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Length of Residence and Its Association to Eating Practices, Physical Activity, and BMI among Latina Immigrants in Alabama

Cedillo YE[1]*, Fernandez JR[1], Cherrington AL[2] and Scarinci IC[2]

[1]Department of Nutrition Sciences, University of Alabama at Birmingham, USA

[2]Division of Preventive Medicine, University of Alabama at Birmingham, USA

***Corresponding author:** Cedillo YE, Department of Nutrition Sciences University of Alabama at Birmingham, USA

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Abstract

The process of cultural assimilation may influence certain health outcomes among Hispanic/Latino immigrants due to the exposure to newly-acquired mainstream dietary and physical activity practices and, in turn, may increase obesity prevalence. The present study examines the effects of Length of Residence (LOR) on BMI among Latina immigrants living in a new-destination state (LINDS; n = 217) aged 20 to 50 years. Statistical analyses evaluated the associations between LOR and BMI, eating practices, physical activity, and demographic factors. LINDS consumed less fruit and vegetables, had higher intake of fried food and sweetened beverages, and their physical activity levels fluctuated below national recommendations. LOR was positively associated ($p<0.05$) with LINDS' BMI, accounting for approximately 29.43% of the variance. Eating practices or physical activity was not significantly linked with BMI. Our findings suggest that prolonged exposure to the US environment plays a role when explaining BMI among Latina immigrants, particularly those living in new-destination states.

Keywords: Body mass index; Eating patterns; Physical activity; Latinas

Introduction

Hispanics/Latinos in the US have contributed to the nation's population growth, increasing from 22 million in 1990 to 55 million in 2014 [1]. The influx of this ethnic group is primarily due to immigrants from Mexico, followed by Puerto Rico, Cuba, El Salvador, Dominican Republic, Guatemala, Brazil and other South American countries. Currently, Hispanics/Latinos represent the largest minority group in the US totaling 17% of the US population [2].

Perhaps the most concerning non-communicable disease impacting Hispanics/Latinos is obesity, whose prevalence in the US has increased to an alarming 35% of the population [3]. Obesity heightens the risks for cardiovascular diseases, some cancers, hypertension, diabetes, and other diseases that are leading causes of death in the US [4-10]. Among Hispanics/Latinos, the prevalence of obesity has almost doubled from 23% in 1994 to 42.5% in 2014, documenting an increase that is higher than Non-Hispanic Whites (NHWs) (32.6%) but lower than Non-Hispanic Blacks (NHB) (47.8%) [3,11]. Flegal et al., [12] examined obesity trends between 1999-2008 and found that 18.9% of Hispanic women ≥ 20 years of age had a BMI ≥ 35 kg/m^2 compared to 16.6% of NHW women. Gender differences have also been reported with 42.4% of Hispanic/Latino women being obese (BMI ≥ 30kg/m^2) as compared to 36.5% of Hispanic/Latino men [13]. The disproportionate burden of obesity in the Hispanic/Latino community is a major issue considering the high rates of morbidity, mortality, and the high obesity-associated annual healthcare costs [14].

The etiology of obesity in the Hispanic/Latino community is complex. Despite country of origin, increased obesity prevalence in Hispanics/Latinos has been mostly associated with time of exposure to a new environment [15]. Research has documented that those living in the US for more than twenty years are more likely to be obese than US Hispanic/Latino immigrants who have been in the country for less time [13]. Evidence also supports that obesity-related factors such as dietary practices and physical activity are modified by the immigration experience [16,17]. For example, Batis et al., [18] used data from the Mexican National Nutrition Survey (1999) and the National Health and Nutrition Examination Survey (NHANES, 1999-2006) to evaluate differences of food intake. It was reported that Mexican Americans born in Mexico, Mexican Americans born in the US, and NHWs showed greater intakes of saturated fat, sugar, desserts, and salty snacks when compared to native Mexicans. Similar studies also show that immigrants who become more acculturated through increased LOR in the US reduce their diet quality by assimilating NHW's eating practices, which tend to promote some unhealthy intake behaviors [19-21], despite engaging in higher levels of physical activity [22]. Evidently, other identified etiological aspects also contribute to the increased prevalence of obesity in the Hispanic/Latino immigrant population, including generational status, education, stress, cultural barriers, linguistic isolation, and socioeconomic factors. Overall, the LOR seems to modulate any changes in health behaviors, including diet and physical activity [16,23-28].

Migration of the Hispanic/Latino population has been evolving from states with traditionally higher rates of immigrants to other areas of the US Even though 55% of the Hispanics/Latinos in the US reside in California, Florida, and Texas, recent migration has more than doubled in what is considered "new-destination states", particularly Southern and Midwest states, which have shown high

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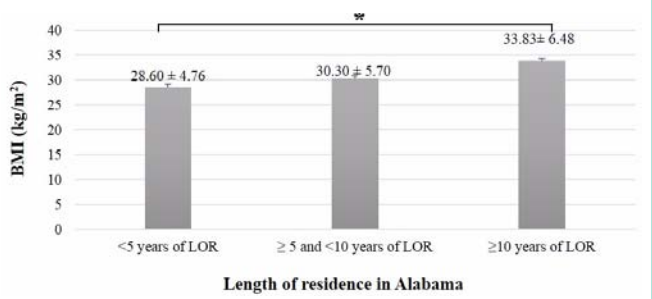

Figure 1: Means differences in BMI by Length of Residence in Alabama. A one-way ANOVA between LOR on BMI outcome was significant (p=0.0005). The results of Tukey' post hoc test are denoted by *p=<0.05.

rates of obesity prevalence [29]. This recent migration pattern may represent a challenge to state agencies committed to overall health of their residents, prompting the need for responsible research that can inform public health initiatives. Consequently, and given that increased time of residence could result in increased risk for obesity, this study evaluated how LOR influenced BMI, eating practices, and physical activity in a sample of Hispanic/Latino women who have migrated to Alabama, a non-traditional migratory state reported to have the fastest growing Latino population during the period of the study. Therefore, the purpose of this study was to test the hypothesis that BMI, eating practices, and physical activity would be positive associated with LOR. This research was guided by three specific aims examining the association of LOR with: 1) eating practices, 2) physical activity, and 3) BMI, considering the potential role of various sociodemographic factors in a group of women living in Alabama.

Methods

Study design and participant recruitment

217 Latina immigrants living in a New-Destination State (LINDS), aged 20 to 50 years were recruited as part of the control group of a larger randomized community based intervention trial in Alabama to assess the efficacy of a cervical cancer prevention program [30]. An intervention addressing eating practices and physical activity was implemented in the control group given that the community considered these topics important to discuss. Participantes self - identified as Latina immigrants from Mexico, Central America (El Salvador, Guatemala, Honduras, Nicaragua) and Peru. According to the US, Census Bureau, 66% of Latinos in Alabama are of Mexican origin [31]. However, our data showed that this percentage is over 80% which is similar than previously documented estimates [32,33]. This difference may be due to the large undocumented Latino population who may not be captured by census estimates. The participants in this study completed an interviewer-administered questionnaire in Spanish as part of the baseline assessments after consenting in their native language. This study was approved by the Institutional Review Board (IRB) at UAB and all participants provided written informed consent. Only participants in the control group were included in the analysis because BMI was not assessed among participants in the cervical cancer prevention intervention group.

Socio demographic data

Information about age, country of origin, LOR, educational attainment, income, number of children, marital and employment status were included. LOR was collected as years in Alabama (LOR_{AL}) - indicating time in new-destination state – and years living in the US (LOR_{US}). Both LOR were measured in years and independently evaluated as a continue variable to assess its association with eating practices, physical activity, and BMI.

Eating practices and physical activity

Eating practices was assessed with these questions: "In an average day, how many portions of fruit and vegetables do you eat?", "How often do you eat deep fried food?", and "In an average day, how many cans/glasses of sweetened beverages do you drink?" Variables were categorized according to the number of portions (fruit/vegetables, and sweetened beverages) or times per week (fried food). Portions were measured by providing participants with a cup and bowl to aid in their estimation of portion sizes. The engagement in physical activity was measured with the question "In an average week, how many days do you get at least 30 minutes of moderate physical activity? Examples of activities considered as moderate were running, walking, cycling, swimming, and gardening.

Body mass index

Body mass index was calculated as weight in kilograms divided by height in meters squared. Height and weight were measured by research personnel using standardized protocols. The height of Latinas was measured to the nearest centimeter (cm) on a stadiometer (Seca 217, Seca, Columbia, MD) and body weight was measured in kilograms (kg) using an electronic scale (Health-O-Meter Professional 349KLX, Health-O-Meter, Boca Raton, FL) and recorded to the nearest 0.1kg. BMI was used as a continuous variable in linear regression analysis. Additionally, BMI was categorized based on the World Health Organization (WHO) classification [34]: Underweight (BMI < 18.5 kg/m^2), normal weight (BMI 18.5 - 24.99 kg/m^2), overweight (BMI 25 - 29.99 kg/m^2), and obese (BMI > 30 kg/m^2).

Statistical analysis

Descriptive statistics (mean, standard deviation, and frequencies) were calculated to summarize sociodemographic information including age, LOR in the US (LOR_{US}), LOR in Alabama (LOR_{AL}), educational attainment, income, number of children, country of origin, marital status, and employment status. Eating practices included measures of fruit and vegetable intake, sweetened beverages consumption, and fried food intake. Physical activity included measure of days per week of moderate exercise. Simple linear regression models adjusted for age were used to evaluate the association between LOR and 1) eating practices (fried food, sweetened beverages, and fruit/vegetables consumption), 2) physical activity, and 3) BMI. A multiple regression model was applied to predict BMI based on LOR after adjusting for the following covariates: eating practices, physical activity, educational attainment, income, marital status, number of children, and employment status.To fulfill the assumption of regression modeling, residuals were visually evaluated for normality removing those deviating more than three standard deviations. Mean differences of BMI were also evaluated considering LOR_{AL} as a categorical variable to evaluate recent (<5 years), medium (≥5 and <10 years), and longer term (>10 years) immigrants using an Analysis of Variance (ANOVA) F - test with Tukey'spost-hoc.The significance level was considered $\alpha = 0.05$ for all statistical analyses. All analyses

Table 1: Socio demographic characteristics of migrant Latinas living in new-destination states (n=217).

Variables	Mean ± Standard deviation
Age (y)	30.56 ± 6.82
Length of residence in the US (y)	6.30 ± 4.12
Length of residence in Alabama (y)	4.94 ± 2.89
Educational attainment (y)	8.86 ± 2.98
Income ($)	1,690.87 ± 902.54
Number of children	2.19 ± 1.20
	Percentage (n)
Country of origin	
Mexico	85.25 (185)
Central American countries	14.75 (32)
Marital status	
Married	52.07 (113)
Living together/common law	42.40 (92)
Divorced/Separated	2.76 (6)
Single	2.76 (6)
Employment	
House wife	42.59 (92)
Fulltime job	24.07 (52)
Part time job	21.76 (47)
Do not have a job or other	11.57 (25)

were performed with SAS statistical software (version 9.4, 2002 - 2012 by SAS Institute Inc., Cary, NC).

Results

Table 1 describes population characteristics of the sample. Most of the participants were from Mexico, with a mean US residence of 6.30 ± 4.12 years (range of < 1 to 20 years) and a mean Alabama residence of 4.94 ± 2.89 years (range < 1 to 18 years). Seventy percent of the Latinas reported that Alabama had been the only place of residence. The majority of participants were married or cohabiting and 47% reported having a full time or part time job, mainly in housekeeping, restaurants, or babysitting. Less than 2% of the participants had college education, and the average monthly family income was $1,690.87 ± 902.54. According to the BMI classifications, only 23.96% were considered normal weight, 29.95% overweight, and 46.08% obese.

Neither LOR_{US} nor LOR_{AL} were associated with eating practices and physical activity ($p > 0.05$). However, 43.32% of Latina immigrants reported an intake of one portion or less of fruit and vegetables per day, about 30% of them consumed fried food more than four times per week, and 46.55% of them drank two or more glasses/cans of sweetened beverages per day (Table 2). Fifty three percent of Latina immigrants reported not engaging in moderate physical activity during the week, 34.09% of them engaged in moderate physical activity between 1-3 days, and 12.4% of them were physically active for more than four days per week.

Length of residence in Alabama on BMI

Linear regression model evaluating the association between LOR_{AL} with BMI yielded statistical significance [F (2,214) = 8.04, p = 0.0.0004; R^2 = 0.0699] and accounted for approximately 29.43% of the BMI variance. Exploratory Analysis of Variance (ANOVA) F-test grouping length of residence every five years yielded similar results (Figure 1). The mean difference in BMI by LOR_{AL} was significant for immigrants living in Alabama less than 5 years (28.60 ± 4.76) in comparison to those who lived in Alabama for at least 10 years or more (33.83 ± 6.48). No significance differences were found for pairwise comparison between those living between 5 to 10 years and the other two groups.

Demographic indicators, eating practices, physical activity, LOR on BMI

Multiple regression analyses evaluated income, educational attainment, number of children, eating practices (fruit and vegetables, fried food, sweetened beverages intake), physical activity and LOR_{US} on BMI and yielded statistically significant model [F (9,198) = 3.57, p = 0.0004; R^2 = 0.1396]. In addition to LOR_{US}, household income (p = <0.05) was negatively associated with BMI among LINDS, accounting only for 0.13% of the BMI's variance. However, fruit and vegetables, fried food, sweetened beverages intake, physical activity, educational attainment, and number of children showed no association.

Discussion

This study focused on investigating if LOR in what is considered US new-destination states was associated with eating practices, physical activity, and BMI in a sample of Latina immigrants. The results of this exploratory study show an increase of relative body weight as time in the US increases, demonstrating that the previously

Table 2: Eating practices of migrant Latinas living in new-destination states (n=217).

Fruits and vegetables		Sweetened beverages		Fried food	
Portions per day		*Portions per day*		*Times per week*	
Frequency	**Percentage (*n*)**	**Frequency**	**Percentage (*n*)**	**Frequency**	**Percentage (*n*)**
None	6.91 (15)	None	11.52 (25)	Daily	21.66 (47)
Less than one portion	5.07 (11)	Less than one can or glass	11.06 (24)	4-6 times per week	9.22 (20)
1 portion	38.25 (83)	1 can or glass	30.88 (67)	1-3 times per week	60.83 (132)
2 portions	26.27 (57)	2 cans or glasses	26.27 (57)	Less that once per week	5.99 (13)
3 portions	12.90 (28)	3 cans or glasses	12.44 (27)	I do not eat fried food	2.30 (5)
4 portions	7.83 (17)	4 cans or glasses	3.69 (8)		
5 or more portions	2.76 (6)	5 cans or glasses	4.15 (9)		

reported effect of LOR in weight among Latina immigrants is not limited to those migrating into larger cities or metropolitan areas. The complex etiology that characterizes weight increase among immigrants is captured in our results by the lack of association of LOR with participant's eating practices or their physical activity.

Although the results of our study replicate previous findings [26,35]. there are unique aspects that deserve discussion. Of relevance is the finding that in this population of LINDS, increase in weight manifested earlier than the previously reported twenty years timeframe [26,35]. The understanding of this observation is beyond the scope of the study; however, Latina immigrants in our sample reported low fruit-and-vegetable and high fried-food/sugar intake compared with US national recommendations and recommended dietary guidelines from the Latinas' country of origin [13,36,37]. It has been documented that the reduced intake of fruit and vegetables in this population occurs despite consuming one or more daily servings of these items [20]. The reasons for low consumption of healthy foods are not completely understood; however, data showing that only 30% of a Mexican representative sample had adequate fruit-and-vegetable intake according to American dietary guidelines [38] may suggest the adoption of eating practices in their own countries prior to migration. In addition, according to the Center for Disease Control and Prevention, by 2013 less than 10% of adults meet the recommendations for fruit and vegetable intake in Alabama (9.5% and 7.1% of adults, respectively) [39]. Due to the cross-sectional design of the study, it is not possible to dissent angle if reduced consumption of fruit and vegetables in this cohort is due to unhealthy behaviors originated in their native country, acquired practices after moving to the US, or potential culturally defined resistance or aversion to certain food consumption.

Our results support previous reports of no association between LOR in the US, new migrant destinations and physical activity [22]. And are consistent with the work of Sweatt et al., [40] who reported that Latinas residing in Alabama had a high prevalence of sedentary activity compared with recommendations. Between 2000 and 2011, an immigration rising of 158% placed Alabama as the US state with the fastest growing Latino population [29]. Our study benefits from a "natural migration experiment" to investigate how the "new" immigrant experience can impact health, particularly in a state with one of the highest obesity prevalence in the nation (35.6%) [41]. It is worth noticing that there were no differences in the associations between BMI and LOR_{US} or LOR_{AL} in any tested statistical models, except that LOR_{AL} accounted for a slightly greater proportion of the variance of BMI. Any understanding between potential differences of these two LOR variables is limited by their nested relationship. Uncovering how migration in states characterized by extensive obesogenic environments might impact the health of Hispanic/Latino immigrants is an area of need for further research. Hence, the results of our study must be confirmed and expanded to inform clinicians, researchers and public health personnel of potential consequences of LOR into cardiometabolic health in migrant groups, in hopes of improving the overall health of the population.

Of great interest is the significant negative association between Latinas' BMI and their household income, consistent with previous studies in minority populations [42,43]. The relationship between socioeconomic status and health varies according to immigration status with research documenting a lower BMI among Hispanic/Latino immigrants than Hispanic US -born [23,44]. It appears that the interaction of LOR, birthplace effect, and poverty have the potential to provide meaningful insights to be translated into obesity-prevention strategies in the US population.

Although our results suggest that the prevalence of obesity increases with longer residence in new destinations, this study has some limitations. First, this cross-sectional study did not allow for examination of developmental trajectories of LOR and BMI. Second, the small sample size. Third, the short, self-reported dietary intake questionnaire, while easy to use and requiring minimal training, limits the possibility of evaluating macro- and micronutrient composition of the diet. Similarly, the limitations of self-reported physical activity, including limitation to leisure time and the lack of reflection of work-related physical activity. Fourth, the use of tools (dietary intake and physical activity) to assess lifestyle behaviors, and our inability to capture information regarding behavioral practices prior to migration. Lastly, the use of BMI, which is based on height and weight measurements, ignores the specific amount of fat in the body compared to other body mass measurements. Although the extent to which our limitations assessing behavioral practices or changes reduced our ability to identify associations of interest is unclear, our results raise awareness of the need to understand the etiology of health in migrant communities. Given the unique historical context and the desire to protect their autochthonous culture, LINDS could serve as a research model to empower and enrich recent migration experiences and the consequential improved health desired by other migrant groups. Further research is needed to corroborate our results, to explore potential causal relationships of LOR, diet, and physical activity, and to uncover how immigrant's health is shaped by the complex dynamics that arise in a new environment, including time spent, cultural adaptations, incorporation of behavioral practices, and overcoming language, social and political barriers.

Ethical Approval

Institutional Review Board (IRB) approval was obtained for this study from University of Alabama at Birmingham (UAB). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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