Research Article

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http://www.imedpub.com/

Journal of Childhood Obesity
ISSN 2572-5394

2018
Vol.3 No.2:11

DOI: 10.21767/2572-5394.100051

Childhood Obesity Factors and Family Structure on Latino-American Adolescents in the National Health Information Survey from 2008 to 2015

Jeffrey ES*, Banta JE, Modeste NN and Dos Santos H

School of Public Health, Loma Linda University, 24951 North Circle Drive, Loma Linda, California, USA

***Corresponding Author:** Jeffrey ES, School of Public Health, Loma Linda University, 24951 North Circle Drive, Loma Linda, California, USA, Tel: (240). 899.7618; E-mail: ejiiithechosenone@gmail.com

Received date: April 26, 2018; **Accepted date:** April 30, 2018; **Published date:** May 04, 2018

Citation: Jeffrey ES, Banta JE, Modeste NN, Dos Santos H (2018) Childhood obesity factors and family structure on Latino-American adolescents in the national health information survey from 2008 to 2015. J Child Obes Vol No 3 Iss No: 2: 11.

Abstract

Latinos are the largest minority group in the US and childhood obesity is a huge problem for that group mostly because of the easy access to unhealthy and high-calorie dense foods and lack of opportunities and willingness for exercise. The rates of obesity among Latino adolescents (12-19 years old) are 22.8% which is the higher rates of obesity among all adolescent groups in the country.

We investigated the association between Body Mass Index (BMI) in Latino adolescents and demographical and social factors such as family income, geographic location, parental education, gender, the language of interview, family size, and household structure. Participants in this research study were Latino adolescents between the ages of 13-17 years who lived with single mothers, single fathers, married, and unmarried couples, step-parent, or with extra adults in the home. Household structure has been shown to be related to childhood obesity in the general population, but data is limited for adolescents and nonexistent for Latinos. Responses from 2008-2015 were collected in the National Health Interview Survey (NHIS) and then multiple NHIS surveys have been combined into one system called the Integrated Health Interview Survey (IHIS) from which we obtained data. Bivariate analysis at first showed some association between household structure and BMI, but in the final model, the association disappeared in favor of the other covariates, mostly education and income. In families with parents who had at least a college degree, children had 48% lower odds of becoming obese. Also, after controlling for all the potential confounding variables, females had 18% lower odds of being obese compared to males.

Therefore, interventions to this Latino population should be targeted to increase opportunities for education for Latino parents, incorporating messages about weight management and the importance of having a normal BMI for children.

Keywords: Latinos; Exercise; Body mass index; Obesity; Adolescents

Introduction

According to Ogden [1], 22.8% of Latino adolescents between 12-19 years old are obese, compared to about 19.6% of all Caucasian adolescents. Rates are similar to African American Adolescents (22.6%). One reason for this is that Latino children are less likely to be in after-school activities that involve physical activity, because of issues like cost of participation, transportation and language barriers [2]. Moreover, Perez-Escamilla [3], examined the nutrition and health outcomes in Latino adolescents and found that obese (i.e., ≥ 95th sex- and age-specific reference BMI percentile) and non-obese children followed a dietary pattern that involved low intakes of fruits and vegetables, coupled with excessive high-fat and high sugar foods and beverages.

Additionally, Singh et al. [4] discovered that from 2003 to 2007, obesity prevalence increased by 10% for all US children; however, it increased by 23%-33% for children in low-education, low-income, and higher unemployment households. Also, Latinos, non-Latino white, and American Indian children had 3.0-3.8 times higher odds of obesity and overweight than Asian children; children from low-income and low-education households had 3.4-4.3 times higher odds of obesity than children from high socioeconomic households [4].

Although there has been some research on the influence of family structure on academic, behavioral, and cognitive outcomes, little research exists on the impact of household structure on physical health factors such as body weight [5]. Household structure is defined by the number and type of adults living with children such as parents, stepparents, and other adults [6]. Children in stable marriage households have healthier BMI due to decreased stress levels and increased emotional support in such mothers compared to single-mother households; similarly, maternal stress, maternal depression, care neglect, and less sensitive mothering contribute to higher BMI and increased risk of obesity in children [5]. Furthermore, the household structure has an impact on the health care and physical outcome of a child; for example, single mothers with asthmatic children use fewer asthma medications and provide worse control of asthma symptoms than two-parent families [7].

Moreover, preschool children rose by cohabiting biological parents (parents who are unmarried, but living together as a couple) had the highest rates of obesity at 31% compared to 15% for children in households with married parents [8]. Similarly, married step-parent households had lower rates of obesity at 15% compared with 31% of unmarried parents who are living together; also, children in single-father household families had a 15% rate of obesity while children in single-mother families had higher rates of obesity at 23% [8]. This could be due to differences in income level between single fathers and single mothers, less stress, and higher social support. There is, however, limited information on the association of household structure on BMI among Latino adolescents in the US.

Method

This study used a cross-sectional design to explore the factors associated with obesity among Latino adolescents in the US. The dataset is from the National Health Interview Survey (NHIS). Multiple NHIS surveys have been combined into one system called the Integrated Health Interview Survey (IHIS). Data were collected via the National Health Interview Survey (NHIS). NHIS contains data from all 50 states in the nation and has a sample size of about 87,000 from approximately 35,000 households per year. The selected adult in each household answered questions about themselves, such as sociodemographics, health behaviors, health status, and healthcare utilization, family cancer history, health education, mental health status, etc. Parents with children also answered some questions regarding one child as well as family characteristics. For example: for living arrangements, they were asked, “Are they a married couple? Are they an unmarried couple? Are the mothers biological or non-biological with children? Are the fathers biological or non-biological with children? Is either of the parent step-parents? Is either of the parents an adoptive parent? Are the parents married or unmarried parents?” All the information from the questionnaire was self-reported.

Participants

Participants were Latino parents with children between 13-17 years old living in households with at least one child, taken from the Integrated Health Interview Survey (IHIS) database, who completed surveys from 2008-2015. However, analyses were focused on children, not the parents. The domains for the definition of Latino included: Hispanic/Spanish origin, Mexican, Mexican-Mexicano, Mexicano, Mexican-American, Chicano, Puerto Rican, Cuban/Cuban-American, Dominican (Republican), Other Hispanic, Central/South American, Other Latin American, and Other Spanish [6]. There were 17,213 completed surveys. However, many of the records did not have valid BMI data, so analysis was restricted to 7,396 youth.

Procedures

Multiple NHIS surveys have been combined into one system called the Integrated Health Interview Survey (IHIS) to facilitate researchers. Data for this analysis were extracted for years 2008 to 2015 from the Integrated Health Interview Survey (IHIS) [6]. The Integrated Health Interview Survey (IHIS) database is accessible online at no cost. The University of Minnesota and Minnesota Population Center owns all the rights to the database. We requested access to the database online and received permission to use it.

Measuring tools

Body Mass Index (BMI) was the dependent variable and already part of the database. BMI was classified as a categorical variable following the reference categories for childhood obesity percentiles from the CDC. BMI calculations were based on the Centers for Disease Control and Prevention (CDC) [9] categories for childhood obesity percentiles. Obesity was categorized as ≥ 95th percentile. BMI was used as a dichotomous variable and with levels above and below the 95th percentile.

The household structure variable definitions followed a study from the National Center for Health Statistics [10]. The household structure variable definitions are:

- Nuclear: A nuclear family consists of one or more children living with two parents who are married to one another and are each biological or adoptive parents to all children in the family.
- Single mother: A single-mother family consists of one or more children living with a single adult mother.
- Single father: A single-father family consists of one or more children living with a single adult father.
- Cohabiting: A cohabiting family household consists of one or more children living with a biological or adoptive parent and an unrelated adult who are cohabiting with one another.
- Blended: A blended family household consists of one or more children living with a biological or adoptive parent and an unrelated stepparent who are married to one another.
- Extended: An extended-family household consists of one or more children living with at least one biological or adoptive parent and a related adult who is not a parent (example, an adult child, an aunt, uncle, or grandparent).

The other variables used in the study were parental education, geographic region (Northeast, Midwest, West, South), household income level, child gender and age, the language of interview and number of children in the household.

Concerning the household structure, the nuclear family was chosen as the reference category based on the guidelines from the National Center for Health Statistics [10]. For education, the categories were less than high school degree, high school graduate, some college/associates degree, and college graduate. The parental education category was based on the highest education of the parent in the house. The reference chosen for parental education was less than High School Diploma.

Geographic location was categorized into four regions of the United States: West, Northeast, Central/Midwest, and South. The reference category for this variable was west.

Additionally, for income, the categories were less than 100% Federal Poverty Level (FPL), 100% to 175% FPL and greater than 175% FPL. The FPL was determined using reported total family

income which was compared to the US. Census Bureau poverty thresholds for the year; these thresholds are based on both family size and the number of children under age 18. For example, the FPL for a family size of five including three children under 18 years old is $28,643.00. The reference category for this analysis was the Less than 100% of the Federal Poverty Level (FPL). The gender variable was the child chosen by the parent. The reference category for gender was Males.

For the language of interview, the categories were English only, Spanish only, and both English and Spanish. For Latinos, there was an option to have the questionnaire in Spanish. These were the options available for language which was used to conduct the interview. For the analysis, English was the reference category. Regarding family size or the number of children in the household, the categories were only 1 child, 2 or 3 children, and 4 or more children [6]. Only 1 Child was the reference category chosen for this variable.

Data analysis

Variables for the study were pulled from the IHIS website and analyzed using Statistical Analysis System (SAS) 9.4 software. Survey-weighted analyses included descriptive for all the variables comparing obese and nonobese children. Next, individual associations with household structure and BMI were examined. Finally, regression including all variables done to determine which variables have the greatest association with BMI among Latino children between 13-17 years of age. Missing data were not included in the data for analysis because of non-response to one or more of the questions in the questionnaire about the research study.

Results

The total population was 7,396 of Latino adolescents with valid BMI data, 1,135 were in the obese category and 6,261 in the non-obese category of Latino children between the ages of 13-17 years. Regarding parental education, the highest percentage of the obese population was less than High School diploma with 37.8%, followed by some college/Associate degree with 27.2%, then by High school graduate with 22.8%. College graduate had a percentage of 8.2%, and Missing data was 4.0% (**Table 1**). These results show that 2/3 of the parents of Latino adolescents have high-school or less education.

Table 1: Descriptive of obese *vs.* nonobese data of Latino children between 13-17 years old.

Survey	Obese	Non-obese	P-value
n=	1,135	6,261	
Total	19,494,404	12,790,003	-
Annual estimated population	278,318	1,598,750	
Family Category			
Nuclear	23.3	27.4	
Single Mother	15.8	13.2	
Single Father	2.9	3.4	
Cohabiting	1.9	2.7	<0.0001
Blended	6.1	5.5	
Extended	45.8	43.1	
Missing	4.2	4.7	
Sex			
Male	54.2	50.3	-
Female	45.8	49.7	
Region			
Northeast	13.2	13.3	
North Central/Midwest	10.3	9	-
South	31.1	31.4	
West	45.4	46.2	
Parental Education			
Less than HS diploma	37.8	32.3	<0.0001
High School graduate	22.8	22.3	

Some college/Associates	27.2	24	
College graduate	8.2	16.2	
Missing	4	5.2	
Poverty			
Less than 100% FPL	29.5	25.3	<0.0001
100 to 175% FPL	23.6	22.3	
Greater than 175% FPL	35.4	40.9	
Missing	11.5	11.5	
Interview Language			
English	60.7	60.8	-
Spanish	23.3	23	
English and Spanish	15.7	15.8	
Missing	0.3	0.4	
Number of Children			
1 only	46.1	43.6	-
2 or 3	46.4	48.3	
4 or more	7.5	8.2	
Survey Year			
2008 to 2010	31.5	33.2	<0.01
2011 to 2013	40.8	40.4	
2014 to 2015	27.7	26.4	

For the region, the two highest percentages in the obese category were from the West with 45.4%, and South, 31.1%. This finding demonstrates that childhood obesity in Latino children between 13-17 years old in this database is more prevalent in the West and South regions compared to the North Central/ Midwest and the Northeast.

Furthermore, a look at the family income category shows that for the obese category, Greater than 175% FPL had the highest percentage of the obese population with 35.4%, followed by less than 100% FPL with 29.5% and 100% to 175% FPL with 23.6%. There were also 11.5% missing data. This demonstrates that over half of Latino households with obese children between the ages of 13-17 years old have parents who earn less than 175% of the Federal Poverty Level. Regarding gender, the distribution was almost equal, 50.9% were males, and 49.1% were females.

For interview language, in the obese category, English only was 60.7%, Spanish only was 23.3%, and English and Spanish was 15.7%, and 0.3% missing data. Therefore, most of the respondents in the obese category preferred the English language for the interview. For family size, in the obese category, parents with only 1 child was 46.1%, parents with 2 or 3 children were 46.4%, and parents with 4 or more children was 7.5%. Hence, the higher percentage of households had 2 or 3 children. The highest percentages of family structure variables were: 43.6% in the Extended family category followed by Nuclear family with 26.7% and Single mother with 13.5% (**Table 1**).

Discussion

Our study showed that about 15% of Latino adolescents between 13-17 years old are obese. According to Ogden et al. [1], 22.8% of Latino adolescents between 12-19 years old are obese compared to 19.6% in non-Latino whites. Our results may be different because of the difference in age groups: 12-19 in ours and 13-17 in Ogden's [1]-and also there was a huge number of BMI missing date (9,817) (**Table 2**).

Table 2: Descriptive of missing *vs.* non-missing data of Latino children between 13-17 years old.

Survey	Missing BMI Data	Non-missing BMI Data	P-value
n=	9,817	7,396	-

Total	19,494,404	12,790,003	
Annual estimated population	2,436,801	1,877,068	
Family Category			
Nuclear	30.7	26.7	<0.0001
Single Mother	12.9	13.5	
Single Father	2.4	3.3	
Cohabiting	3.5	2.6	
Blended	7.4	5.6	
Extended	37.2	43.6	
Missing	5.9	4.7	
Sex			
Male	50.8	50.9	-
Female	49.2	49.1	
Region			
Northeast	11.4	13.3	<0.05
North Central/Midwest	9.5	9.2	
South	31.6	31.4	
West	47.5	46.1	
Parental Education			
Less than HS diploma	39	33.1	<0.0001
High School graduate	22.8	22.4	
Some college/Associates	21.7	24.5	
College graduate	10.4	15	
Missing	6.1	5	
Poverty			
Less than 100% FPL	33.2	26	<0.0001
100 to 175% FPL	21.1	22.5	
Greater than 175% FPL	27.4	40	
Missing	18.3	11.5	
Interview Language			
English	56.6	60.8	<0.0001
Spanish	26.8	23.1	
English and Spanish	16.2	15.8	
Missing	0.4	0.3	
Number of Children			
1 only	7.1	44	<0.0001
2 or 3	66.2	48	
4 or more	26.7	8	
Survey Year			

2008 to 2010	35.9	33	<0.01
2011 to 2013	38.4	40.4	
2014 to 2015	25.6	26.6	

Regarding the relationship between household structure and BMI among Latino adolescents between 13-17 years old, initially, the results were positive for some variables such as single mother and extended family households (**Table 3**).

Table 3: Family Structure variables and BMI levels of each of 13-17 year old Latino children compared to individual demographic variables-Odds ratio and confidence intervals from 2008-2015 in the Integrated Health Interview Survey (IHIS).

Variables	Odds Ratio	Confidence Intervals	P-value
Family Category			
(Reference=Nuclear)	1	-	-
Single Mother	1.44	(1.09-1.78)	0.008
Single Father	1.18	(0.74-1.90)	0.491
Cohabiting	1.19	(0.73-1.93)	0.482
Blended	1.06	(0.75-1.51)	0.747
Extended	1.23	(1.01-1.48)	0.036

However, in the final regression model with all variables (region, parental education, gender, language, income, and family size) there was no association between single mother or extended families and childhood obesity in 13-17 years old Latino adolescents. This was probably because education acted as a confounding variable. Therefore, the Single mother and extended families variables in household structure would still be valid for those with lower educated parents (**Table 4**). Single mother families and extended families could lead to increased levels of stress in low-income families. There has been an association between psychological stress and childhood obesity; children in families who reported stress were 2.6 times more likely to be obese compared with families who did not report facing psychological stress [11].

Table 4: Family Structure variables and BMI levels of 13-17 year-old Latino children compared to all demographic variables-Odds ratio and confidence intervals from 2008-2015 in the Integrated Health Interview Survey (IHIS).

Variables	Odds Ratio	Confidence Intervals	P-value
Family Category			
(Reference=Nuclear)	1	-	-
Single Mother	1.21	(0.92-1.60)	0.17
Single Father	1.08	(0.60-1.97)	0.791
Cohabiting	1.05	(0.62-1.77)	0.861
Blended	1.09	(0.76-1.57)	0.647
Extended	1.11	(0.89-1.37)	0.356
Sex			
(Reference=Male)	1	-	-
Female	0.82	(0.69-0.98)	0.025
Region			
(Reference=West)	1	-	-
North Central/Midwest	1.21	(0.89-1.64)	0.236
Northeast	0.86	(0.68-1.08)	0.19

South	1.03	(0.85-1.26)	0.759
Parental Education			
(Reference= Less than High school diploma)	1	-	-
High School Graduate	0.91	(0.73-1.15)	0.449
Some college/Associates	1.04	(0.81-1.33)	0.763
College graduate	0.52	(0.35-0.78)	0.002
Poverty			
(Reference=Less than 100% FPL)	1	-	-
100 to 175% FPL	0.89	(0.69-1.15)	0.386
Greater than 175% FPL	0.77	(0.59-1.01)	0.055
Interview Language			
(Reference=English)	1	-	-
Spanish	0.85	(0.65-1.11)	0.219
English and Spanish	0.97	(0.76-1.24)	0.822
Number of Children			
(Reference=1 only)	1	-	-
2 or 3 children	0.94	(0.75-1.17)	0.553
4 or more children	0.87	(0.60-1.25)	0.444

After controlling for all the potential confounding variables, parents with children who had at least a college degree were 47.7% lower odds of becoming obese (**Table 4**). Lindsay et al. [12] discovered that parents have a profound influence on the dietary practices, physical activity, sedentary behaviors, and weight status of children; this is because parental knowledge of nutrition, meal structure, and home eating patterns predict future choices and decisions in children. Therefore, it is imperative that parents are involved in obesity prevention interventions since parents are role models and reinforce dietary behaviors and can support children in healthy eating habits [12-14]. Kimbro [8] on their study with preschool children also found that mother's college degree was protective against childhood obesity by 35%.

Obesity interventions that target Latino adolescents must provide more education programs and options for Latino parents. Additionally, it is necessary to focus on high-risk Latinos with low academic performance. This should be done by organizing community health forums that educate and teach residents about the importance of healthy decisions and choices. Also, such meetings must involve cooking lessons which are culturally appropriate in Latino communities to encourage healthy and nutritious food consumption. Similarly, parents must be educated about the importance of physical activity in preventing diseases such as hypertension, diabetes, hypercholesteremia.

Furthermore, females had 17.7% lower odds of being obese compared to males (**Table 4**). This is consistent with the study by Kimbro [8], which shows that Latino female children were 19% less likely of becoming obese compared to Latino male children. Latino adolescent males should be encouraged to participate in extracurricular activities that involve sports both after school and also at home with their friends and colleagues.

Both college degree education and gender are statistically significant as shown in **Table 4**. Since children depend on their parents for food, they are likely to have similar weight classification as their parents. While being financially stable is important in purchasing healthy foods, education is equally important in making healthy choices and decisions.

There was no significant association between BMI and income, family size, and region. Kimbro [8], however, found a protective association between family size (13%) and region (West had 36% lower rates) and BMI, but this was among preschool children and in the general population of the US. Lower income is related to weight; however, we could not find this in our study. However, there was a trend to confirm it as a higher income would have lower odds of obesity, only that the results were not statistically significant (**Table 4**).

Hence, our study showed that parental education and gender were responsible for the association between childhood obesity in Latino adolescents between 13-17 years old in this study.

Conclusion

Our study showed a strong inversed association between BMI and education of parents in this database of Latino adolescents in the US. After controlling for all the potential confounding variables, parents with children who had at least a college degree had 47.7% lower odds of becoming obese. Childhood

obesity interventions usually focus on dietary habits and exercise, but it is necessary to understand other factors that contribute to the childhood obesity prevalence among Latino adolescents in the nation such as lack of education. In our study, we found that lower education was more important than any household structure or other covariates. It is necessary to target both parents and children when designing childhood obesity interventions and tailor programs to Latinos that address the lack of education in this population. Developing more adult education courses might also be important for that minority and not necessarily in Spanish as they preferred English as the language of the interview, meaning that they were comfortable with the language. Also, parents must be educated about the importance of physical activity, and if children live in neighborhoods that are unsafe and poor communities, they should be encouraged to participate in sports activities in school, especially for male adolescents as they are more likely to be obese. On the same line, probably curtailing hours spent in video games, computer and TV could be another strategy to be used in this population. Similarly, it will be useful to incorporate healthy ingredients that are common in Latino households in cooking demonstrations and lessons during community forums.

A few limitations of this research study were that the variables were self-reported by parents who live in households with children. Hence there was the possibility of inaccurate reporting on their behalf. Also, parents chose children who they wanted to participate in the study while answering the questionnaire. This induces the possibility of a selection bias in the research study. Also, the dataset was from 2008-2015, and it is possible that there were changes in data collection methods during those years.

Another important factor was the missing data. There were 9,817 missing BMI data, and this could have challenged the results of the study if they had been included (**Table 2**). Out of a total of 17,213 Body Mass Index (BMI) data for Latino children between 13-17 years old, 9,817 of them were missing BMI data, and 7,396 had BMI data. For those with and without BMI data, the highest percentages of family structure variables were 43.6%/37.2% in the Extended family category followed by Nuclear family with 26.7%/30.7%, and Single mother with 13.5%/12.9%, respectively. Even though there were differences, there was a similar trend in those missing BMI data. Also, regarding gender, the two groups were almost identical (**Table 2**).

For the region, the two highest percentages in those with BMI data were from the West with 46.1%, and South, 31.4% compared to values without BMI of 47.5% and 31.6% respectively. There was a similar trend here again.

For Parental Education, the differences in those with and without BMI were Less than High School diploma with 33.1%/39%, Some college/Associate degree with 24.7%/21.7%, High school graduate with 22.4%/22.8%, College graduate had a percentage of 15.0%/10.4 respectively. Differences here also were not so great, and the general trend was the same, just that in the missing data there was a little lower level of high education. This could explain that there was a slightly higher educated population in the BMI group, which could justify that more educated people will mostly know the measures of their children. However, probably this would not affect the results as they are in concurrence with the literature.

Regarding family income results showed that for those with BMI data, Greater than 175% FPL had the highest percentage of the obese population with 40.0%, followed by Less than 100% FPL with 26.0% and 100% to 175% FPL with 22.5%. Conversely, for those missing BMI data, less than 100% FPL had the highest percentage of the obese population with 33.2%, followed by Greater than 175% FPL with 27.4% and 100% to 175% FPL with 21.1%. That could be the cause of our results not finding an association with income as our data with BMI has a higher income. Probably, if we had the whole data without including the whole population of lower income, income would be negatively associated with obesity, more agreeable with the literature. Our study, however, had a trend in that direction.

For family size, and those with BMI data, parents with only 1 child was 44.0%, parents with 2 or 3 children was 48.0%, and parents with 4 or more children was 8.0%. However, for those missing BMI data, parents with only 1 child was 7.1%, parents with 2 or 3 children were 66.2% and parents with 4 or more children was 26.7%. Again, here we have a potential for a challenge to our results as a higher family size could produce different results.

Future research studies must focus on designing and implementing surveys carefully to not miss important health information such as BMI mostly for minorities or low education populations who might not know their children's measures. Community strategies should be developed to increase opportunities for the education of Latino parents, mostly developing more adult education programs. Those programs, targeted to low educated Latinos, should incorporate information on the importance of making healthy dietary choices and learn how to motivate their children to adopt them. Also, when designing interventions to this population, Latino children with low academic level should be addressed and taught lessons about healthy nutrition in classrooms and be encouraged to participate in sports activities both at home and in school. Still, the focus on household structure should continue in practice and research, mostly addressing single mother and extended families with low education and probably low income as those were more likely to be affected. Again, here we have a potential for a challenge to our results as a higher family size could produce different results.

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