

# CHILDHOOD OBESITY AMONG HEAD START ENROLLEES IN SOUTHEASTERN MINNESOTA: PREVALENCE AND RISK FACTORS

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**Background:** Up to 32% of US Head Start enrollees in inner-city settings have been reported to be obese. However, little is known about the prevalence of overweight and associated risk factors in Head Start enrollees in non-inner-city settings.

**Objectives:** To determine the prevalence of childhood obesity from 1998 to 2001 and associated risk factors for overweight among Head Start enrollees in southeast Minnesota.

**Methods:** The study was designed as a cross-sectional study. Subjects were 788 children ages three to five years who were enrolled in Head Start of Olmsted and Freeborn Counties, Minnesota, between 1998 and 2001. Anthropometric data and other sociodemographic variables were collected. The Centers for Disease Control and Prevention (CDC) classification for body mass index (BMI) was used (ie, overweight is >95th percentile BMI for age). Data were fit to a logistic regression model to identify risk factors associated with overweight.

**Results:** From 1998 to 2001, the overall prevalence of overweight and at risk for overweight was 12.9% and 12.2%, respectively. The prevalence of overweight from 1998 to 2001 remained steady, but the prevalence of at risk doubled from 8.2% in 1998 to 16.1% in 2001. On the basis of BMI at the time of enrollment in Head Start, Mexican origin (OR=2.76;  $P=.002$ ) and speaking English as a second language (ESL) at home (OR=1.75;  $P=.026$ ) were independent predictors for overweight.

**Conclusions:** The Head Start setting in a non-urban area does not confer any more or less risk for overweight for enrollees, compared to those in urban settings. Children within a certain ethnic group (eg, Mexican) and those who speak English as a second language at home have a higher risk of being overweight. Specific early interventions for these children in a Head Start setting are warranted. (*Ethn Dis.* 2007;17:23–28)

**Key Words:** Body Mass Index, English as a Second Language, Ethnicity, Hispanic, Mexican, Overweight, Somalian

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## INTRODUCTION

Childhood obesity is associated with significant morbidity and mortality and poses a major challenge in health care.<sup>1–3</sup> Data from National Health and Nutrition Examination Survey (NHANES) demonstrated that the prevalence of overweight, defined as a body mass index (BMI) >95th percentile, among children two to five years of age had increased from 4.9% in 1971–1974 to 6.9% in 1988–1994 and 10.4% in 1999–2000.<sup>4,5</sup>

This obesity epidemic also affects children who attend Head Start, a state and federally funded school readiness program for children ages 3 to 5 years. For example, Wiecha et al reported that the prevalence of overweight among Head Start enrollees in Massachusetts increased from 9.6% in 1988 to 13.3% in 1991.<sup>6</sup> Another study reported that 32% of Head Start enrollees were overweight.<sup>7</sup> Therefore, the prevalence of overweight among children enrolled in Head Start appears to be higher than the national average. However, many previous studies that assessed the prevalence of overweight in Head Start enrollees were conducted in inner-city settings, which may be quite different from a non-urban setting such as southeastern Minnesota with regard to physical environment (eg, access to

fast-food restaurants), ethnic composition (eg, a higher proportion of Hispanic children), and living costs. At present, the literature in pediatric obesity has suitably addressed the disparities of the prevalence of obesity among children with different ethnic<sup>8</sup> or socioeconomic groups.<sup>9</sup> On the other hand, the differences in pediatric obesity risk between urban and non-urban settings have been underreported.<sup>10</sup> Whether the prevalence of overweight among Head Start enrollees is high in a non-inner-city setting (or non-urban setting) is unknown. Similarly, whether the underlying risk factors for childhood obesity are similar to those in Head Start enrollees in an inner-city setting has not been studied.

Although the underlying mechanisms for obesity among Head Start enrollees are unclear, child control of food intake may be a crucial factor. According to a small, qualitative study, parents of Head Start children reported that their children decided which food items were offered for meals and snacks.<sup>11</sup> Such child control of type and amount of food might be a barrier to pleasant meal times, which can be a risk factor for overweight.<sup>11</sup> Because most previous studies did not follow their subjects longitudinally, data on whether children continue to gain weight during Head Start enrollment through a longitudinal follow-up study is not available.

To address these limitations, we conducted a cross-sectional study with a small longitudinal follow-up component to assess the trends of overweight prevalence among 788 Head Start enrollees in southeast Minnesota (Olmsted and Freeborn Counties) from 1998 to 2001.

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## METHODS

### Study Design and Setting

The study was a cross-sectional study. According to the 2000 Census, the population of Olmsted County, Minnesota, was 133,283 (90.3% White compared to 89.4% in Minnesota and 75.1% in the United States) and the population of Freeborn County, Min-

nesota was 32,523 (95.2% White). Women made up 50.9% of the population in Olmsted and Freeborn Counties. Income per capita for Olmsted and Freeborn Counties were \$24,939 and \$18,325, respectively (compared to \$23,198 in Minnesota). The proportion of population below poverty level in Olmsted and Freeborn Counties was 6.4% and 8.4%, respectively. Among the labor force >16 years of age, 18% and 49%, respectively in the two counties, were employed in farm-related industries. Therefore, our study setting is significantly different from typical urban settings in terms of ethnic composition, socioeconomic status, and large proportions of farming work.

### Study Subjects

The study subjects were all children ( $n=788$ ) ages three to five years who were enrolled in Head Start of Olmsted and Freeborn Counties, Minnesota, between 1998 and 2001. Of these 788 children, 765 (97%) had complete

information for this study and were enrolled in this study. Of these 765 children, a subsample of the study cohort ( $n=237$ ) were enrolled in two consecutive years and were followed for two years by assessing their BMI at the time of the first and last enrollment. Two hundred six of them had complete entry and exit information. Information was abstracted from records of the pre-Head Start enrollment physical examination and the intake records of Head Start, which include sociodemographic variables, weight, height, parental marital status, income, and primary language at home (see Table 1 for details).

### Ascertainment of Body Mass Index (Dependent Variable)

Body mass index (BMI) of each child was calculated on the basis of anthropometric data collected at each physician visit before annual enrollment and graduation from Head Start. Percentile ranks of BMI for age and sex were determined by using published standardized growth

**Table 1. Characteristics of the study subjects at the time of enrollment in Head Start from 1998 to 2001**

|                         | Number (%) | Mean Age (years $\pm$ SD) | Mean BMI (kg/m <sup>2</sup> $\pm$ SD) | Proportion of Overweight Children (%) | P value |
|-------------------------|------------|---------------------------|---------------------------------------|---------------------------------------|---------|
| Total                   | 765        | 4.1 $\pm$ .6              | 16.06 $\pm$ 1.93                      | 12.2                                  |         |
| Sex                     |            |                           |                                       |                                       | .5      |
| Girls                   | 392 (51.3) | 4.1 $\pm$ .6              | 16.07 $\pm$ 1.9                       | 5.9                                   |         |
| Boys                    | 373 (48.7) | 4.1 $\pm$ .6              | 16.05 $\pm$ 2.0                       | 6.3                                   |         |
| Lives with              |            |                           |                                       |                                       | .32     |
| Both parents            | 327 (42.8) | 4.0 $\pm$ .6              | 15.96 $\pm$ 1.8                       | 11.3                                  |         |
| Single parent           | 418 (54.6) | 4.1 $\pm$ .6              | 16.13 $\pm$ 2.0                       | 12.9                                  |         |
| Other                   | 20 (2.6)   | 4.2 $\pm$ .7              | 16.08 $\pm$ 2.1                       | 10.0                                  |         |
| Ethnicity               |            |                           |                                       |                                       | .016    |
| Caucasian               | 265 (34.6) | 4.2 $\pm$ .6              | 15.90 $\pm$ 1.8                       | 11.3                                  |         |
| Asians/Pacific Islander | 97 (12.7)  | 4.1 $\pm$ .6              | 15.95 $\pm$ 2.2                       | 12.4                                  |         |
| African American        | 133 (17.4) | 4.1 $\pm$ .6              | 16.03 $\pm$ 2.0                       | 10.5                                  |         |
| Mexican                 | 62 (8.1)   | 4.2 $\pm$ .6              | 16.96 $\pm$ 2.0                       | 29.0                                  |         |
| Other Hispanic          | 71 (9.3)   | 3.9 $\pm$ .6              | 16.09 $\pm$ 2.0                       | 7.0                                   |         |
| Somalian                | 64 (8.4)   | 4.0 $\pm$ .6              | 16.18 $\pm$ 1.7                       | 9.4                                   |         |
| Middle Eastern          | 21 (2.7)   | 3.9 $\pm$ .7              | 16.00 $\pm$ 2.4                       | 19.0                                  |         |
| Other                   | 52 (6.8)   | 4.0 $\pm$ .6              | 15.91 $\pm$ 1.7                       | 7.7                                   |         |
| Language                |            |                           |                                       |                                       | .035    |
| Children speaking EPL   | 443 (57.9) | 4.1 $\pm$ .6              | 15.97 $\pm$ 1.8                       | 9.7                                   |         |
| Children speaking ESL   | 322 (42.1) | 4.1 $\pm$ .6              | 16.17 $\pm$ 2.1                       | 15.5                                  |         |
| Income                  | 765        | -                         | -                                     | -                                     | .097    |

EPL=English as primary language at home; ESL=English as secondary language at home.

charts by the Centers for Disease Control and Prevention (CDC).<sup>12</sup> According to the CDC classification of BMI for age and sex, the children were categorized as underweight (<5th percentile BMI), normal weight, at risk for overweight (85th–95th percentile BMI), and overweight (>95th percentile BMI).

### Independent Variables

The main independent variables of interest included the number of parents at home, ethnicity, and the primary language spoken at home.

Children were categorized according to family situation as living with both parents, living with a single parent (mother or father), or other (grandparents, foster parents, aunts and uncles).

Self-reported ethnic background allowed us to divide children into eight groups: Caucasians, Asians/Pacific Islanders, Blacks/African Americans, Mexicans, Middle Easterners, non-Mexican Hispanics, Somalians, and other. Some ethnic groups had only a few children, so they were collapsed into larger groups with similar background for analytical purposes. These included Puerto Rican children who were grouped with non-Mexican Hispanics and Native American children who were grouped with other. According to main language spoken at home, children were divided into two groups: those from families that spoke English as the primary language (EPL) and those from families that spoke English as a second language (ESL).

### Data Analysis

Data analyses focused on three study outcomes: 1) the trends of overweight and at-risk for overweight from 1998 to 2001; 2) factors associated with overweight in a multivariate model; and 3) changes of BMI of children (a subsample,  $n=206$ ) who were enrolled in Head Start for two consecutive years.

According to BMI of children at the time of enrollment in Head Start in

each year, we calculated crude prevalence rates of overweight and at risk for overweight. Because the main aim of the study was to assess the trends of overweight and at-risk for overweight over time, and sex and age were not significant confounders in this study, we did not assess sex- and age-specific or adjusted prevalence rates.

Body mass index (BMI) of children at the time of enrollment in Head Start in each year was categorized in a binary variable (normal weight vs overweight). For statistical testing of the association between BMI status (ie, binary variable) and discrete or continuous independent variables (eg, age), we used Student  $t$  test or rank-sum test depending on the distribution of the variable. Pearson  $\chi^2$  test was used for statistical testing for the relationship between BMI status and categorical independent variables (eg, sex). After a priori univariate analyses, a multivariate logistic regression model was fit to identify factors that predicted children who were overweight, adjusting all pertinent covariates and confounders. For entry criteria into the final model, we used Greenland's and Dales's entering criteria ( $\alpha=.2$ ),<sup>13,14</sup> and removal criteria were set at  $\alpha=.2$  by using a backward selection. The associations were summarized by calculating odds ratios (OR) and corresponding 95% confidence intervals (CIs.) All calculated  $P$  values were two-sided, and  $P$  values  $<.05$  were considered statistically significant. The analysis was performed by using the STATA 9.0 software package (StataCorp., College Station, Texas).

Because a subset of children ( $n=206$ ) were enrolled in Head Start for two consecutive years, the trend of BMI changes in these children over two years was examined by measuring their BMI at the time of initial and last enrollment in Head Start (ie, repeated cross-sectional measures). Group differences in BMI were determined by Student  $t$  test.

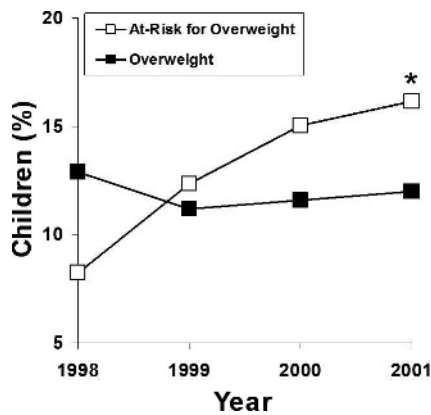
## RESULTS

### Study Cohort

From 1998 to 2001, 256 in 1998, 259 in 1999, 293 in 2000, and 217 children in 2001 were enrolled in Head Start in Olmsted and Freeborn Counties. Because a proportion of these children were enrolled in Head Start consecutively, these study subjects were separately included in the annual prevalence data. However, all subjects were counted only once for the initial enrollment in Head Start, and 788 Head Start enrollees had undergone the pre-Head Start physical examinations by local physicians during the study period, 1998–2001. Of these 788 children, 765 children had complete information for this study. The annual family income of these children was  $\$13,082 \pm \$7,573$  (mean  $\pm$  standard deviation). The demographic characteristics of this Head Start population are shown in Table 1. Briefly, of the 765 children, 51.3% were female, and 65.4% were from non-Caucasian families. In addition, 42.8% lived with both parents, and 42.1% were from families who spoke ESL. The age of these children was similar across all subgroups and across all years. Only Somalian children had a large demographic change during the study period; they made up 1% of all children in 1998 but increased to 25% in 2001. Of these 765 children, 206 children had consecutive BMI data for two years and formed a convenient subsample.

### Overall Prevalence and the Trends of Overweight and At Risk for Overweight

The overall prevalence of overweight and at risk for overweight during the four-year period was 12.2% and 12.9%, respectively. The prevalence of overweight and BMI according to socio-demographic variables are summarized in Table 1. Between 1998 and 2001, the overall prevalence of overweight remained steady among Head Start enrollees: 12.9% in 1998 and 12.0%



**Figure 1. Overall prevalence of overweight and at risk for overweight during four-year period: 1998–2001**

in 2001. During the same period, the overall prevalence of at risk doubled from 8.2% in 1998 to 16.1% in 2001 ( $P < .05$ ). The results are summarized in Figure 1.

### Multivariate Model to Identify Risk Factors Associated with Overweight

All variables that were associated with overweight based on univariate analyses were entered into the logistic regression model to identify independent predictors of overweight of 765 Head Start enrollees. These variables include the number of parents at home, ethnicity, age, income, and the primary language spoken at home.

Mexican children (OR=2.76, 95% CI: 1.44–5.27,  $P = .002$ ) and children from families speaking ESL (OR=1.75, 95% CI: 1.07–2.87,  $P = .026$ ) had an increased risk of being overweight. Living with a single parent approached statistical significance (OR=1.35,  $P = .089$ ). Gender, age, income, and other ethnic backgrounds than Mexican were not significant risk factors for overweight.

### Changes of BMI of Children Who Were Enrolled in Head Start for Two Years

Of all Head Start enrollees, 237 children participated in the program

**Table 2. Logistic regression model of predictors for childhood obesity at time of enrollment in Head Start, 1998–2001 (N=765)**

| Variable                          | Odds Ratio | 95% Confidence Interval | P value |
|-----------------------------------|------------|-------------------------|---------|
| Mexican                           | 2.76       | 1.44–5.27               | .002    |
| Somalian                          | .50        | .18–1.36                | .179    |
| Caucasian                         | 1          | Referent                |         |
| English as a second language      | 1.75       | 1.07–2.87               | .026    |
| English as a primary language     | 1          | Referent                |         |
| Age                               | 1.39       | .95–2.03                | .087    |
| Family supported by single parent | 1.35       | .94–2.41                | .089    |
| Family supported by both parents  | 1          | Referent                |         |

for two consecutive years after initial enrollment, and complete information was available for 206 of the 237. The BMI change over two years of followup remained relatively steady through the years, from  $-.19 \text{ kg/m}^2$  in 1998 to  $-.29 \text{ kg/m}^2$  in 2000. Despite the overall net negative change in BMI, the proportion of overweight children increased from 9.7% at beginning of enrollment to 16.0% at end of followup ( $P = .08$ ), while the proportion of children at risk for overweight increased from 11.2% to 13.1% ( $P > .2$ ). When examined by primary family language, 23.3% of children from ESL families and 19.5% of children from EPL families with normal weight at time of initial enrollment moved to overweight or at risk for overweight categories over the two-year period. Whereas normal-weight children from ESL and EPL families experienced similar BMI changes during two years of enrollment starting in 1998 ( $-.19 \text{ kg/m}^2$  vs  $-.02 \text{ kg/m}^2$ ,  $P$  not significant), normal-weight ESL children were more likely to gain weight than EPL children during enrollment starting in 2000 ( $+.17 \text{ kg/m}^2$  vs  $-.42 \text{ kg/m}^2$ ,  $P = .055$ ). Along these lines, normal-weight ESL children had an increasing trend of moving up to the next weight categories, from 13.0% in 1998 to 27.6% in 2001, whereas EPL children had a steady trend of moving up in weight categories, from 18.2% in 1998 to 16.1% in 2001. While no trend of faster increases was seen among EPL children,

the distinction was not statistically significant.

## DISCUSSION

The prevalence of overweight and at risk for overweight among Head Start enrollees in southeast Minnesota, a non-urban area, is similar to that of Head Start enrollees in inner-city settings and to the national average. While the prevalence of overweight remained steady during the study period, the prevalence of at risk for overweight among enrollees of a Head Start program in southeastern Minnesota increased significantly. Children within a certain ethnic group (eg, Mexican) and those who spoke ESL at home appeared to have higher odds of being overweight. The proportion of overweight Head Start enrollees tended to increase during enrollment in Head Start, and children from ESL families may be more likely to gain weight than children from EPL families.

In this study, we found the prevalence of overweight (12.2%) among Head Start enrollees in a non-urban setting to be similar to that of Head Start enrollees in an inner-city setting (9.6%–13.3% between 1988 and 1991).<sup>6</sup> Our data are more recent than these earlier studies and may suggest a lower prevalence of overweight in a rural area, especially when seen in conjunction with more recent data (32%) in another inner-city setting.<sup>7</sup> However, our observed prevalence of

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*While the prevalence of overweight remained steady during the study period, the prevalence of at risk for overweight among enrollees of a Head Start program in southeastern Minnesota increased significantly.*

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overweight was similar to that of the national average<sup>8</sup> and remained relatively steady during the study period. Thus, the demographic make-up of the Head Start population within the two different communities may account for the observed difference in prevalence. On the other hand, the prevalence of at risk for overweight among enrollees of a Head Start program in southeastern Minnesota rose rapidly between 1998 and 2001. This finding may be the first sign of an obesity epidemic among Head Start enrollees or children who have similar socioeconomic or ethnic backgrounds in our community. Based on our limited longitudinal followup, normal-weight children in subgroups predisposed to being overweight (eg, children from ESL families) may experience more weight gain over time than other subgroups. However, a longitudinal study is necessary to fully confirm this observation.

Obesity affects minority children disproportionately.<sup>8,15</sup> We found similar results (29% in our study) to those of a previous study that reported the high prevalence of overweight (28%) among Mexican children in Chicago Head Start programs.<sup>7</sup> Therefore, regardless of the study setting (ie, inner-city vs rural), minority children, especially Mexican pre-schoolers, are at a significant risk of becoming overweight. Our study results indicate that Mexican children (29%) were

almost twice as likely to be overweight as Caucasian children (11.3%) and the rest of ethnic groups, including non-Mexican Hispanic children, after adjusting for other risk factors (OR=2.76,  $P=.002$ ). The differences in the risk of being overweight cannot be solely explained by the difference in socioeconomic status between these two ethnic groups (\$12,628 for mean family income for Caucasian children vs \$12,779 for Mexican children). As >90% of children enrolled in Head Start are from families with household incomes below the poverty line,<sup>16</sup> the homogeneous socioeconomic status of our study subjects accounts for the confounding effects of socioeconomic status. This finding may suggest a potential biological predisposition to obesity among children with certain ethnic backgrounds, as opposed to ethnicity as an indicator of socioeconomic or cultural characteristics. Most bodies of research to date have only described ethnic differences with regard to weight-related outcomes, and further studies are needed to elucidate the potential underlying biological mechanism associated with pediatric obesity.

Our study also revealed that ESL children had a significantly higher prevalence (15.5%) of overweight than did EPL children (9.7%). To our knowledge, this is the first report of primary family language background as an independent risk factor for childhood overweight, although the influences of language on obesity have been postulated among Puerto Rican women.<sup>17</sup> Taking into account other risk factors such as ethnic background and income, the primary language spoken at home was independently associated with increased odds of being overweight (OR=1.75, 95% CI 1.07–2.87,  $P=.026$ ).

Why children from ESL families were predisposed to be overweight is unclear. This finding is unlikely to be solely due to migration of at-risk or overweight ESL children into our area.

For example, a large influx of Somalian children occurred during the study period, but they were an unlikely source of obesity, since the risk of overweight among Somalian children was lower than among Caucasian children (OR=.50,  $P=.18$ ). In addition, among those with two years of followup, a significant proportion of children from ESL families moved up in weight categories. Thus, ESL background may represent an intrinsic susceptibility to weight gain or at least a proxy for such susceptibility, because important confounding factors such as ethnic background and socioeconomic status were controlled for in the analysis.

An example of one such susceptibility to overweight among children speaking ESL includes a barrier to effective health care<sup>18–22</sup> or relevant nutritional information on food labeling. Perhaps the primary language at home may be a better indicator for lifestyle differences under ethnic and cultural beliefs, acculturation, and/or economic marginalization<sup>23–27</sup> rather than ethnicity itself. Degree of acculturation was shown to be a strong predictor of the inactive “Westernized” lifestyle among adolescents and young adults.<sup>24,28,29</sup> Whether this finding holds true for younger children such as those in Head Start is unclear, as children may adapt to Western lifestyles or diets that underlie obesity much sooner than the minimum period of 10 years seen in immigrant adults.<sup>30</sup>

Strengths of our study include a relatively large sample size, a socioeconomically homogeneous study cohort, and a small longitudinal component. Our study also has some limitations. Relevant covariates such as dietary intake, level of physical activity, birth weight, parental weight, length of time in Western society, parental education levels, and relative degree of food insecurity were not available and thus not included. Our study also only examined the prevalence of overweight and risk factors in a non-urban Head

Start setting, and results may not be generalizable to other populations but is an important area of research.<sup>31</sup>

In conclusion, the Head Start setting in a non-urban area does not confer any more or less risk for overweight for enrollees, compared to those in urban settings. The primary language spoken at home is newly identified as an independent risk factor for overweight and merits further investigation. Because the prevalence of at risk for overweight among enrollees of a Head Start program in southeastern Minnesota is rising rapidly, specific early interventions to prevent excessive weight gains need to be implemented in this setting.

#### ACKNOWLEDGMENTS

We would like to thank Dr. Aida Lteif of the Division of Pediatric Endocrinology and Metabolism, Mayo Clinic, for her expert opinion on the issue of pediatric obesity during the preparation of this manuscript. None of the authors has any financial or other conflict of interest to disclose.

#### REFERENCES

1. Wang Y. Cross-national comparison of childhood obesity: the epidemic and the relationship between obesity and socioeconomic status. *Int J Epidemiol.* 2001;30:1129–1136.
2. Strauss RS, Pollack HA. Epidemic increase in childhood overweight, 1986–1998. *JAMA.* 2001;286:2845–2848.
3. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999–2000. *JAMA.* 2002;288:1728–1732.
4. National Center for Health Statistics. Plan and operation of the Third National Health and Nutrition Examination Survey, 1988–1994. *Vital Health Stat 1.* 1994;32:1–407.
5. Troiano R, Flegal KM, Kuczmarski RJ, Campbell SM, Johnson CL. Overweight prevalence and trends for children and adolescents: The National Health and Nutrition Examination Surveys 1963 to 1991. *Arch Pediatr Adolesc Med.* 1995;149:1085–1091.
6. Wiecha JL, Casey VA. High prevalence of overweight and short stature among Head Start children in Massachusetts. *Public Health Rep.* 1994;109:767–774.
7. Hernandez B, Uphold CR, Graham MV, Singer L. Prevalence and correlates of obesity in preschool children. *J Pediatr Nurs.* 1998;13(2):68–76.
8. Hedley AA, Ogden CL, Johnson CL, Carroll MD, Curtin LR, Flegal KM. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999–2002. *JAMA.* 2004;291(23):2847–2850.
9. Lindquist CH, Reynolds KD, Goran MI. Sociocultural determinants of physical activity among children. *Prev Med.* 1999;29:305–312.
10. Reilly JJ. Descriptive epidemiology and health consequences of childhood obesity. *Best Pract Res Clin Endocrinol Metabol.* 2005;19:327–341.
11. Hoerr S, Utech AE, Ruth E. Child control of food choices in Head Start families. *J Nutr Educ Behav.* 2005;37(4):185–190.
12. Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, et al. *CDC Growth Charts: United States, Advance Data.* 2000;314:1–28.
13. Greenland S, Robbins JM. Estimators of the Mantel-Haenszel variance consistent in both sparse data and large-strata limiting models. *Biometrics.* 1985;42:311–323.
14. Dales L, Ury H. An improper use of statistical significance testing in studying covariates. *Int J Epidemiol.* 1978;4:373–375.
15. Ogden CL, Troiano RP, Briefel RR, Kuczmarski RJ, Flegal KM, Johnson CL. Prevalence of overweight among preschool children in the United States, 1971 through 1994. *Pediatrics.* 1997;99:E1.
16. Department of Health and Human Services, Administration on Children, Youth and Families. *Project Head Start: Statistical Fact Sheet.* Washington, DC: USDHHS; January 1992.
17. Himmelgreen DA, Perez-Escamilla R, Martinez D, et al. The longer you stay, the bigger you get: length of time and language use in the US are associated with obesity in Puerto Rican women. *Am J Phys Anthropol.* 2004;125(1):90–96.
18. Gordon-Larsen P, Harris KM, Ward DS, Popkin BM. Acculturation and overweight-related behaviors among Hispanic immigrants to the US: the National Longitudinal Study of Adolescent Health. *Soc Sci Med.* 2003;57(11):2023–2034.
19. Flores G, Abreu M, Olivar MA, Kastner B. Access barriers to health care for Latino children. *Arch Pediatr Adolesc Med.* 1998;152(11):1119–1125.
20. Baker DW, Parker RM, Williams MV, Coates WC, Pitkin K. Use and effectiveness of interpreters in an emergency department. *JAMA.* 1996;275(10):783–788.
21. Flores G, Gee D, Kastner B. The teaching of cultural issues in US and Canadian medical schools. *Acad Med.* 2000;75(5):451–455.
22. Chamberlin LA, Sherman SN, Jain A, Powers SW, Whitaker RC. The challenge of preventing and treating obesity in low-income, preschool children. *Arch Pediatr Adolesc Med.* 2002;156:662–668.
23. Khan LK, Sobal J, Martorell R. Acculturation, socioeconomic status, and obesity in Mexican Americans, Cuban Americans, and Puerto Ricans. *Int J Obes Relat Metab Disord.* 1997;21(2):91–96.
24. Gordon-Larsen P, Harris KM, Ward DS, Popkin BM. Acculturation and overweight-related behaviors among Hispanic immigrants to the US: the National Longitudinal Study of Adolescent Health. *Soc Sci Med.* 2003;57(11):2023–2034.
25. Stern MP, Gonzalez C, Mitchell BD, Villalpando E, Haffner SM, Hazuda HP. Genetic and environmental determinants of type II diabetes in Mexico City and San Antonio. *Diabetes.* 1992;41(4):484–492.
26. Ravussin E, Valencia ME, Esparza J, Bennett PH, Schulz LO. Effects of a traditional lifestyle on obesity in Pima Indians. *Diabetes Care.* 1994;17(9):1067–1074.
27. Esparza J, Fox C, Harper IT, et al. Daily energy expenditure in Mexican and USA Pima Indians: low physical activity as a possible cause of obesity. *Int J Obes Relat Metab Disord.* 2000;24:55–59.
28. Sundquist J, Winkleby M. Country of birth, acculturation status and abdominal obesity in a national sample of Mexican American women and men. *Int J Epidemiol.* 2000;29:470–477.
29. Lizaraburu JL, Palinkas LA. Immigration, acculturation, and risk factors for obesity and cardiovascular disease: a comparison between Latinos of Peruvian descent in Peru and in the United States. *Ethn Dis.* 2002;12:342–352.
30. Goel MS, McCarthy EP, Phillips RS, Wee CC. Obesity among US immigrant subgroups by duration of residence. *JAMA.* 2004;292:2860–2867.
31. Reilly JJ. Descriptive epidemiology and health consequences of childhood obesity. *Best Pract Res Clin Endocrinol Metab.* 2005;19:327–341.

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