWs and licensed clinical nurses obtained clinical measurements. Study methods have previously been described.[52,53]

Survey data collected between 2008 and 2012 were used for analyses (screening surveys collected for the second pilot and full AsPIRE interventions). A total of 1,312 surveyed individuals identified as Filipino, were born in the Philippines, were between 18 and 85 years of age, and lived in the NY metropolitan area. Of these individuals, those who did not report duration of time in the US were excluded (n = 61). In addition, individuals who did not have a height or weight calculation of BMI were also excluded (n=38), resulting in a final sample size of 1,213.

Survey Measures

BMI was calculated from height and weight data, which were measured by CHWs and licensed clinical nurses, and was categorized as normal/underweight (<23 kg/m^2), overweight (23–27.49 kg/m^2), and obese (≧27.5 kg/m^2) according to Asian BMI guidelines.[36,37] Duration of years in the US was calculated by subtracting the year of entry into the US from the survey year, and was categorized as <5 years, 5–<10 years, 10 to ≥15 years, and ≥15 years.[15,50] Age of entry in the US was determined by subtracting duration of years in the US from current age, and was categorized as <30, 30–39, 40–49, 50–59, and ≥60.[54]

Consistent with previous literature, other covariates included current age (18–45, 46–55, 56–65, and 66–85), sex, employment status (employed, not employed), insurance (private, public, uninsured), and preferred spoken language (English, Tagalog/other Philippine dialect, Tagalog/other Philippine dialect and English).[15,50] We included insurance status as a proxy for SES because information on education and income was not available for this entire study sample. In addition, we included area of residence as an indication of both

individual and neighborhood socio-economic status (NYC borough, NJ, other location).[55] Other location consisted of individuals living in counties outside of NYC (Nassau=26, Westchester=18, Suffolk=5, Rockland=2, and Orange=2) and Connecticut (n=3). Also because of potential variation in degree of urbanization, culture, diet and activity patterns by region in the Philippines, we included island group of origin (Luzon, Visayas, Mindanao).[6,44]

Statistical Analyses

To explore baseline characteristics and differences in overweight prevalence among Filipino immigrants by duration of time in the US, characteristics of the study sample were run overall and by years lived in the US. Chi-square tests were run across years in US for each characteristic, and p-values are presented. Statistical significance was considered at $P \leq 0.05$.

Logistic regression models were run with 2 outcome variables: overweight/obese (BMI ≥ 23) and obese (BMI ≥ 27.5); however, we present results for overweight (BMI>=23) only. Sensitivity analyses indicated directions of associations between our primary independent variables and both outcomes were similar; however, overweight (BMI>=23) was more sensitive to variation in key independent variables of study. Because current age of the respondent is the sum of the age when he/she migrated to US and the total number of years living in the US, to avoid variable redundancy and multicollinearity,[56] we ran two separate age-adjusted models predicting obesity risk: one with years in the US and one with age of migration to the US (results not shown). Following Roshania et al. (2008)[54], we tested for multicollinearity with all three variables – current age, age at migration and years in the US – in one model; this model had very high multicollinearity (variation inflation factor of 21.79). In addition, because adaptation process is different for different age cohorts and previous evidence suggests differential associations between time in the US and obesity risk by age at migration, we stratified analysis by age at migration.[49,54,57]

Previous studies have found differences by sex for the associations between acculturation and particular health behaviors.[58] Therefore, the interactions between sex and age at migration and between sex and time in the US were assessed; neither was significant. The interaction between age at migration and time in the US was also tested and was not significant.

Analyses were performed with SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp).

RESULTS

This sample was predominantly female (71.0%) with a mean age of 52.2 ± 12.8. Over half the sample lacked health insurance (54.3%), and the majority preferred to speak English or English and Tagalog/another dialect (77.6%). BMI differed significantly across duration of time in the US, and individuals who had lived in the US for ≥15 years were most likely to be obese according to Asian BMI standards (P=0.002); a dose effect relationship between years in the US and obesity can be seen. Significant differences by time in the US were also seen

for current age, employment status, insurance, location of residence, age of entry into the US, and island group (Table 1).

Table 2 presents the overall adjusted model predicting overweight, while adjusting for years in the US in addition to all other variables in the model. Individuals living in the US for ≥15 years were 1.7 times more likely to be overweight/obese compared to individuals living in the US for 0 – <5 years (P=0.017). Additionally, individuals from the Visayas island group were 1.6 times more likely to be overweight/obese compared to individuals from the Luzon island group (P=0.028), males were 3.3 times more likely than females to be overweight/obese (P<0.001), and individuals living in NJ were 1.6 times more likely than individuals living in NYC to be overweight/obese (P=0.028). Table 3 presents three models predicting overweight while stratifying by age at migration. Years in US was only found to be significant for the youngest migration group (<30 years). Among this group, compared to individuals living in the US for 0 – <5 years, individuals living in the US for 10 – <15 years were 3.8 times more likely to be overweight/obese (P=0.019), and individuals living in the US for ≥15 years were 5.7 times more likely to be overweight/obese (P=0.003). All stratifications also found that males were significantly more likely than females to be overweight/obese.

DISCUSSION

Our study suggests that longer US residence is associated with an elevated risk of overweight, using Asian BMI standards, among Filipino immigrants living in the NY metropolitan area: those who have lived in the US 10 years or longer have a significantly heightened risk, compared to those living in the US less than 5 years. This association is largely driven by age at migration. In stratified analyses, the association between time in the US and overweight risk is only present in Filipino individuals migrating to the US before the age of 30 (OR=5.7, 95% CI: 1.8, 17.8). In additional analyses (not shown), in the same group of Filipinos migrating to US before age of 30, those who lived in the US 15 years or longer had a significantly heightened obesity risk, compared to those living in the US less than 5 years. These findings are consistent with past studies which have shown an elevated obesity risk at the 10 and 15 years duration of residence cutoff points[15,59,60] In our analysis, the association between time in the US and overweight risk is not influenced by demographic characteristics measured. Of the demographic factors we examined, sex and island group of origin were consistently the only significant covariates for overweight and obesity risk. Males were more likely to be overweight than females. Also, among Filipinos who migrated to US between the ages of 30–49 years, those who originated from the Visayas region in the Philippines, compared to other regions, were more likely to be overweight, a finding that could be potentially explained by regional variation in urbanicity.[6,7,44] In addition, the geography of the Philippine islands and its complex colonial history– with Spanish, Islamic and US influences – has created considerable cultural diversity among the island regions[46], and consequently behaviors that relate to diet and/or activity patterns that predispose to obesity.

It is notable, too, that residence in NJ, compared to the NYC boroughs, was associated with a higher risk of overweight, a finding consistent with studies that associate urban sprawl and

built environment (lack of sidewalks, long distance to schools, etc.) to higher obesity risk.[61] However, the association between residence and overweight risk is attenuated in the analysis stratified by age at migration. In additional bivariate analyses (not presented) we found associations between US residence and years lived in the US as well as migration age; newer immigrants are significantly more likely to live in NYC, and individuals living in NJ migrated at younger ages, a finding consistent with the attenuation observed. This pattern is also expected to the extent that newer immigrants move to traditional urban destinations, such as NYC, for greater job opportunity and the presence of a large co-ethnic community, and then migrate to areas outside of these ethnic enclaves once they are more established.[62]

Another contribution of our study is that the relationship between time in the US and overweight is only present in those who migrated to the US at the age of 30 years old or younger. The influence of age of migration on the association between years in the US and obesity is supported by several studies.[54,57] Yet, the findings diverge from those of Roshania et al. (2008) to some extent; they find that the relationship is present among immigrants who migrated to the US up until the age of 50 years old.[54] It is important to note, however, that the Roshania study analyzed a national sample of immigrant groups from both Latin America and Asia. Thus aggregated analyses may mask any heterogeneity that exists among the different ethnic sub-populations.[41,42]

From a broader perspective, duration of US residence may be viewed as a marker of assimilation to US society and of the cumulative exposure to a new social, cultural, and physical environment.[18,63] In this regard, our study lends support to the notion of “unhealthy assimilation.[15] Relating our findings to global changes in lifestyles and patterns in obesity and diabetes, may help elucidate some of the causal pathways implicated in this process of unhealthy assimilation.[7,64] Intra-country migrants who move from rural to urban areas, or who transition from poverty to affluence, for example, can take on more sedentary jobs, markedly different from their former labor-intensive work and adopt less healthy diets.[65] Migrants who move from their home country to the US, particularly major urban destinations such as NYC, and seek better economic opportunities undergo similar, perhaps more dramatic changes.

Further, as a way of coping with the stress of adaptation to a new setting, there is a possibility that Filipino immigrants in our study engage in eating behaviors that predispose to obesity.[66] Processed snacks and “junk” foods that have characterized many Western or US diets[66,67] may also be accompanied by over-consumption of indigenous “festival foods” that are high in carbohydrates, sugars and fats, traditionally reserved for special occasions.[66] In attempt to hold on to familiar habits of home and stay connected to their co-ethnic community, social gatherings, where these “festival foods” play a prominent role, might be more frequent.[66] Thus, it makes sense that more sedentary lifestyles and a shift to energy rich diets might be responsible for increased risk of overweigh/obesity among Filipino immigrants in this study.

Chronic exposure to the US built environment (e.g. walkability, proximity to grocery stores, public transit), which is increasingly characterized as “obesogenic”[68] may also play an important role in accelerating the development of obesity in US immigrants. Within an

urban context such as NYC, neighborhood crime, unfamiliarity with the physical surroundings, acculturation and chronic stress, and lack of time may also discourage immigrants from maintaining an active lifestyle.[69–71] Future studies should examine these and the diet-related factors as potential mediators or moderators of the causal relationship between assimilation and obesity risk.

Limitations

Several limitations should be noted. First, use of venue-based sampling (a type of convenience sampling) limits the generalizability of these findings to the larger Filipino population in NY metro area. However, population-based sampling was inadequate for this research for several reasons.[72] First, there are significant challenges in obtaining an adequate and precise sampling frame list that is representative of the Filipino community in NY metro area (e.g. many Filipinos have Spanish surnames, thereby making it difficult to isolate Filipinos). Fears of deportation or loss of current healthcare services may be a barrier to study participation. Using a community-based approach, via community representatives and community-based organizations, with a long history of trust, as what was done, was the most practical and effective means of recruiting participants into this study and ensuring high response rates. Lee and colleagues (2006) conducted a study which compared random and venue-based sampling strategies in the Chinese and Korean communities in NY/NJ and concluded that differences between participants based on sampling strategies were not remarkable. The authors suggest that by engaging in careful site selection, purposive or convenience sampling such as the type used in this study, provides data that is representative of the community.[73] We compared our sample characteristics to all Filipinos (immigrant and US born) living in the NY metropolitan area using data from the 2012 American Community Survey. Our sample consisted entirely of immigrants whereas just over 70% of Filipinos living in NYC/NJ were immigrant in 2012.[74] Although education level was not included on the survey administered to our analytical sample, we were able to assess approximate education level of the sample using data from a later intervention cohort (n = 230), which indicated comparable education levels to Filipinos living in NYC/NJ.[74]

Second, because of the nature of outreach and recruitment for this study, our dataset had inadequate information on several important variables, including educational attainment, marital status, detailed occupation categories, diet and physical activity. Third, because this study relies on cross-sectional data, it is beyond our scope to estimate temporal effects, which would help to establish causality.[75] Fourth, cross-sectional studies of immigrants do not allow the study of key dynamic aspects of immigration at the individual level.[76] Finally assimilation and related concepts such as acculturation are complex and require extensive measurement, but such scales are time consuming and impractical and it is still unclear whether these more extensive scales have explanatory power over the shorter or 1-item language proxies in health studies.[77]

Conclusion

Relationships between duration of US residence, a marker for assimilation, and health are complex, and both negative and positive associations between measures of assimilation and

health have been observed.[15,17,18,59,78] This evidence from the health literature is not surprising given the heterogeneity of assimilation processes in US immigrants as described by scholars of migration.[62] Our study adds to the evidence on the adverse associations between accumulating exposure to US environment and health in US immigrants. It provides evidence of an adverse association between increased exposure to US environment and obesity risk among a large sample of Filipinos who live in the NY metropolitan area, a major contribution to the field of immigrant health. The majority of research on US Filipinos derives from the West Coast,[24–26] and studies presenting on Filipino populations often aggregate the data with other Asian American groups.[41,42]

In our study population, obesity risk is heightened after 10 years of living in the US among immigrants who migrate to the US at a young age (30 years of age or younger). These findings should be validated in prospective studies of immigrants that take into consideration causal mechanisms linking assimilation to poor health including transformations in diet, physical activity and stress. Still, they provide a compelling basis for targeting and informing interventions that aim to slow the accelerated development of obesity in Filipino immigrants, and other Asian immigrant populations, for whom just small increments of weight gain, may carry a much more severe risk for poor health outcomes, relative to the general US population.

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Table 1

Characteristics of the sample by years in the United States, n (%)

	Total sample n=1,213	0 – <5 years (n=321)	5 – <10 years (n=317)	10 – <15 years (n=183)	≥15 years (n=392)	p-value
Sex						0.215
Male	352 (29.0)	107 (33.3)	91 (28.7)	47 (25.7)	107 (27.3)	
Female	861 (71.0)	214 (66.7)	226 (71.3)	136 (74.3)	285 (72.7)	
Age, mean (SD)	52.2 (12.8)	48.7 (12.6)	48.4 (11.9)	50.6 (12.0)	58.8 (11.2)	
Age						<0.001
18–45	347 (28.6)	114 (35.5)	121 (38.2)	64 (35.0)	48 (12.2)	
46–55	353 (29.1)	107 (33.3)	104 (32.8)	52 (28.4)	90 (23.0)	
56–65	347 (28.6)	71 (22.1)	70 (22.1)	50 (27.3)	156 (39.8)	
66–85	166 (13.7)	29 (9.0)	22 (6.9)	17 (9.3)	98 (25.0)	
Preferred language						0.539
English	174 (14.7)	40 (12.8)	51 (16.6)	28 (15.5)	55 (14.5)	
Tagalog/Other dialect	265 (22.4)	62 (19.9)	68 (22.1)	40 (22.1)	95 (25.0)	
Tagalog and English	742 (62.8)	210 (67.3)	189 (61.4)	113 (62.4)	230 (60.5)	
Employment						<0.001
Employed	903 (74.4)	232 (72.3)	263 (83.0)	134 (73.2)	274 (69.9)	
Unemployed	185 (15.3)	55 (17.1)	27 (8.5)	23 (12.6)	81 (20.4)	
Missing	125 (10.3)	34 (10.6)	27 (8.5)	26 (14.2)	38 (9.7)	
Insurance						<0.001
Private	282 (24.4)	23 (7.6)	54 (18.0)	32 (18.8)	173 (45.5)	
Public	245 (21.2)	51 (16.8)	42 (14.0)	42 (24.7)	110 (28.9)	
No insurance	627 (54.3)	230 (75.7)	204 (68.0)	96 (56.5)	97 (25.5)	
Self-rated health						0.696
Excellent/Very good	339 (28.4)	85 (26.6)	96 (31.0)	46 (25.8)	112 (28.9)	
Good	604 (50.5)	165 (51.7)	148 (47.7)	89 (50.0)	202 (52.1)	
Fair/Poor	252 (21.1)	69 (21.6)	66 (21.3)	43 (24.2)	74 (19.1)	
Island Group						<0.001
Luzon	740 (61.9)	182 (57.2)	169 (54.2)	114 (63.7)	275 (71.2)	
Visayas	181 (15.1)	38 (11.9)	46 (14.7)	24 (13.4)	73 (18.9)	

	Total sample n=1,213	0 – <5 years (n=321)	5 – <10 years (n=317)	10 – <15 years (n=183)	≥15 years (n=392)	p-value
Mindanao	274 (22.9)	98 (30.8)	97 (31.1)	41 (22.9)	38 (9.8)	
Age of entry into U.S.						<0.001
<30	265 (21.8)	34 (10.6)	54 (17.0)	42 (23.0)	135 (34.4)	
30–39	330 (27.2)	47 (14.6)	79 (24.9)	54 (29.5)	150 (38.3)	
40–49	345 (28.4)	110 (34.3)	103 (32.5)	53 (29.0)	79 (20.2)	
50–59	189 (15.6)	78 (24.3)	63 (19.9)	24 (13.1)	24 (6.1)	
≥60	84 (6.9)	52 (16.2)	18 (5.7)	10 (5.5)	4 (1.0)	
Location of residence						<0.001
NYC borough	955 (78.7)	272 (84.7)	250 (78.9)	153 (83.6)	280 (71.4)	
New Jersey	202 (16.7)	37 (11.5)	56 (17.7)	20 (10.9)	89 (22.7)	
Other NY Metropolitan area	56 (4.6)	12 (3.7)	11 (3.5)	10 (5.5)	23 (5.9)	
BMI, mean (SD)	25.1 (3.7)	24.7 (3.7)	24.6 (3.5)	25.3 (3.6)	25.7 (3.8)	
BMI						0.002
<23	348 (28.7)	109 (34.0)	106 (33.4)	46 (25.1)	87 (22.2)	
23–27.49	600 (49.5)	150 (46.7)	155 (48.9)	94 (51.4)	201 (51.3)	
≥27.5	265 (21.8)	62 (19.3)	56 (17.7)	43 (23.5)	104 (26.5)	

Table 2

Adjusted odds ratios of BMI ≥ 23 (years in US)

	BMI ≥ 23	
	OR (95% CI)	**p-value**
Years in US		
0 – <5	Ref	
5 – <10	0.9 (0.6 – 1.3)	0.721
10 – <15	1.4 (0.9 – 2.2)	0.106
≥15	1.7 (1.1 – 2.5)	**0.017**
Sex		
Male	3.3 (2.3 – 4.6)	**<0.001**
Female	Ref	
Age		
18–45	0.8 (0.5 – 1.4)	0.444
46–55	1.1 (0.6 – 1.8)	0.761
56–65	1.4 (0.8 – 2.3)	0.212
66–85	Ref	
Preferred language		
English	1.2 (0.8 – 1.8)	0.408
Tagalog/Other dialect	1.1 (0.7 – 1.5)	0.784
Tagalog and English	Ref	
Employment		
Employed	Ref	
Unemployed	1.3 (0.8 – 2.0)	0.320
Missing	0.8 (0.5 – 1.2)	0.313
Insurance		
Private	0.9 (0.6– 1.4)	0.709
Public	0.9 (0.6 – 1.3)	0.417
No insurance	Ref	
Island Group		
Luzon	Ref	
Visayas	1.6 (1.1 – 2.4)	**0.028**
Mindanao	1.3 (0.9 – 1.9)	0.095
Location of residence		
NYC borough	Ref	
New Jersey	1.6 (1.1 – 2.4)	**0.025**
Other	0.9 (0.5 – 1.7)	0.751

Table 3

Adjusted odds ratios of BMI ≥ 23, stratified by age at migration

	<30 years		30–49		≥50 years	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
Years in US						
0 – <5	Ref		Ref		Ref	
5 – <10	2.5 (0.9 – 6.5)	0.074	0.8 (0.5 – 1.3)	0.406	1.3 (0.7 – 2.6)	0.444
10 – <15	3.8 (1.2 – 11.7)	**0.019**	1.2 (0.6 – 2.3)	0.698	1.2 (0.4 – 4.0)	0.758
≥15	5.7 (1.8 – 17.8)	**0.003**	1.0 (0.4 – 2.1)	0.900	2.7 (0.7 –10.4)	0.156
Sex						
Male	3.8 (1.9 – 7.6)	**<0.001**	3.5 (2.1 – 6.0)	**<0.001**	2.8 (1.3 – 6.1)	**0.009**
Female	Ref		Ref		Ref	
Age						
18–45	0.3 (0.0 – 2.7)	0.273	0.8 (0.3 – 2.4)	0.663	n/a	
46–55	0.5 (0.1 – 5.2)	0.565	0.9 (0.3 – 2.4)	0.776	1.0 (0.3 – 2.9)	0.969
56–65	0.1 (0.0 – 1.2)	0.076	2.3 (0.9 – 5.6)	0.077	1.4 (0.6 – 2.9)	0.436
66–85	Ref		Ref		Ref	
Preferred language						
English	1.2 (0.5 – 2.8)	0.718	1.1 (0.6 – 1.9)	0.719	1.2 (0.5 – 3.0)	0.716
Tagalog/Other dialect	2.2 (1.0 – 5.2)	0.057	0.9 (0.6 – 1.5)	0.783	0.8 (0.4 – 1.6)	0.492
Tagalog and English	Ref		Ref		Ref	
Employment						
Employed	Ref		Ref		Ref	
Unemployed	1.3 (0.5 – 3.4)	0.586	1.2 (0.6 – 2.4)	0.659	1.8 (0.8 – 4.2)	0.178
Missing	1.5 (0.6 – 4.1)	0.402	0.8 (0.4 – 1.4)	0.368	0.7 (0.3 – 1.9)	0.497
Insurance						
Private	0.9 (0.4 – 2.0)	0.861	1.0 (0.6 – 1.6)	0.871	0.8 (0.3 – 2.4)	0.712
Public	0.8 (0.3 – 2.0)	0.660	0.8 (0.5 – 1.4)	0.464	0.9 (0.5 – 1.9)	0.859
No insurance	Ref		Ref		Ref	
Island Group						
Luzon	Ref		Ref		Ref	

	<30 years		30–49		≥50 years	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
Visayas	1.4 (0.5 – 4.1)	0.555	1.8 (1.0 – 3.1)	0.051	1.1 (0.5 – 2.6)	0.825
Mindanao	0.6 (0.3 – 1.4)	0.279	1.5 (0.9 – 2.4)	0.134	1.3 (0.7 – 2.6)	0.446
Location of residence						
Queens	Ref		Ref		Ref	
New Jersey	1.8 (0.8 – 4.0)	0.174	1.8 (1.0 – 3.4)	0.061	1.5 (0.6 – 3.4)	0.397
Other	1.0 (0.3 – 3.2)	0.949	0.9 (0.3 – 2.7)	0.841	0.6 (0.1 – 2.6)	0.480