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ARTICLE

Iron Deficiency in Early Childhood in the United States: Risk Factors and Racial/Ethnic Disparities

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ABSTRACT

BACKGROUND. Iron deficiency affects 2.4 million US children, and childhood iron-deficiency anemia is associated with behavioral and cognitive delays. Given the detrimental long-term effects and high prevalence of iron deficiency, its prevention in early childhood is an important public health issue.

OBJECTIVES. The study objectives were to (1) identify risk factors for iron deficiency in US children 1 to 3 years old, using data from the most recent waves of the National Health and Nutrition Examination Survey IV (1999–2002) and (2) examine risk factors for iron deficiency among Hispanic toddlers, the largest minority group of US children.

PATIENTS AND METHODS. Analyses of the National Health and Nutrition Examination Survey IV were performed for a nationally representative sample of US children 1 to 3 years old. Iron-status measures were transferrin saturation, free erythrocyte protoporphyrin, and serum ferritin. Bivariate and multivariable analyses were performed to identify factors associated with iron deficiency.

RESULTS. Among 1641 toddlers, 42% were Hispanic, 28% were white, and 25% were black. The iron deficiency prevalence was 12% among Hispanics versus 6% in whites and 6% in blacks. Iron deficiency prevalence was 20% among those with overweight, 8% for those at risk for overweight, and 7% for normal-weight toddlers. Fourteen percent of toddlers with parents interviewed in a non–English language had iron deficiency versus 7% of toddlers with parents interviewed in English. Five percent of toddlers in day care and 10% of the toddlers not in day care had iron deficiency. Hispanic toddlers were significantly more likely than white and black toddlers to be overweight (16% vs 5% vs 4%) and not in day care (70% vs 50% vs 43%). In multivariable analyses, overweight toddlers and those not in day care had higher odds of iron deficiency.

CONCLUSIONS. Toddlers who are overweight and not in day care are at high risk for iron deficiency. Hispanic toddlers are more likely than white and black toddlers to be overweight and not in day care. The higher prevalence of these risk factors among Hispanic toddlers may account for their increased prevalence of iron deficiency.

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Key Words
iron deficiency, early childhood, day care, disparities, obesity, racial/ethnic minorities

Abbreviations
NHANES—National Health and Nutrition Examination Survey
WIC—Supplemental Nutrition Program for Women, Infants, and Children
OR—odds ratio
CI—confidence interval

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IRON DEFICIENCY AND iron-deficiency anemia affect 2.4 million and 490 000 US children, respectively.[1,2] Children 1 to 3 years old are particularly vulnerable, because maternal iron stores are depleted during a period of rapid growth.[2,3] A recent analysis of the National Health and Nutrition Examination Survey (NHANES) III found the prevalence rates of iron deficiency and iron-deficiency anemia among US toddlers to be 9% and 3%, respectively[2] (herein, "toddlers" refers to children 12–30 months old, and "infants" refers to those <12 months old[4]). Other investigators have reported much higher rates, particularly in urban settings and poor households. The *Third Report on Nutrition Monitoring in the US* showed a 15% prevalence of iron-deficiency anemia among children 1 to 3 years old,[5] while another study reported an 8% prevalence of iron-deficiency anemia in toddlers.[6]

Iron-deficiency anemia in infancy and early childhood is associated with behavioral and cognitive delays, including impaired learning,[7] decreased school achievement,[8,9] and lower scores on tests of mental and motor development.[10–12] Given the detrimental long-term effects and high prevalence of iron deficiency, its prevention in early childhood is an important public health issue. A *Healthy People 2010* objective is to reduce iron deficiency in children 1 to 2 years old to 5% (compared with the 1988–1994 baseline prevalence of 9%) and in children 3 to 4 years old to 1% (compared with the 1988–1994 baseline prevalence of 4%) by 2010.[13]

Effective approaches to the prevention of iron deficiency in infancy and early childhood should include screening and counseling practices targeting children identified to be at high risk for iron deficiency.[6,14–16] Iron deficiency affects 20% to 25% of infants worldwide,[17] and most studies of risk factors for iron deficiency in early childhood have been conducted in Latin America, Africa, India, Europe, and Canada.[18–29] Several studies have demonstrated a high prevalence of iron deficiency in the United States among low-income infants and children,[30–32] who may experience food insecurity and have diets low in iron.[33] Important dietary risk factors include exclusive breastfeeding beyond 6 months not supplemented by iron-rich foods or vitamins with iron,[34,35] early introduction of milk,[3,35] prolonged bottle-feeding,[36–40] and excessive cow's milk consumption.[36,38] An association between maternal prenatal anemia and iron deficiency has also been reported.[33] A comprehensive list of known risk factors appears in the 1998 Centers for Disease Control and Prevention recommendations for the prevention and control of iron deficiency in the United States.[16]

The most recent published estimates of the prevalence of iron deficiency among US toddlers use data from the NHANES III (1988–1994).[2] Analyses are needed to more clearly delineate risk factors for iron deficiency among US toddlers using current data. In addition, striking racial/ethnic disparities in the prevalence of iron deficiency among toddlers were recently reported, with high prevalence rates among Hispanic children.[36,37] The reasons for these racial/ethnic disparities in the prevalence of iron deficiency remain unclear. The objectives of this study were to (1) identify risk factors for iron deficiency in US children 1 to 3 years old, using data from the most recent waves of the NHANES IV (1999–2002); and (2) examine risk factors for iron deficiency among Hispanic toddlers, the largest minority group of US children.

METHODS

Data Source

The data source for these analyses was the NHANES IV, a large-scale national survey conducted by the National Center for Health Statistics from 1999 through 2002.[41,42] The NHANES IV is the eighth in a series of national examination studies conducted in the United States since 1959. From 1960 to 1994, a total of 7 national surveys have been conducted; beginning in 1999, the survey has been conducted continuously.[41,42] The NHANES IV is a nationally representative sample of the civilian US population ≥2 months of age living in households, including 5785 children. Subjects were asked to complete an extensive household interview and an examination in a mobile health center. Data were collected through interviews and physical examinations on the prevalence of specified chronic diseases and conditions, physical measures such as height and weight, physiologic measures such as blood pressure and serum cholesterol levels, levels of cognitive function, mental health, and dental health. Low-income persons, adolescents 12 to 19 years old, persons ≥60 years old, African Americans, and Mexican Americans were oversampled.[43] Results were weighted to adjust for nonresponse and to provide national estimates.[41,42]

The National Center for Health Statistics released public use data sets from the continuous NHANES in 2-year groupings: (1) NHANES 1999–2000, conducted on a nationwide probability sample of 9965 persons of all ages; and (2) NHANES 2001–2002, conducted on a nationwide probability sample of 11 039 persons of all ages. Both survey designs are stratified, multistage probability samples of the civilian noninstitutionalized US population. For the NHANES 1999–2000, there were 12 160 persons selected for the sample; 9965 were interviewed (82%), and 10 477 (80%) were examined.[44] For the NHANES 2001–2002, 13 156 persons were selected for the sample; 11 039 were interviewed (84%), and 10 477 (80%) were examined.[44]

All NHANES questionnaires were translated into Spanish and administered in computer-assisted personal interview format, along with the English-language versions.[41,42] All interviewers completed a 2-week training program, and many of the interviewers had previous

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training experience. A large percentage of the household interviewers was bilingual in English and Spanish. Neighbors or household interpreters were used to assist in completing interviews with household members speaking a language other then English or Spanish.

Independent Variables

Independent variables included age and gender. Poverty status was dichotomized as below the poverty threshold versus at or above the poverty threshold, based on family size and the federal poverty threshold at the time of the survey.[45,46] The child's race/ethnicity was defined by parental self-identification and included non-Hispanic white, non-Hispanic black, and Hispanic. Because of small sample sizes, Asian/Pacific Islander, Native American, other, and multiple race/ethnic groups were excluded from the analyses. Other independent variables included weight-for-height status (using age-specific and gender-specific weight-for-length percentiles, with at risk for being overweight defined as a weight-for-length status of ≥85th and <95th percentile, and overweight defined as a weight-for-length status of ≥95th percentile [BMI was not used because only weight-for-length measurements were available for children 1 to 3 years of age]); birth weight (<2500 vs ≥2500 g); blood lead level (≥10 vs <10 μg/dL); interview language (English versus a non-English language); household food insecurity (defined as "limited or uncertain availability of food, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" as a result of inadequate financial resources[47] [based on the 18-item Food Security Survey Module, with data released in the categories household fully/marginally food secure versus food insecure with or without hunger during the past 12 months]); day care/preschool attendance (attends or ever attended day care/preschool versus does not attend or has never attended day care/preschool); and whether the child received Supplemental Nutrition Program for Women, Infants, and Children (WIC) in the past 12 months. To assess the appropriateness of the duration of breast milk or formula-feeding in relation to the American Academy of Pediatrics' guidelines,[48] we also examined the age at which breastfeeding or formula-feeding was discontinued. Exclusive breastfeeding beyond 6 months was not included, because its prevalence was low in the study sample. It was not possible to include caretaker educational attainment and duration of bottle-feeding as independent variables, because neither was included in the NHANES IV questionnaire. Laboratory values were measured by using standard measurement assays, the details of which are described elsewhere.[49,50]

Definitions

We used the definitions of iron deficiency previously described by Looker et al[2] in their evaluation of the prevalence of iron-deficiency anemia in the United States using the NHANES III. The diagnosis of iron deficiency was based on 3 laboratory tests of iron status: transferrin saturation, free erythrocyte protoporphyrin, and serum ferritin. An individual was considered iron deficient if any 2 of these 3 values were abnormal for age and gender. For children between the ages of 1 to 2 years, the cutoff values for tests of iron status are <10% transferrin saturation, <10 μg/L of serum ferritin, and >1.42 μmol/L of red blood cells erythrocyte protoporphyrin. For 3-year-old children, these cutoff values are <12%, <10 μg/L, and >1.24 μmol/L of red blood cells, respectively. It was not possible to include data from the NHANES 2003–2004 in these analyses, because beginning with the NHANES 2003, iron-status indicators are no longer available for children <3 years of age. Because of small sample sizes, it was not possible to examine iron-deficiency anemia as an outcome measure among US children 1 to 3 years old.

Analysis

The prevalence of iron deficiency was determined for toddlers in the different risk categories of the independent variables defined previously: age, gender, race/ethnicity, poverty, weight-for-height status, birth weight, blood lead level, interview language, household food security, day care/preschool attendance, receipt of WIC in the past 12 months, and the age at which breastfeeding or formula-feeding was discontinued. Bivariate analyses were performed to examine the association between iron deficiency and each of these independent variables. To maintain an event-per-variable ratio of >10, only those independent variables significant in bivariate analyses were entered into a series of stepwise multivariable models, in which the outcome variable was iron deficiency.

SAS 9.1 (SAS Institute Inc, Cary, NC) was used in all analyses. Sample weights were applied to account for the unequal probabilities of selection, oversampling, and nonresponse for all analyses using SAS and to estimate standard errors using the Taylor series linearization method. Logistic regression was used for multivariable analyses, and χ^2 tests were used to test for differences in proportions.

RESULTS

Among 1641 1- to 3-year-old children in the sample, 42% were Hispanic, 25% were non-Hispanic black, and 28% were non-Hispanic white. Of 960 toddlers with all 3 iron-status indicators present, 8% (n = 92) had iron deficiency (Table 1). Fourteen percent of toddlers with parents interviewed in a non–English language had iron deficiency, compared with only 7% of toddlers with parents interviewed in English (P = .01). Forty-four percent of parents of Hispanic toddlers were interviewed in Spanish and 56% in English. One non-English interview was conducted with parents of a black toddler. Iron

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TABLE 1 **Prevalence of Iron Deficiency Among US Children 1 to 3 Years of Age, by Demographic and Selected Biological Characteristics**

Feature	*n*	% Iron Deficient	*P*
Total sample	960	8.0	
Parental interview language			.01
English	730	7.3	
Non-English	174	13.8	
Weight-for-height status			.02
Normal (<85th percentile)	681	7.1	
At risk (85th to <95th percentile)	115	8.3	
Overweight (≥95th percentile)	77	20.3	
Day care/preschool attendance			.02
Yes	376	5.2	
No	582	10.0	
Race/ethnicity			.15
Hispanic	400	12.1	
White[a]	271	6.2	
Black[b]	239	5.9	
Household food security			.06
Secure	673	7.1	
Insecure	255	12.3	
Age, y			.14
1	331	11.2	
2	373	7.6	
3	256	5.6	
Age at discontinuation of breastfeeding or formula feeding, y			.72
<1	344	8.0	
≥1	611	7.3	
Child received WIC in past 12 mo			.30
Yes	518	9.6	
No	430	6.9	
Poverty status			.55
Below poverty threshold	378	8.8	
At or above poverty threshold	506	7.4	
Lead level, μg/dL			.68
≥10	25	10.2	
<10	931	7.9	
Gender			.78
Male	526	8.2	
Female	434	7.6	
Birth weight, g			.85
<2500	99	8.3	
≥2500	824	7.5	

Data source: NHANES IV, 1999–2002.
[a] $P = .03$ versus Hispanic.
[b] $P = .02$ versus Hispanic.

deficiency was most prevalent among overweight toddlers at 20%, compared with 8% in those at risk for overweight, and 7% in normal-weight toddlers ($P = .02$). Five percent of toddlers with day care/preschool attendance and 10% of toddlers not in day care/preschool had iron deficiency ($P = .02$). The prevalence of iron deficiency was 12% among Hispanic children, 6% in white children, and 6% in black children; the prevalence of iron deficiency was significantly higher in Hispanic children than in white children ($P = .03$) and also significantly higher in Hispanic children than in black children ($P = .02$). Twelve percent of toddlers in food-insecure households had iron deficiency, compared with 7% of toddlers in food secure households ($P = .06$). Age, gender, poverty, lead level, birth weight, receipt of WIC in the past 12 months, and the age at which breastfeeding or bottle-feeding was discontinued were not found to be significantly associated with iron deficiency.

As shown in Table 2, Hispanic toddlers were more likely to be overweight (16%) than white (5%) and black (4%) toddlers ($P = .0004$). Hispanic toddlers were also more likely not to be in day care/preschool (70%), compared with white (50%) and black (44%) children 1 to 3 years old ($P < .0001$).

Hispanic children had significantly greater unadjusted odds of iron deficiency (odds ratio [OR]: 2.08; 95% confidence interval [CI]: 1.07–4.04), compared with white children (Table 3). The Hispanic/white disparity in iron deficiency prevalence rates disappeared after multivariable adjustment for parental interview language (model 2; Table 3). Interview language remained significant after adjustment for weight-for-height status alone (model 3) but was no longer significant after adjustment for preschool/day care attendance alone (model 4). After adjustment for both preschool/day care attendance and weight-for-height status, interview language was no longer significant (model 5). In the full multivariable model (model 6) that included race/ethnicity, interview language, weight-for-height status, and preschool/day care attendance, overweight toddlers (OR: 3.4; 95% CI: 1.1–10.1) and those not in day care (OR: 1.9; 95% CI: 1.0–3.3) had higher odds of iron deficiency, but neither race/ethnicity nor interview language was significantly associated with iron deficiency in this model.

DISCUSSION

The study findings show that racial/ethnic disparities in the prevalence of iron deficiency exist, with Hispanic toddlers twice as likely to be iron deficient compared with white toddlers. Hierarchical multivariable models, however, reveal that Hispanic ethnicity is no longer significantly associated with iron deficiency in toddlers after adjustment for relevant covariates. Adjustment for survey language eliminates Hispanic/white disparities in iron deficiency prevalence. Even after adjustment for weight-for-height status alone, toddlers with parents interviewed in a non–English language remained almost twice as likely to be iron deficient compared with toddlers with parents interviewed in English. After adjustment for both preschool/day care attendance and weight-for-height status, differences by survey language were eliminated, with preschool/day care attendance and weight-for-height status each independently associated with iron deficiency in the final multivariable model.

Toddlers who are overweight and those not in day care are at high risk of iron deficiency. Hispanic toddlers are more likely to be overweight and less likely to be in

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TABLE 2 **Preschool/Daycare Attendance, Weight-for-Height Status, and Parental Interview Language by Race/Ethnicity Among US Children 1 to 3 Years of Age**

Characteristic	Race/Ethnicity			
	White ($N = 271$), %	Black ($N = 239$), %	Hispanic ($N = 398$), %	*P*
Preschool/day care attendance				<.0001
Yes	50.3	56.1	29.7	
No	49.7	43.9	70.3	
Weight-for-height status				.0004
Normal (<85th percentile)	84.5	79.7	73.9	
At risk (≥85th to <95th percentile)	10.1	16.6	10.1	
Overweight (≥95th percentile)	5.4	3.6	16.1	
Parental interview language				—[a]
English	100.0	99.6	55.6	
Non-English	0	0.4	44.4	

Data source: NHANES IV, 1999–2002.

[a] The *P* value could not be calculated because an empty cell exists for white/non-English.

TABLE 3 **Multivariable Analyses of Factors Associated With Iron Deficiency Among US Children 1 to 3 Years of Age**

Characteristic	OR (95% CI) for Iron Deficiency					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Race/ethnicity						
White	Referent	Referent	—	—	—	Referent
Black	0.96 (0.39–2.37)	0.96 (0.38–2.38)	—	—	—	0.99 (0.40–2.43)
Hispanic	2.08 (1.07–4.04)	1.68 (0.75–3.78)	—	—	—	0.94 (0.36–2.45)
Parental interview language						
English	—	Referent	Referent	Referent	Referent	Referent
Non-English	—	1.40 (0.66–2.98)	1.74 (1.01–2.99)	1.82 (1.00–3.30)	1.56 (0.89–2.74)	1.74 (0.76–3.97)
Preschool/daycare attendance						
No	—	—	—	Referent	Referent	Referent
Yes	—	—	—	0.52 (0.28–0.98)	0.54 (0.30–0.99)	0.54 (0.30–0.98)
Weight-for-height status						
Normal (<85th percentile)	—	—	Referent	—	Referent	Referent
At risk (≥85th to <95th percentile)	—	—	1.20 (0.60–2.40)	—	1.22 (0.61–2.46)	1.29 (0.64–2.58)
Overweight (≥95th percentile)	—	—	2.92 (1.03–8.27)	—	3.12 (1.08–8.97)	3.34 (1.10–10.12)

preschool/day care, compared with white toddlers (Table 2). The higher prevalence of these nonethnic risk factors among Hispanic toddlers may account for their increased prevalence of iron deficiency.

A key finding of this study is the alarmingly high prevalence of iron deficiency among overweight toddlers. This finding is consistent with a previous analysis of the NHANES III (1988–1994), which demonstrated an association of overweight with iron deficiency among US children 2 to 16 years of age.[51] Our findings document an even higher prevalence of iron deficiency among younger children (20% iron-deficiency prevalence among overweight 1- to 3-year-olds versus 6% among overweight 2- to 5-year-olds), using more recent data. A few other small studies, mainly in adolescents, also reported an association between overweight and iron deficiency.[52–54] Several factors have been proposed to explain this association, including genetic influences, alterations in iron metabolism,[55,56] and an inadequate diet with limited intake of iron-rich foods.[51] Our study is the first, to our knowledge, to report an association between iron deficiency and overweight among children as young as 1 to 3 years old. The reasons for the strong association in this age group are unclear and need to be elucidated. Dietary practices may play an important role, since diets high in calories but poor in micronutrients may lead to both iron deficiency and overweight.[14] Nutritional practices such as excessive milk or juice intake, prolonged bottle-feeding, snacking, and junk food intake, might contribute. Prolonged bottle-feeding was found to be significantly associated with both overweight and iron-deficiency anemia in a survey of caregivers of 95 WIC-enrolled children 18 to 56 months of age.[39] Children not weaned from the bottle at an appropriate age may become accustomed to drinking excessive amounts of milk and juices, thus having less appetite for a more balanced and healthy diet.[36,39] The American Academy of Pediatrics' recommendations emphasize the role of diet in the prevention of iron

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deficiency in children, because sufficient dietary intake of iron is essential for toddlers to maintain a positive iron balance.[57]

To our knowledge, this is the first study to report an association between preschool/day care attendance and iron deficiency in the United States, with day care being protective against iron deficiency. One can only speculate as to why preschool/day care attendance might be protective against iron deficiency. It may be that children in preschool/day care centers have better diets, with higher amounts of iron, than children who do not attend preschool/day care. It is possible that children enrolled in preschool/day care are protected from adverse nutritional practices, such as excessive milk or juice intake, prolonged bottle-feeding, snacks, and junk food intake, which may lead to iron deficiency. Little is known about the quantity and types of foods and beverages offered in child care facilities. More research is needed to examine the nutritional quality of foods and beverages served in childcare settings as well as staff training on nutrition.[58]

Toddlers of parents who spoke a non–English language during the NHANES IV interview had almost twice the unadjusted odds of iron deficiency compared with toddlers with parents interviewed in English. Interview language is considered a crude proxy for acculturation and is a central component of acculturation scales.[59,60] The NHANES IV is the first wave of this large national survey to include a measure of acculturation, using the language use subscale of the Short Acculturation Scale for Hispanics.[60] However, these questions regarding acculturation are asked only of adolescents and adults; in addition, there is no maternal-child link available to provide data on maternal acculturation. The study findings by interview language, however, suggest that toddlers from less acculturated families could be at greater risk of iron deficiency than toddlers from more acculturated families. Education on appropriate infant feeding practices by culturally competent physicians is essential for these families. This is consistent with previous research pointing to the role of cultural factors in shaping infant feeding practices among Mexican American families.[36] Hispanic children have high rates of prolonged bottle-feeding, and Hispanic normative cultural values may be instrumental in shaping dietary practices.[36] Additional studies are needed to clarify the relationship between acculturation and iron deficiency.

Household food insecurity was not associated with iron-deficiency anemia in bivariate analyses, although there was a trend toward significance, consistent with recent work showing an association between food insecurity and iron-deficiency anemia.[61] A recent analysis of data from the Children's Sentinel Nutrition Assessment Program showed an association between food insecurity and iron-deficiency anemia.[61] The authors proposed a model in which food insecurity leads to decreased nutrient intake, resulting in a host of negative consequences, including iron-deficiency anemia. They argued that policymakers need to expand programs and services providing food assistance to families with young children.

Certain study limitations should be noted. First, certain dietary information relevant to iron deficiency, such as volumes of milk and iron-rich foods consumed, is not available in the NHANES IV. Second, analyses of iron deficiency among toddlers from other racial/ethnic groups, particularly Native Americans and Asians/Pacific Islanders, were not possible because of small sample sizes. Third, the NHANES questions regarding acculturation were asked only of adolescents and adults, and no maternal-child link was available to provide data on maternal acculturation. Hispanic toddlers from less acculturated families may be at greatest risk of prolonged bottle-feeding and iron deficiency. We plan to collect data on maternal acculturation in future work to examine its association with infant feeding behaviors and iron-deficiency prevalence in Hispanic toddlers. Finally, changes in the NHANES data set have limited the study sample size and precluded examination of important variables. Since 1971, the NHANES has been instrumental as a national surveillance mechanism in the tracking of iron deficiency and anemia among US children. However, in the NHANES IV and future NHANES waves, there are changes that will affect the ability of the survey to serve as such a powerful surveillance mechanism. Interview data are no longer being collected on several key variables, including bottle-feeding duration and maternal educational attainment. In addition, iron-status measures will no longer be available for children 1 to 3 years old, starting with the NHANES 2003–2004. To be effective in monitoring iron deficiency among US children, the NHANES should once again consider collecting these key measures for all children, and particularly toddlers, a group at high risk for iron deficiency.

Community-based interventions should take into account the increased risk of iron deficiency among overweight toddlers, as well as the protective effects of day care. The day care environment provides an ideal setting in which to implement nutritional education programs and other interventions.[62] In Brazil, a recent study showed that daily consumption of iron-fortified drinking water in day care facilities is an effective, simple, and inexpensive means of reducing moderate and severe anemia in preschool children.[63] Various behavior change interventions have been tried in US day care settings with some success.[64,65] One of these studies evaluated the effects of a preschool nutrition education and food service intervention on 2- to 5-year-old children in 9 Head Start Centers in upstate New York and found that the intervention was effective in reducing the fat content of preschool meals.[65] Similar programs designed to improve nutrition for toddlers in day care facilities might be ef-

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fective in preventing both overweight and iron deficiency in this age group.

CONCLUSIONS

Racial/ethnic disparities in the prevalence of iron deficiency exist, with Hispanic toddlers twice as likely to be iron deficient compared with white toddlers. Toddlers who are overweight are at high risk of iron deficiency, with 20% of overweight toddlers being iron deficient. Day care/preschool attendance, on the other hand, is protective against iron deficiency. Hispanic toddlers are more likely than white and black toddlers to be overweight and not in day care. The higher prevalence of these nonethnic risk factors among Hispanic toddlers may account for their increased risk of iron deficiency.

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