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***The Prevalence of
Overweight Among
WIC Children***



United States Food and
Department of Nutrition
Agriculture Service

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Executive Summary

This study examines the trends in the prevalence of overweight among WIC children during the 1990s. The study is based on data collected by the biennial *WIC Participant and Program Characteristics Studies* (1992, 1994, 1996, and 1998). Overweight prevalence among WIC children is measured according to the revised growth charts, released by the National Center for Health Statistics (NCHS) in May 2000.

WIC is the Special Supplemental Nutrition Program for Women, Infants, and Children. This Federal program is administered by USDA and provides supplemental foods, nutrition education, and health care referrals to pregnant and postpartum women, infants, and children up to age 5 who are income-eligible and at nutritional risk. WIC regulations require anthropometric measurements (height or length, and weight) be taken and recorded as part of determining nutritional risk for all enrollees, and these data are regularly reported in the biennial *WIC Participant and Program Characteristics Studies*.

In May 2000, the National Center for Health Statistics (NCHS) released revised growth charts to replace the original NCHS growth charts developed in the 1970s. The revised growth charts are based on national survey data and improved statistical procedures. The revised charts overcome the shortcomings of the original charts, particularly with regard to measuring the growth of children from birth through 24 months.

This report provides a bridge for the WIC community between the old and revised NCHS growth charts. The revised growth charts are applied to WIC data from PC92, PC94, PC96, and PC98. The report compares the distributions of WIC children according to the original and revised charts, and examines the trends in overweight prevalence among WIC children according to the revised growth charts.

Impact of Growth Chart Revision

According to NCHS, the impact of the growth chart revision varies by age group. For children age 6 and over, the main difference between the original and revised charts is that the revised charts are based on more recent (and thus heavier) reference populations. As a result, application of the revised charts for children age 6 and over results in lower estimates of overweight prevalence.

For children under age 6 –which includes the WIC population – the original charts suffered from discontinuity at age 24 months because national survey data were not available for children under 24 months. The revised charts, however, use national survey data (and more recent data) for all ages and eliminate the discontinuity in the original charts. The difference between the original and revised charts varies along the distribution of length and stature. The revised charts result in higher estimates of overweight for shorter children and lower estimates of overweight for taller children, with the difference for taller children more apparent for girls than boys (CDC, 2000).

In 1998, 3.8 million children (age 13 to 59 months) were enrolled in WIC. In that year, overweight prevalence among WIC children (measured by weight-for-height), was 12.4 percent according to the original NCHS growth charts, and 13.2 percent according to the revised NCHS growth charts. The impact of the chart revision differs for boys and girls, with overweight prevalence increasing among boys (from 11.5 to 13.9 percent) and decreasing among girls (from 13.3 to 12.6 percent).

Trends in Overweight among WIC Children

Reexamination of overweight prevalence among WIC children, using the NCHS revised growth charts, shows that 11 percent of WIC children were overweight in 1992 and 13.2 percent were overweight in 1998. Overweight prevalence rose 20 percent over this six-year period.

Overweight prevalence among boys exceeded overweight prevalence in girls by 1.3 percentage points in both 1992 and 1998. For boys, overweight prevalence increased from 11.6 to 13.9 percent over the 6-year period (a 19.8 percent rise in prevalence); for girls, overweight prevalence increased from 10.3 to 12.4 percent over the 6-year period (a 22.3 percent rise in prevalence). The percent of WIC children measured overweight decreases with age; in 1998, the percents overweight among one-, two-, three-, and four-year olds were 15.6, 14.2, 11.1, and 9.9 respectively.

Overweight prevalence among WIC children varies by racial/ethnic group, with Hispanic and Native American children having the highest rates of overweight prevalence (16.4 and 18.6 percent, respectively, in 1998). From 1992 to 1998, blacks had the smallest increase in overweight prevalence (0.9 percentage point) and Hispanics had the largest increase (2.0 percentage points). In relative terms, however, the increased prevalence for white children, from 9.2 to 11.1 percent, was a 20.7 percent increase over the 6-year period and the greatest relative increase among racial/ethnic groups.

Geographic differences in overweight prevalence have narrowed over time. In 1992, the Northeast and Western regions had the highest rates of overweight prevalence; but these regions experienced the smallest growth in overweight prevalence between 1992 and 1998. On a State-by-State basis, the percent of WIC children who were overweight in the median State in 1992 was 10 percent; by 1998, more than 10 percent of WIC children were overweight in all but 5 States.

Prevalence and Co-occurrence of Nutrition Risks in Overweight Children

While overweight status is a nutritional risk that qualifies low-income children for WIC enrollment, it is clear from WIC data that overweight WIC children have health concerns that are more complicated than simple excess weight. The majority of overweight WIC children (88.9 percent) have nutrition risks in addition to overweight status.

Aside from being overweight, overweight WIC children are similar to other WIC children in that their most common nutrition risks are inadequate or inappropriate nutrient intake and low hematocrit or hemoglobin. Overweight children, however, are more likely to have multiple nutrition risks, compared to other WIC children: 79.1 percent of overweight WIC children have two or three nutrition risks, while only 48.2 percent of other children have two or three risks.

1. Introduction

The prevalence of overweight among children and adolescents in the United States has increased dramatically over the past 30 years. Data from the National Health and Nutrition Examination Surveys (NHANES) show that, among children age 6 through 11, the prevalence of overweight nearly tripled from 4 percent during 1963-65 to 11 percent during 1988-94 (Troiano and Flegal, 1998). Preschool children are also increasingly overweight, with 7.9 percent of 4- and 5-year old children measured overweight in 1988-94, compared to 5.1 percent in 1971-74 (Ogden, 1997).

Overweight and obesity among all age groups is an important public health concern. Overweight is determined by comparing weight to height and may be the result of greater lean body mass or adiposity; obesity, however, specifically refers to excess adiposity. For adults, obesity increases the risks of cardiovascular and gallbladder disease, diabetes mellitus, high cholesterol, and certain types of cancer (Barlow and Dietz, 1998). The primary health risk for overweight children is the increased likelihood of overweight and obesity later in life, and consequent increased risk of adult morbidity.¹ The prevalence of overweight-associated illness in children is low, although recent research shows that 60 percent of overweight 5- to 10- year old children have at least one risk factor for heart disease (Freedman, 1999). In addition to health risks, overweight children suffer social and psychological consequences: "diminished self-esteem, ostracism by peers, reduced physical activity and exercise tolerance" (American Academy of Pediatrics, 1981).

Overweight children are identified by comparing height and weight measurements to published growth charts. Growth charts developed in 1977 by the Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) had been widely used in clinical settings and in research for over 20 years. In May 2000, NCHS released revised growth charts based on more recent national survey data and improved statistical procedures (CDC, 2000).

This report applies the revised NCHS growth charts to examine trends in the overweight status of WIC children during the 1990s. WIC is the Special Supplemental Nutrition Program for Women, Infants, and Children, administered at the Federal level by the U.S. Department of Agriculture, Food and Nutrition Service (FNS). In 1998, WIC served nearly 4 million children – roughly 26 percent of

¹ The predictive value of childhood obesity increases with age (Guo, 1994; Clarke, 1993; Dietz, 1997). Infants above the 90th percentile of weight-for-length have a two- to threefold increased risk of being obese in childhood and adulthood and 75 percent of obese adolescents will be obese as adults. (American Academy of Pediatrics, 1981) However, Dietz (1997) reviewed several studies and concluded that "only 15% to 30% of obesity in adults is a result of obesity that was present in childhood or adolescence."

all U.S. preschool children, and an estimated 53 percent of preschool children in low-income families.² WIC provides nutritional benefits to children up to age 5 who are income-eligible and have been determined to be at nutritional risk.

Every two years since 1988, USDA's Food and Nutrition Service has reported on the demographics, income, and nutritional status of WIC enrollees.³ Since 1992 these reports have been based on a census of persons enrolled in WIC during a target month, and include information on the prevalence of overweight among WIC children, calculated from reported anthropometric measurements compared to the NCHS-CDC growth charts. Beginning with year 2000, the WIC biennial reports will apply the revised growth charts to anthropometric measurements collected for WIC enrollees.

This report provides a bridge for the WIC community between the old and revised NCHS growth charts. The next section of the report describes the NCHS growth chart revisions, the implications of the revision for measurement of overweight in children, and the general trends in overweight prevalence among children during the past thirty years. A description of WIC data is provided in section 3, along with a comparison of overweight prevalence among WIC children according to the old and revised growth charts. Trends in overweight prevalence among WIC children are examined in section 4 using WIC data from 1992, 1994, 1996, and 1998. In section 5, we examine the prevalence and co-occurrence of other nutrition risks in overweight WIC children, and conclusions appear in section 6.

² The number of WIC participants is from: Bartlett, et. al., *Studies of WIC Participant and Program Characteristics, 1998* (PC98). The estimated population of children age 1-4 in 1998 is 15.2 million (U.S. Bureau of Census). The most recent data for the estimated number of children age 1-4 in families income-eligible for WIC is 7.3 million in 1995 (USDA, Food and Nutrition Service, 1996).

³ The biennial reports are the *Studies of WIC Participant and Program Characteristics* (known as the PCs).

2. Overweight Measurement and Trends

One of the primary means of assessing health and development during early childhood is by charting a child's growth. Overweight children are identified by their place on pediatric growth charts, which assess a child's growth relative to the average growth patterns of other children of the same age and gender. Growth charts based on national survey data were first developed in 1977 using data collected by the National Center for Health Statistics (NCHS). These growth charts have been used to monitor trends in the prevalence of overweight among children for more than 20 years.

Measuring the Prevalence of Overweight among Children

Classifying children as overweight is fundamentally different from classifying adults as overweight. "Adults have been classified as overweight by a variety of cutoffs based on the mortality experience of life insurance policy holders, statistical criteria from a reference population, and, more recently, on data relating morbidity as well as mortality to weight status" (Troiano and Flegal, 1998). In contrast, outcome-based criteria cannot be used for the classification of children as overweight: childhood mortality is not likely to be related to overweight and the prevalence of childhood overweight-related morbidity is too low to define meaningful cutoff points.⁴ The consensus approach to classifying children as overweight –in both research and clinical settings– is by use of statistical criteria to compare easily obtained height and weight measures to reference populations.⁵

NCHS/CDC Growth Charts. NCHS developed growth charts in 1977 to provide reference curves for evaluating child and adolescent growth relative to a reference population. Charts were developed for height-for-age (ages 2-17), weight-for-age (ages 2-17), and weight-for-height (ages 2-11). The charts were based on data collected in the National Health Examination Surveys (NHES) (1963-65,1966-70) and the first National Health and Nutrition Examination Surveys (NHANES I) (1971-74).

⁴ Barlow and Dietz (1998) cite the approximate prevalence, among children, of four obesity-associated conditions. Hypothyroidism occurs in 1/10 of one percent of school children; sleep apnea has been observed in one percent of children attending a pediatric obesity clinic; hypertension is seen in 25 percent of obese children; and high cholesterol is observed in 20-40 percent of obese children.

⁵ Several studies have examined the reliability and validity of weight-for-height or BMI measures in identifying overweight children. Dietz (1998) concludes that composite measures based on height and weight are more reliable (i.e., replicable) than measures such as skinfold thickness or other body composition measures. The validity of height and weight measures is demonstrated by the high correlation between BMI and percent body fat measured by DXA (dual photon absorptiometry) in a sample of boys and girls age 5 to 19 (Pietrobelli et al.,1998). However, in a study of children age 7-17 years of age, Daniels et. al. (1997) find that the relation between BMI and adiposity varies by ethnicity and stage of sexual maturation.

The primary limitation of the 1977 growth charts was that national survey data did not include sufficient samples of infants (birth to 24 months) on which to base the charts. The growth charts for infants up to 24 months of age were based on data collected for the Fels Longitudinal Study (1929-75) conducted in Ohio; these data were not nationally representative and, for several reasons, were not believed to represent average growth patterns.⁶ Furthermore, because the charts for infants and older children were based on different data, there was discontinuity in the charts at 24 months of age.

Revised NCHS Growth Charts. In May 2000, the National Center for Health Statistics released revised growth charts based on pooled data from five national U.S. health examination surveys: NHES (1963-65, 1966-70), NHANES I (1971-74), NHANES II (1976-80), and NHANES III (1988-94). NHANES III was designed to over-sample infants and preschool children ages 2 months through 5 years to support revision of the growth charts. The revised growth charts include eight separate charts, applicable to various age groups, as shown in Exhibit 2.1. Like the original charts, the revised charts are gender-specific. In planning the chart revision, however, NCHS determined that the charts would not be specific to race/ethnicity because "current knowledge and expert opinion indicate that all children have a similar genetic potential for growth" (Kuczmarski, 1998).

Exhibit 2.1

NCHS Revised Growth Charts (May 2000)

Chart	Age or Height Range	Primary Data Sources
Weight-for-age	Birth to 36 months	NHANES I, II, III
Length-for-age	Birth to 36 months	NHANES I, II, III
Head circumference -for-age	Birth to 36 months	NHANES I, II, III
Weight-for-length ^b	45-103 cm	NHANES I, II, III ^a
Weight-for-stature	77-121 cm	NHANES I, II, III ^a
Weight-for-age	2-20 years	NHES II, III; NHANES I, II, III ^a
Stature-for-age	2-20 years	NHES II, III; NHANES I, II, III ^a
BMI-for-age	2-20 years	NHES II, III; NHANES I, II, III ^a

^a Excludes data from NHANES III for ages > 72 months. See text.

^b Weight-for-length is generally measured for children under 24 months, and weight-for-stature is measured for children 24 months to 5 years. Either chart may be used for children between 24-35 months, depending on height.

Source: Kuczmarski et al. *CDC Growth Charts: United States*. December 2000.

⁶ The Fels Longitudinal Study was conducted by the Fels Research Institute. Participants in the Fels Study were primarily formula-fed, white, middle-class infants from Ohio (<http://www.med.wright.edu/lhrc/fels.html>). See CDC, 2000 for the limitations of the Fels data.

The revised growth charts provide several significant improvements over the 1977 charts. First, nationally representative survey data were used for all charts and all ages. Second, Body Mass Index (BMI) charts were developed as new charts for children age 2 years and older.⁷ And third, the discontinuity in the weight-for-height charts for infants and older children was eliminated.⁸

With the revised charts, BMI-for-age replaces weight-for-height measurement and extends this measurement through age 20. (In contrast, the 1977 charts included weight-for-height charts only up through age 11.) The addition of BMI-for-age charts is significant because BMI-for-age is the only indicator that plots a measure of weight and stature on the same plot with age, and BMI provides a consistent measure of weight and stature that can be used from childhood into adulthood (CDC,2001).

While BMI-for-age replaces weight-for-height, NCHS retained the weight-for-height charts for children 2-5 years of age. These charts were retained specifically to accommodate programs such as WIC, which evaluate children from birth through the preschool years. The weight-for-stature chart (age 2-5 years) provides a smooth transition from the weight-for-length chart (birth through age 3). These two charts are parallel in the overlapping ages of 24-36 months so that, within this age group, recumbent length and standing height (when each is used with the appropriate growth chart) yield the same growth chart percentile.⁹ The discontinuity in the 1977 charts – between infants and children – is eliminated by use of weight-for-length and weight-for-stature during the preschool years.

Identifying Overweight Children. The NCHS growth charts provide statistical criteria for classifying children as overweight. The recommended definition of overweight is weight-for-height (or BMI) at or above the 95th percentile of the gender-specific growth curves.¹⁰ The 95th percentile is generally recognized as a conservative cutoff point. There is reason to be conservative with children because weight-for-height and BMI assess weight relative to height and do not identify obesity per se.

⁷ Body Mass Index is equal to weight in kilograms ÷ [height in meters]². Adults are identified as overweight if BMI is between 25.0 and 29.9; and obese if BMI is 30.0 or more. For children, BMI is interpreted differently depending on age, because normal body fatness changes as children age. Overweight status for children is determined by comparing BMI to sex and age specific reference charts.

⁸ Throughout this report "weight-for-height charts" is used to refer to the pair of charts measuring weight-for-length for infants and weight-for-stature for older children.

⁹ The charts are parallel while accounting for the fact that recumbent length is greater than stature. The weight-for-age and height-for-age charts also provide smooth transitions from infants to children.

¹⁰ The 95th percentile is used by NCHS to measure overweight prevalence (CDC, 1997). This cutoff point was recommended by the Committee on Pediatric Obesity, convened by the Department of Health and Human Services, as the cutoff point for identifying overweight children (Barlow and Dietz, 1998), and by the Institute of Medicine for use as a WIC nutrition risk criterion (IOM, 1996). Weight-for-height is generally measured by weight-for-length in children up to 36 months of age and weight-for-stature in children age 36 months and over.

Weight-for-height measurement may falsely identify a muscular person as overweight, while failing to identify a light person who has an excess of body fat. This is a particular concern with children due to the variance in body composition among growing children.¹¹ The goal, however, in the case of children, is to minimize false-positives because misclassification of children as obese can lead to stunting of growth if children are denied nutrients needed for proper growth (Barlow and Dietz, 1998).

Defining overweight at or above the 95th percentile of the growth curves implies that, if the distribution of weight-for-height or BMI in the current population matches the distribution in the reference population, then we will observe an overweight prevalence of 6 percent. Overweight prevalence in excess of 6 percent signals a shift in the population distribution of weight-for-height.

The WIC program can track a child's growth status consistently from birth up to age 5 using the revised weight-for-height charts. Weight-for-height results are not, however, comparable to measures of overweight based on BMI-for-age. National population statistics for overweight prevalence will, for the most part, be based on BMI-for-age because that measure can be used continuously from 2 years of age to adulthood. In section 3 of this report, weight-for-height measures are compared with BMI-for-age measures using data for WIC children.

Impact of the Growth Chart Revision

Because estimates of overweight prevalence for any given population depend on the reference population, when the reference population changes (as it does between the original and revised NCHS growth charts) estimates of overweight prevalence in the current population change. For example, there was an increase in average body weight and BMI within the population between NHANES II and NHANES III. By including NHANES III in growth chart construction, the average weight on the growth chart shifts upward and fewer children will be classified as overweight when measured relative to the revised chart.

In constructing the revised growth charts, NCHS decided to exclude NHANES III data on persons age 6 years and older from the revised charts for weight and BMI. This was done to avoid an upward

¹¹ Troiano and Flegal (1998) review studies of growth curves and patterns of change in weight-for-height and BMI measures with age. Studies show that BMI changes dramatically with age during childhood and adolescence suggesting that "a given BMI value has very different implications for body composition depending on age, and overweight criteria based on BMI must be age-specific."

shift of the weight and BMI curves (CDC, 2000). For younger children, NHANES III data were needed for the revised growth charts in order to have sufficient sample of national survey data.

The impact of the NCHS growth chart revision for children age 6-11 years is shown in Exhibit 2.2. Children from NHANES III were classified as overweight by reference to the original NCHS/CDC growth curves (based on survey data through NHANES I), and using the preliminary revised growth curves (based on survey data through NHANES II). The revised growth charts are based on more recent reference populations (and thus heavier reference populations) and result in lower estimates of overweight prevalence.

Exhibit 2.2

Percent Overweight among Children Age 6-11, Based on NHANES III Data and Original and Revised Growth Charts

Population	Number	Percent Overweight	
		Original Growth Charts ^a	Revised Growth Charts ^b
Male	1,673	14.7	11.2
White, non-Hispanic	446	13.2	10.3
Black, non-Hispanic	584	14.7	11.9
Mexican-American	565	18.8	17.4
Female	1,606	12.5	10.0
White, non-Hispanic	428	11.9	9.2
Black, non-Hispanic	538	17.9	16.4
Mexican-American	581	15.8	14.3
Total	3,279	13.7	10.6

^a Based on 1977 NCHS weight-for-height curves, Centers for Disease Control and Prevention (1997).

^b Based on preliminary revised BMI-for-age curves, Troiano and Flegal (1998).

For children under age 6, the impact of the revised charts, relative to the original charts, depends on the distributions of length and height within the sample being measured. Impacts of the revised charts are summarized by NCHS as follows (CDC, 2000):

- **Weight-for-length.** Revised curves are somewhat higher at short lengths resulting in higher estimates of underweight for short infants.
- **Weight-for-stature.** Revised curves are shifted downward at short statures and shifted upward at high statures. Use of revised curves results in higher estimates of overweight for shorter children and lower estimates of overweight for taller children. The upward shift in weight at higher statures is more apparent for girls than boys.

The transition from measuring weight-for-length to measuring weight-for-height occurs between 24 and 35 months of age. NHANES III measured recumbent length for children 2 months to 3 years, and standing height for children age 2 years and older. For children age 24 to 36 months, both measurements were taken to support construction of weight-for-length and weight-for-stature charts that would overlap in this age group. For children age 24 to 36 months, height and length, used with the appropriate growth charts, yield identical growth chart percentiles.

The impact of the NCHS growth chart revision for children under age 6 years is shown in Exhibit 2.3. Overweight prevalence among NHANES III preschool children is measured using the original and revised weight-for-height charts, and the new BMI-for-age charts. Compared to the original weight-for-height charts, the revised weight-for-height charts result in a greater likelihood of being identified as overweight for preschool boys, and a lower likelihood for preschool girls. The new BMI-for-age charts yield higher estimates of overweight prevalence than either the original or revised weight-for-height charts, for both preschool boys and girls age 24 months and older. A notable impact of the revised charts is that population estimates now show preschool boys having higher overweight prevalence than girls, while the original growth charts showed the opposite.

Exhibit 2.3

Percent Overweight among U.S. Preschool Children, Based on NHANES III Data and Original and Revised Growth Charts

Population	Number	Percent Overweight		
		Original Growth Charts ^a	Revised Growth Charts ^b	
			Weight-for-Height	BMI-for-Age
Male				
12-23 months	613	7.5	9.0	na
2-3 years	1,138	2.1	5.3	5.6
4-5 years	1,023	5.0	4.7	6.7
Female				
12-23 months	617	9.5	6.0	na
2-3 years	1,181	4.8	4.9	6.1
4-5 years	1,048	10.8	6.9	10.9

^a NHANES III data and 1977 NCHS weight-for-height curves, CDC (1997).

^b NHANES III data and May 2000 release of revised NCHS Growth Charts, author's tabulations.

Trends in the Prevalence of Overweight among Children

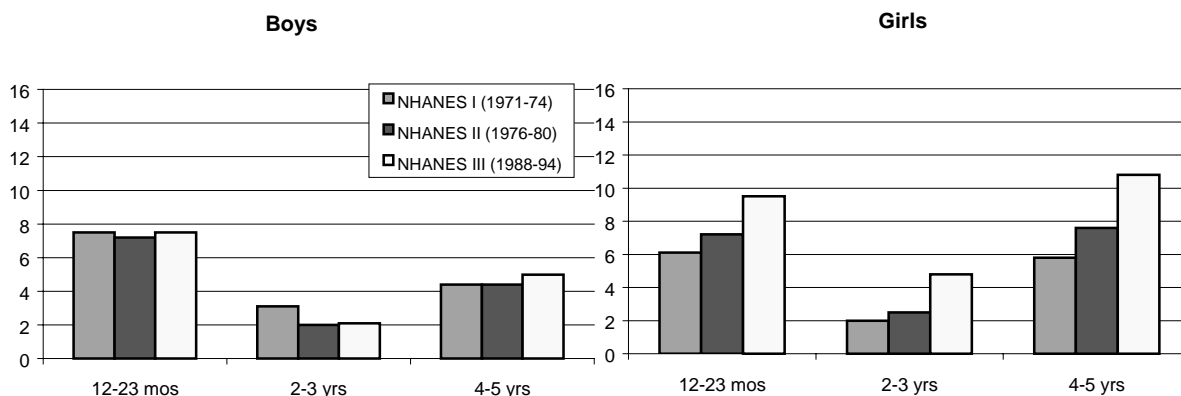
Data collected by the National Center for Health Statistics has been used to provide national estimates of overweight prevalence, and examine trends in overweight prevalence for the past 30 years. Ogden et. al. (1997) examined NHANES data for preschool children, measuring overweight prevalence according to the original NCHS growth charts. These estimates are shown in Exhibit 2.4. The largest change over time in overweight prevalence among preschool children occurred between NHANES II and NHANES III, with girls showing a much larger increase in overweight prevalence than boys.

As seen in Exhibit 2.4, the measured percent of preschool boys and girls who are overweight does not increase monotonically with age when measured relative to the original growth charts. The large drop in overweight prevalence at age 2 years had been considered at least partly due to the discontinuity in the underlying growth chart at 24 months. In fact, the data show a similar, but less dramatic, drop in overweight prevalence for 2-3 year-olds when using the revised growth charts (see Exhibit 2.3).

Longer trend analyses (preceding NHANES I) are not available for preschool children because this age group was not included in the sample frame of the National Health Examination Surveys (NHES) – the precursor to NHANES. Troiano and Flegal (1998) examined the longer historical trend for older children, however, and found that the increasing trend in overweight prevalence did not begin prior to NHANES II. Their estimates are shown in Exhibit 2.5.

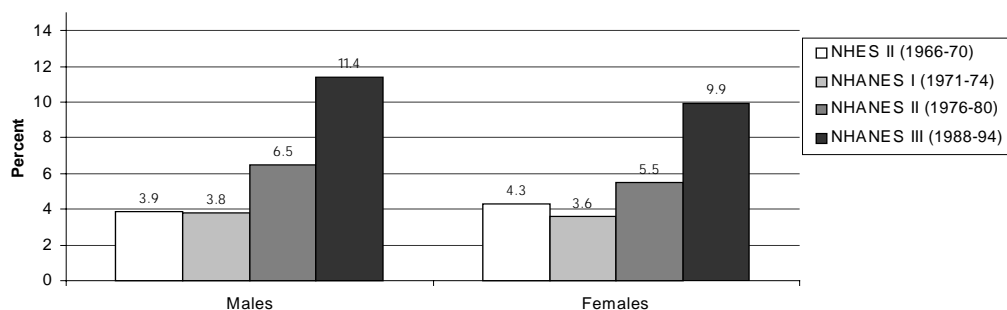
Exhibit 2.4

Prevalence of Overweight among U.S. Preschool Children, NHANES I, II, III



Source: Ogden, et. al. (1997). Overweight is defined as weight-for-height above the 95th percentile of the original NCHS growth charts.

Exhibit 2.5**Prevalence of Overweight among Children 6-11 Years of Age, NHES I through NHANES III**



Source: Troiano and Flegal (1998). Age-adjusted prevalence of overweight based on age-specific percentile cutoffs derived from **revised** NCHS/CDC growth charts (preliminary data).

Exhibit 2.5 shows the trend in overweight prevalence for children age 6 to 11 years, from NHES II (1966-70) through NHANES III (1988-94), with overweight prevalence measured according to the revised growth charts. These data show a slight decrease in overweight prevalence among 6-11 year olds from the late 1960's to early 1970's; a rise in overweight prevalence from NHANES I to NHANES II; and the largest change in overweight prevalence from NHANES II to NHANES III. This trend from NHANES I through NHANES III is consistent with findings for preschool girls shown in Exhibit 2.4.

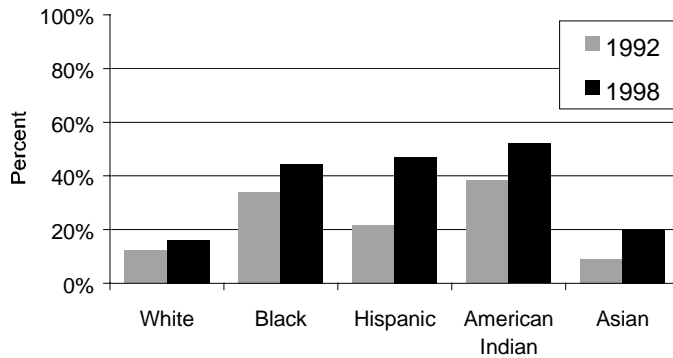
3. Overweight among WIC Children

The WIC program provides benefits to a substantial proportion of the preschool population; benefits include supplemental foods, nutrition education, and health care and social service referrals. Children are eligible for WIC benefits if they are categorically eligible (under 5 years of age), income-eligible (family income below 185 percent of Federal poverty level or adjunct eligible), and are at nutritional risk.¹²

WIC enrollment has increased over time. Measured as a percent of all preschool children, WIC enrollment increased from 17.6 to 26.2 percent between 1992 and 1998. Rates of WIC enrollment for children vary by race and decline with age, as shown in Exhibits 3.1 and 3.2. In 1998, less than 25 percent of all white and Asian preschool children enrolled in WIC, while over 40 percent of black, Hispanic, and American Indian preschool children enrolled in WIC. As shown in Exhibit 3.2, WIC enrollment is highest among children 1 and 2 years of age, and declines with age.

Exhibit 3.1

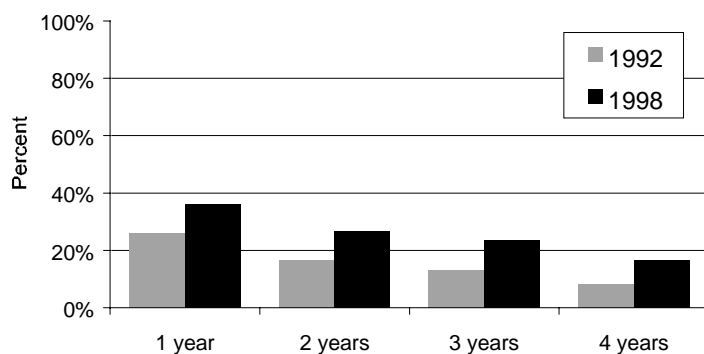
Number of WIC Children as a Percent of All Preschool Children, By Race



Sources: Counts of WIC children are from PC92 and PC96. Population counts are from U.S. Bureau of Census, "Estimates of the Population of States by Age, Sex, Race and Hispanic Origin: 1990 to 1997."

¹² WIC adjunct income eligibility is conferred on persons enrolled in AFDC/TANF, the food stamp program, or Medicaid.

Exhibit 3.2**Number of WIC Children as a Percent of All Preschool Children, By Age^a**



^a WIC children are aggregated by age at certification, where year of age is measured as of last birthday.

Sources: Counts of WIC children are from PC92 and PC96. Population counts are from U.S. Bureau of Census, "Estimates of the Population of States by Age, Sex, Race and Hispanic Origin: 1990 to 1997."

Measuring the Prevalence of Overweight among WIC Children

WIC children are screened for nutrition risks at certification, including the risk of overweight status. The biennial *Studies of WIC Participant and Program Characteristics* have been reporting the prevalence of overweight among WIC children since 1988. Since 1992, these studies have been based on a near census of WIC enrollment collected from each of the 88 State WIC agencies.¹³ The data submitted by States are collectively known as the "PC data" and include most items found on a WIC certification form (including measurements for weight and height taken at certification). Data from four years are used in this report: 1992, 1994, 1996, and 1998.

Overweight children can be identified in the PC data either by the reported nutritional risk of overweight, or by measured height and weight data. The *Studies of WIC Participant and Program Characteristics* use both types of data, reporting the prevalence of "high weight-for-height" as a reported nutrition risk and the prevalence of overweight as determined from anthropometric data.¹⁴

¹³ In 1986, Congress mandated collection of data about WIC participant characteristics. In 1988 and 1990 the *Study of WIC Participant and Program Characteristics* were based on nationally representative samples of WIC participants. Collection of census data for the universe of WIC participants began in 1992.

¹⁴ The height and weight measurements included in data collected from State WIC agencies are compared to the NCHS reference curves, specific to gender, to calculate weight-for-height percentiles. Up through PC98, percentiles were

These measures have not always been consistent. Prior to 1999, each State WIC agency determined the percentile cutoff of the growth charts used to identify overweight as a nutrition risk within their State. For example, in 1996, 62 of 88 State WIC agencies defined overweight as weight-for-height at or above the 90th percentile, rather than the 95th percentile. In 1999, the WIC program adopted a standard list of nutrition risk criteria to be used by all states; this list includes the 95th percentile cutoff for identifying overweight children.¹⁵

Throughout this report, overweight WIC children are identified by weight-for-height at or above the 95th percentile of the growth charts (for all years of data), so that the measure is consistent across States and over time. Furthermore, overweight prevalence is measured among children with non-missing data for weight, height, and gender. The percents of WIC children with missing data in each year 1992, 1994, 1996, 1998 are 8.1%, 6.6%, 9.7%, and 3.0% respectively.¹⁶

Weight-for-Height According to the Original and Revised Growth Charts

Exhibit 3.3 shows the percent of WIC children with weight-for-height at or above the 95th percentile of the original and revised NCHS/CDC weight-for-height growth charts. The revised growth charts result in higher overweight prevalence, with prevalence shifted up by approximately one percentage point in each year.

Exhibit 3.4 shows the impact of the growth chart revision on measured overweight prevalence by gender and race. The revised growth charts result in increased overweight prevalence of 2.4 percentage points for boys, and decreased prevalence of 0.7 percentage points for girls. Boys have higher overweight prevalence than girls, while the reverse was true with the original charts.¹⁷

calculated using software developed by the Centers for Disease Control and Prevention and the World Health Organization. See Sullivan, M. and J. Gorstein. *ANTHRO: Software for Calculating Pediatric Anthropometry Version 1.01*, December 1990. The PC data does not indicate whether the "height" measure is standing height or recumbent length; ANTHRO assumes that "height" is recumbent length for children under 24 months, and standing height for 24 months and older. For the PC reports, gender was randomly assigned, when missing, to obtain a weight-for-height percentile. Measures of overweight prevalence in this report exclude children with missing gender.

¹⁵ The standard nutrition risk criteria now in use are based on the recommendations of the Committee on Scientific Evaluation of WIC Nutrition Risk Criteria, formed by the Institute of Medicine (IOM) under the sponsorship of USDA, FNS (IOM, 1996).

¹⁶ In 1994 and 1996, nearly half of missing weight-for-height data was due to non-reporting of these data by one State. Appendix Exhibit A1 shows the number of WIC children and percent missing overweight status by State and year.

¹⁷ This finding is consistent with NHANES III results presented in Exhibit 2.3.

Exhibit 3.3

Overweight Prevalence among WIC Children Age 1-4 Years, Based on Original and Revised NCHS Weight-for-Height Charts

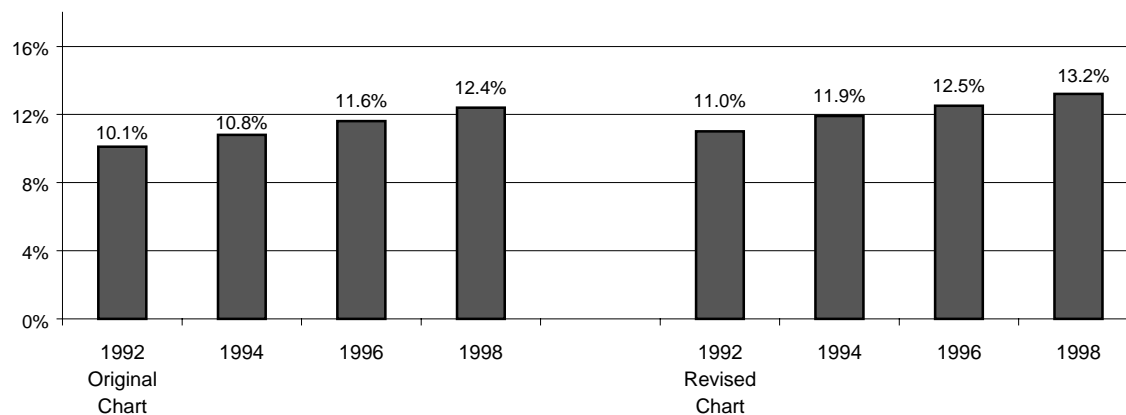


Exhibit 3.4

Overweight Prevalence among WIC Children By Gender and Race, 1998 Based on Original and Revised Growth Charts

Population ^a	Number	Percent Overweight		Difference	
		Original Growth Charts	Revised Growth Charts	Revised – Original	Percent change
Boys	1,923,217	11.5	13.9	2.4	20.9
White	760,706	9.7	11.9	2.2	22.7
Black	451,524	10.7	12.8	2.1	19.6
Hispanic	602,665	14.3	16.9	2.6	18.2
American Indian	32,720	15.7	19.1	3.4	21.7
Asian	64,013	10.8	13.3	2.5	23.1
Girls	1,870,938	13.3	12.6	-0.7	-5.3
White	732,221	10.9	10.3	-0.6	-5.5
Black	445,751	12.8	11.7	-1.1	-8.6
Hispanic	587,733	16.6	15.9	-0.7	-4.2
American Indian	32,791	18.5	18.1	-0.4	-2.2
Asian	61,118	11.8	11.7	-0.1	-0.8
Total	3,794,155	12.4	13.2	0.8	6.5

^a Totals for boys, girls, and overall include children with race not reported.

The impact of the revised charts varies by race: the increase in overweight prevalence for boys is greatest for American Indians, Hispanics, and Asians. For girls, the revised charts lead to decreased prevalence for all racial groups with the largest decrease in prevalence for blacks (1.1 percentage points and an 8.6 percent drop in overweight prevalence).

BMI-for-Age Compared to Weight-for-Height

BMI-for-age growth charts were developed by NCHS, as a replacement for the 1977 weight-for-stature charts, for persons age 24 months through 20 years. Because this measure begins at age 24 months, BMI-for-age cannot be used by WIC to track an individual child's growth from birth through the preschool years. But for children age 24 months and older, it is useful to understand the relationship between weight-for-height and BMI-for-age in order to make comparisons between WIC data and national population estimates for older children.

Exhibit 3.5 shows the distribution of weight-for-height and BMI-for-age percentiles for 2- to 4-year old WIC children. The largest difference in the distributions occurs between the 25th and 35th percentiles. At the extremes, BMI-for-age yields a higher estimate of underweight WIC children (5.3 vs. 4.3% at or below the 5th percentile) and a higher estimate of overweight WIC children (13.6 vs. 12.2% at or above the 95th percentile). BMI-for-age yields a lower estimate, however, of WIC children at-risk for overweight (14.2 vs. 16.3% at 85-95th percentile).

Exhibit 3.5

Weight-for-Height and BMI-for-Age: WIC Children Age 24 Months and Older

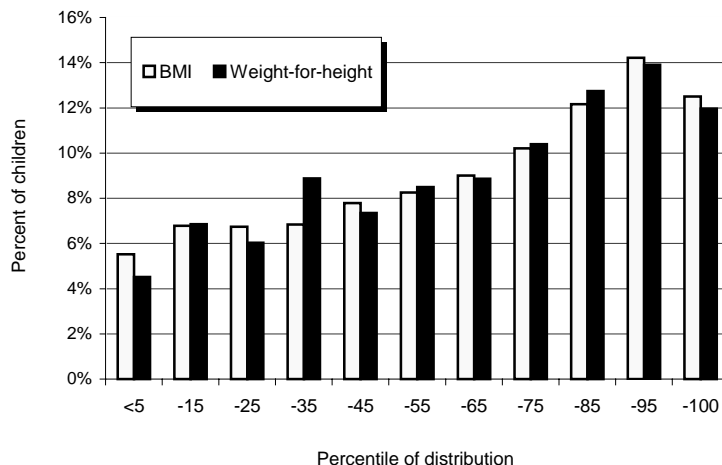
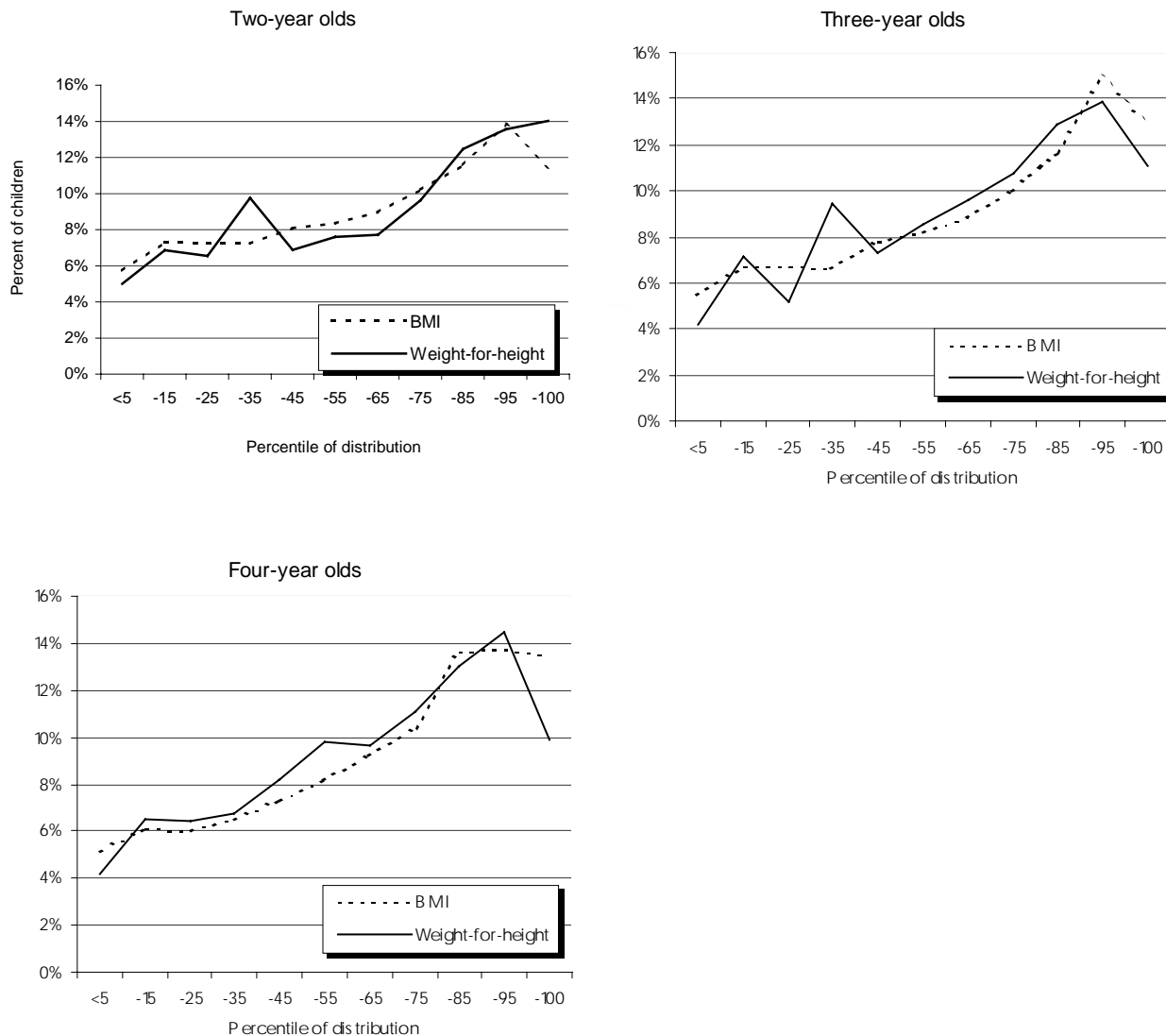


Exhibit 3.6 compares the weight-for-height and BMI-for-age distributions of WIC children separately for each year of age. The weight-for-height distribution of WIC children is smoother for 4-year old children than younger ages (with the peak at the 25-35th percentile disappearing). Aside from the peaks at the 25th to 35th percentiles, for all three years of age, the curves track each other reasonably well except at the extremes. BMI-for-age yields slightly higher estimates of underweight for all three ages and higher estimates of overweight for 3- and 4-year olds. In contrast, weight-for-height yields a higher estimate of overweight for 2-year olds.

Exhibit 3.6

Weight-for-Height and BMI-for-Age: WIC Children by Year of Age



4. Trends in Overweight Prevalence among WIC Children

Reexamination of overweight prevalence among WIC children, using the NCHS revised growth charts, shows that 11 percent of WIC children were overweight in 1992 and 13.2 percent were overweight in 1998. Overweight prevalence rose 20 percent over this six-year time period. This section presents information on the variation and trends in overweight prevalence among WIC children, by demographic characteristics and geographic location.

Overweight Prevalence among WIC Children, By Gender, Race/Ethnicity, and Age

Exhibit 4.1 shows the percent of WIC children measured overweight by gender, by age, and by race. In all years boys show a higher prevalence of overweight than girls. Over the time period, 1992 to 1998, overweight prevalence increased 2.3 percentage points for both boys and girls, representing a 19.8 percent rise in prevalence for boys and a 22.3 percent rise in prevalence for girls.

Relative changes in overweight prevalence by age are consistent across years: overweight prevalence decreased consistently with age in all years. The changes in overweight prevalence by age are similar for boys and girls, as shown graphically in Exhibit 4.2.¹⁸

Among racial/ethnic groups, Hispanic and Native American children have the highest rates of overweight prevalence in each year. The ranking of whites, blacks, and Hispanics is consistent with findings from NHANES III for white, black, and Mexican-American preschool children.¹⁹ From 1992 to 1998, overweight prevalence increased among all racial/ethnic groups, with blacks having the smallest increase (0.9 percentage point) and Hispanics having the largest increase (2.0 percentage points). In relative terms, however, the increased prevalence for white children, from 9.2 to 11.1, was a 20.7 percent increase over the 1992 level and the greatest percent increase among racial/ethnic groups.

Detailed exhibits appear as Appendix Exhibit A2, showing the percent of WIC children who are overweight by race, age, and gender.

¹⁸ Overweight measurement for WIC children age 24-35 months contains some uncertainty because the PC data do not indicate whether the "height" measurement is recumbent length or standing height. Because the transition from measuring length to measuring height is made within this age range, the NCHS revised growth charts for both weight-for-length and weight-for-height may be used for this age group. But using a length measure with the weight-for-height chart, and vice versa, yields incorrect results. For this report, it is assumed that "height" is standing height for children age 24 months and older; this yields conservative estimates of overweight prevalence.

¹⁹ NHANES III samples are not large enough to examine Asian and American Indian preschool children separately.

Exhibit 4.1

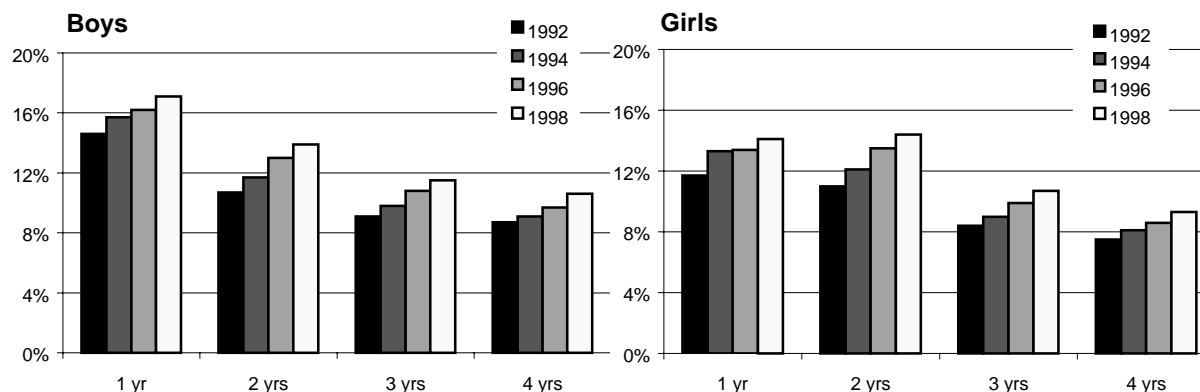
Percent of WIC Children Measured Overweight by Gender, by Age, and by Race

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
All Children	2,395,279	11.0	3,064,898	11.9	3,452,459	12.5	3,794,155	13.2
Gender								
Boys	1,209,926	11.6	1,551,984	12.5	1,749,755	13.1	1,923,217	13.9
Girls	1,185,353	10.3	1,512,913	11.3	1,702,704	11.8	1,870,938	12.6
Age								
Age 1	962,026	13.2	1,204,393	14.5	1,191,652	14.8	1,302,623	15.6
Age 2	607,532	10.8	775,478	11.9	900,356	13.2	960,430	14.2
Age 3	470,780	8.8	634,785	9.4	791,834	10.4	861,385	11.1
Age 4	295,136	8.1	408,352	8.6	554,140	9.1	626,655	9.9
Age not reported	59,805	7.9	41,891	9.9	14,477	9.7	43,062	11.9
Race								
White	1,149,496	9.2	1,380,493	10.1	1,429,659	10.3	1,492,928	11.1
Black	713,244	11.3	831,217	11.8	854,767	11.6	897,276	12.2
Hispanic	423,434	14.4	701,133	15.2	979,929	16.0	1,190,397	16.4
American Indian	53,416	16.9	61,797	17.5	67,744	17.7	65,512	18.6
Asian	43,681	11.2	77,960	11.5	104,056	13.2	125,134	12.5
Race not reported	12,006	11.1	12,294	12.9	16,305	13.1	22,911	13.1
Missing overweight status	266,894		270,993		399,687		187,687	
Total WIC Children	2,667,969		3,361,013		3,858,761		3,987,669	

Notes: Number of children excludes those with missing data for weight, height, or gender.
 Overweight is determined by measured weight-for-height at or above the 95th percentile of the CDC Revised Growth Charts (May 2000).
 Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.

Exhibit 4.2

Prevalence of Overweight among WIC Children, by Gender and Age



Variation in Overweight Prevalence among WIC Children by Geographic Area

Several studies have examined the relationship between overweight prevalence and demographic characteristics in the United States²⁰, but few studies contain sufficient geographic information or sample size to examine the variation in overweight prevalence in different areas of the country. In this section, we examine State and regional variation in overweight prevalence and differences in overweight prevalence in metropolitan versus non-metropolitan areas.

Data collected for the WIC PC studies do not identify the residence of WIC enrollees. But PC data include two identifiers for each WIC enrollee which may be linked to geographic areas: identifiers for the State WIC agency and local WIC agency enrolling the person in the program. WIC is administered at the State level by the 50 geographic States, the District of Columbia, American Samoa, Guam, Puerto Rico, the U.S. Virgin Islands, and thirty-three Indian Tribal Organizations (ITOs). For the most part, ITOs administer WIC programs within the jurisdictions of Federally recognized American Indian Reservations, which may overlap State boundaries.²¹ To examine State and regional variation in overweight prevalence for this report, WIC ITO enrollment is **not** aggregated together with the enrollment of the geographic State within which the ITO resides.

Exhibit 4.3 displays the prevalence of overweight among WIC children in each State, for the four years of WIC data collection. States are shaded according to the quartiles of the distribution in 1992: the median State in 1992 had 10 percent of WIC children overweight. The maps show the gradual movement of States toward increased overweight prevalence during the 1990s. From 1992 to 1994, half of the States in the bottom quartile moved up the distribution. Gradual shifts occurred from 1994 to 1996, and then dramatic changes occurred from 1996 to 1998, as overweight prevalence in all but five States rose above the 1992 median level. Detailed tables of overweight prevalence by State and race are in Appendix Exhibits A3 and A4.

Regional variation in overweight prevalence among WIC children is summarized in Exhibit 4.4. This stacked bar chart shows overweight prevalence in 1992 in dark shading and the increase in overweight prevalence from 1992 to 1998 in light shading. The top of each stacked bar indicates overweight prevalence in 1998. The Mountain Plains region had the lowest overweight prevalence in 1992 and 1998. The Northeast and Western regions had the highest rates of overweight among WIC

²⁰ See Sobal and Stunkard (1998) for a review of the literature on socioeconomic status and obesity.

²¹ Ten ITOs are within the boundaries of the State of Oklahoma where there are no Federally recognized American Indian Reservations.

Exhibit 4.3

Prevalence of Overweight Among WIC Children, 1992, 1994, 1996, 1998

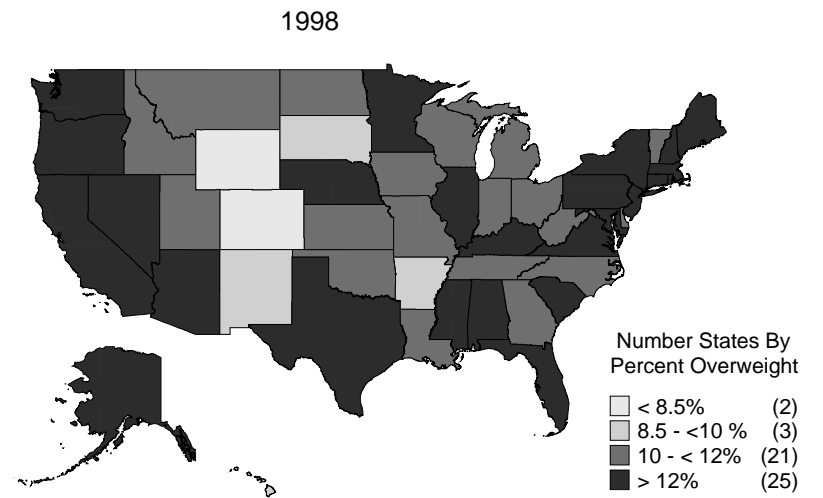
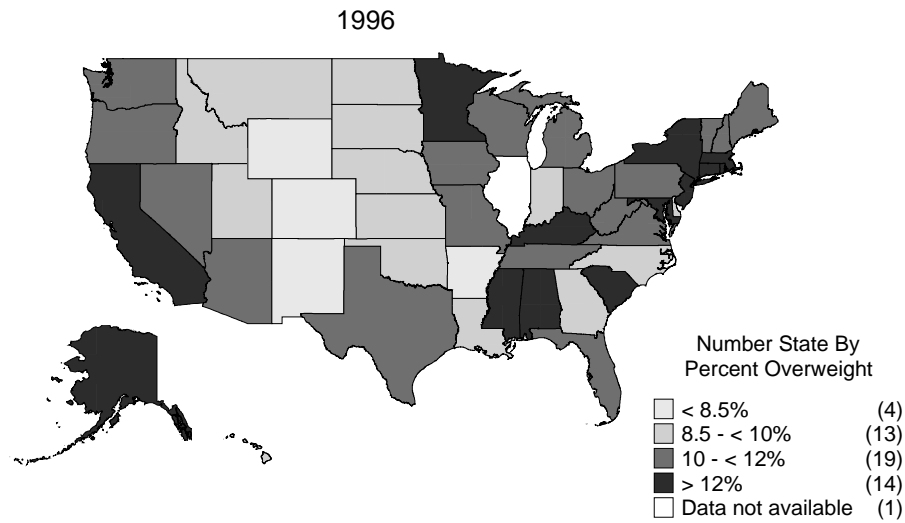
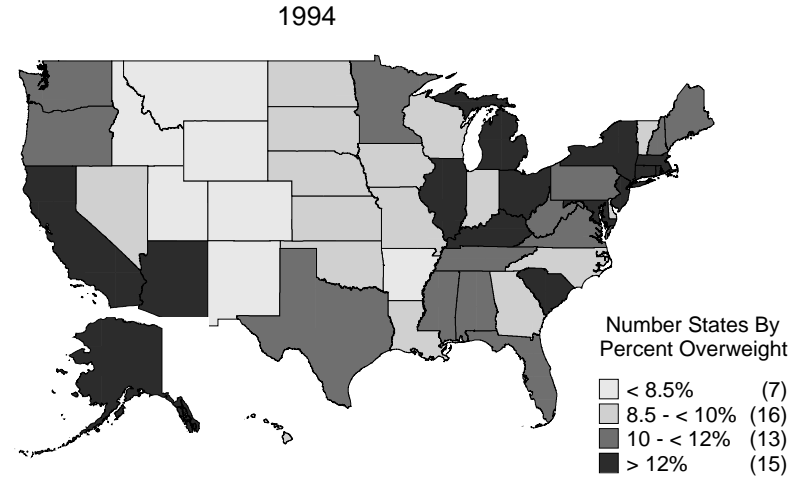
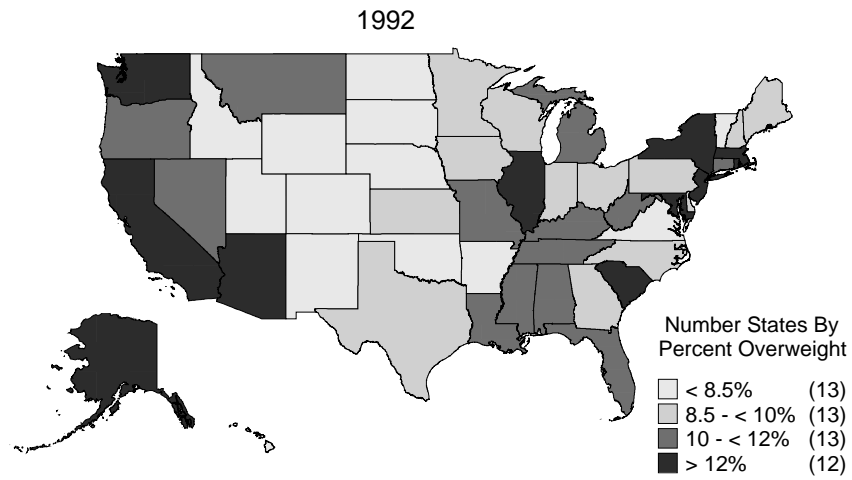
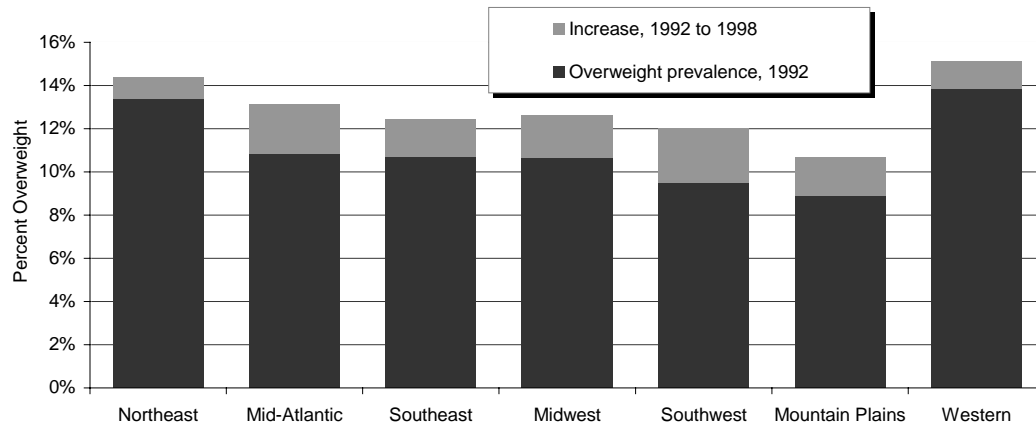


Exhibit 4.4**Overweight Prevalence among WIC Children by Region, 1992 and 1998**



Note: Excludes U.S. territories; includes ITOs.

children in both 1992 and 1998. The Southwest region showed the greatest increase in overweight prevalence over the six-year time period (2.5 percentage point increase, for a 26.2 percent rise in prevalence); the Northeast had the smallest increase over the time period (one percentage point increase, for a 7.4 percent increase in prevalence).

The regional variation in overweight prevalence among WIC children suggests that overweight prevalence may be driven by variation in urban/rural composition across States: the Western and Northeast regions are the most urban regions of the country.²² To investigate this, we examined differences in overweight prevalence between metropolitan and non-metropolitan areas. Each local WIC agency can be characterized as "metro" or "non-metro," according to whether the agency operates in counties that are part of a Metropolitan Area.²³ Local WIC agencies operate within States and are responsible for operating service sites at which applicants are certified and WIC benefits are distributed. In 1998, 2,203 local WIC agencies operated over 10,000 service sites throughout the United States (USDA, 2000). The majority of local WIC agencies are county departments of health and approximately 80 percent of local WIC agencies operate within single counties.²⁴

²² The ranking of FNS regions by percent urban population in 1990 is: Western (87.8%), Northeast (80.1%), Mid-Atlantic (74.4%), Southwest (74.4%) Midwest (73.6%), Mountain Plains (69.4%), Southeast (64.5%).

²³ Office of Management and Budget, Definitions of Metropolitan Areas, June 1998.

²⁴ Information about the counties in which each local WIC agency operates was obtained from State WIC agencies (in some cases via liaison with FNS Region Offices). States agencies provided either a list of counties served by each

Tabulation of WIC enrollment and overweight prevalence, by metro and non-metro areas, is shown in Exhibit 4.5. Nearly 80 percent of WIC enrollment of children is in metropolitan areas. The prevalence of overweight among WIC children is one percentage point (8 percent) higher in metro areas, compared to non-metro areas.

Exhibit 4.5

Distribution of WIC Children and Prevalence of Overweight by Metro/Non-Metro Areas, 1998

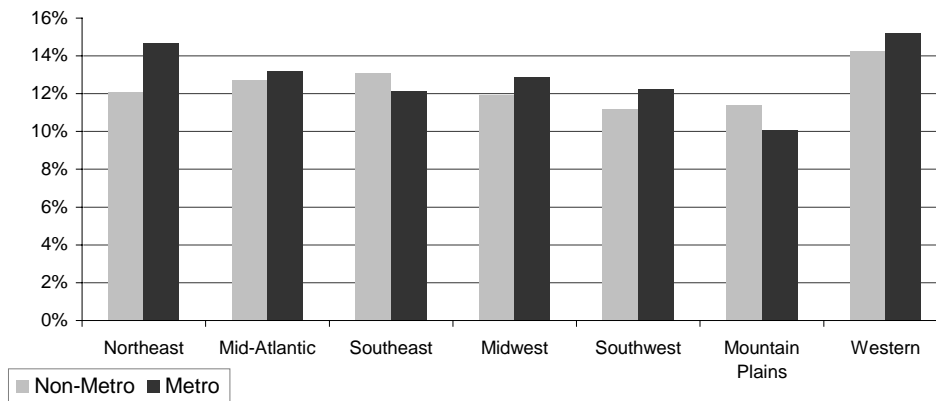
	Total WIC Children		Percent Overweight		
	Number Children	Percent of Total	Boys	Girls	All
Metro	3,012,916	79.4	14.0	12.8	13.4
Non-Metro	781,239	20.6	13.1	11.7	12.4
Total	3,794,155	100.0	13.9	12.6	13.2

Notes: Number of children excludes those with missing data for weight, height, or gender.
 Overweight is determined by measured weight-for-height at or above the 95th percentile of the CDC Revised Growth Charts (May 2000).
 Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.

While there are differences in overweight prevalence in metro and non-metro areas, the metro/non-metro difference varies by region of the country. As seen in Exhibit 4.6, the metro/non-metro difference in overweight prevalence is greatest in the Northeast. In the Mountain Plains and Southeast regions, overweight prevalence is higher in non-metro areas than in metro areas.

Exhibit 4.6

Prevalence of Overweight by Region and Metro/Non-Metro Areas, 1998



local agency or a list of service site locations for each local agency. In the latter case, service site addresses were mapped to determine county locations. Agencies serving both metro and non-metro counties are classified as metro.

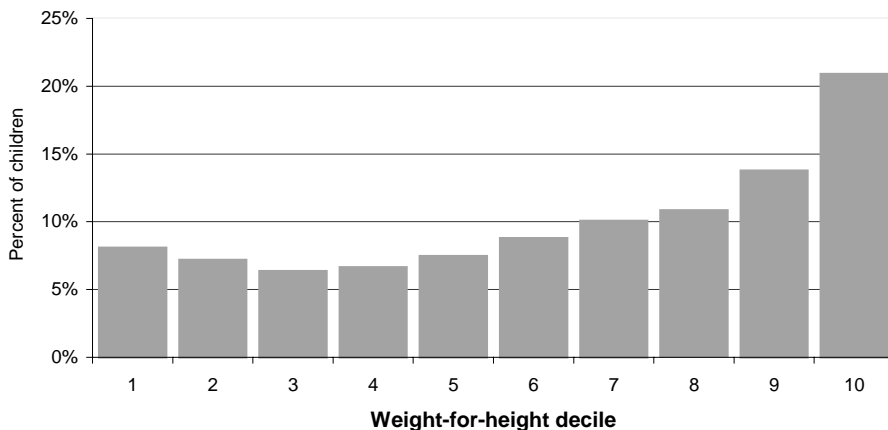
The Weight-for-Height Distribution of WIC Children

The increased prevalence of overweight among WIC children reflects trends in the general population: there are more overweight preschool children today than there were several years ago. Obesity research seeks to explain this disturbing trend by asking the following questions: Is overweight due to increased energy intake or reduced energy expenditure? How much of the tendency toward overweight is genetic, rather than environmental?²⁵ This paper cannot address either of these questions. But with respect to WIC children, we can ask: Is increasing overweight prevalence explained by a shift in the entire weight-for-height distribution, or is the increase concentrated at the upper end?

Exhibit 4.7 shows the distribution of WIC children by weight-for-height decile in 1998. Recall that calculated weight-for-height percentiles for WIC children are based on a comparison of weight and height with the NCHS growth chart. If weight-for-height of WIC children is distributed identically to the reference population, then the bar chart in Exhibit 4.7 would show 10 identically-sized bars each representing 10 percent of WIC children. In fact the chart shows that, compared to the reference population, WIC children are less likely to have weight-for-height under the 60th percentile of the reference population and more likely to have weight-for-height above the 80th

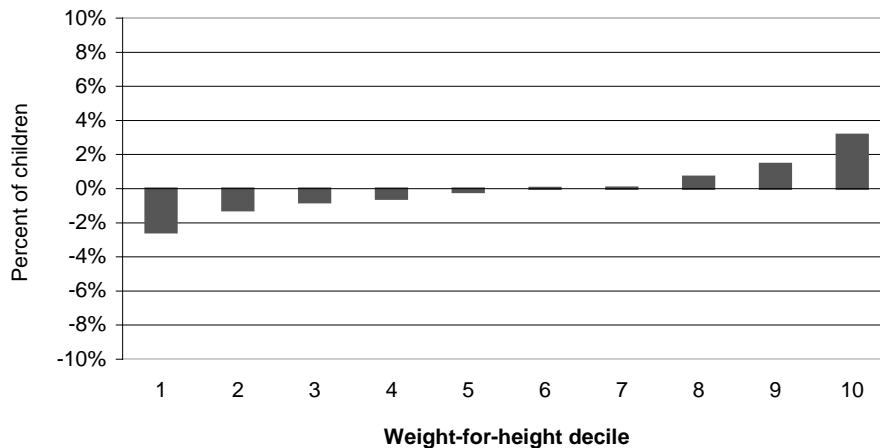
Exhibit 4.7

Distribution of WIC Children by Weight-for-Height, 1998



²⁵ It is generally agreed that genetic factors cannot explain the marked increase in overweight in the general population in the relatively short span of the past thirty years. See Rosenbaum and Leibel (1998) for a discussion.

Exhibit 4.8**Change in the Distribution of WIC Children by Weight-for-Height Deciles, 1992 to 1998**

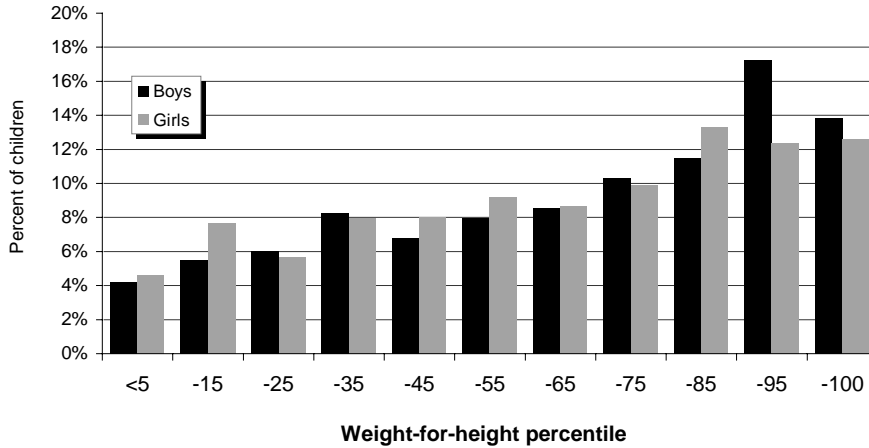


percentile. The top decile of WIC children (weight-for-height above 90th percentile) contains more than twice as many children as we would expect if WIC children had the same distribution as the reference population.

The change in the distribution of weight-for-height among WIC children, from 1992 to 1998, is shown in Exhibit 4.8. This chart shows that the increased prevalence of overweight occurring over the time period was due to a shift in the entire distribution. The larger number of children located at the very high end of the weight-for-height distribution was offset by a lower number of children at the very low end of the distribution. This finding may reflect very recent trends. In contrast, changes in the distribution of BMI from NHES (1963-65) to NHANES III (1988-94) show that "the heaviest children were markedly heavier in NHANES III than in NHES, but the rest of the distribution of BMI showed little change" (Troiano and Flegal, 1998).

Exhibits 4.9 and 4.10 compare the distributions of weight-for-height of boys and girls, and of racial/ethnic groups. These charts display 10-percentage point ranges of the weight-for-height distribution except at the lower and upper ends where 5-percentage point ranges are used to show prevalence of underweight and overweight. The largest differences between boys and girls are in the "at-risk" ranges of the distribution. Girls are more likely to be at-risk of underweight (percentiles in the 6-15 range) and boys are more likely to be at-risk of overweight (percentiles in the 86-95 range).

Exhibit 4.9**Distribution of WIC Children by Weight-for-Height: Boys and Girls, 1998**



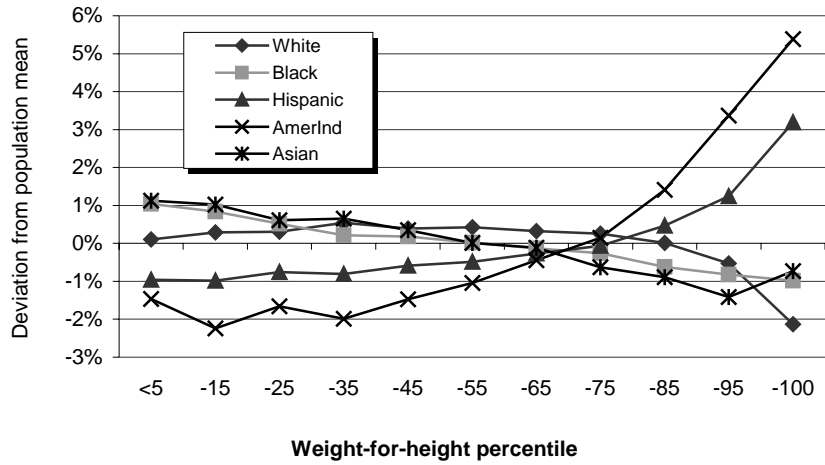
The racial/ethnic differences in overweight prevalence, with Hispanics and Native Americans having the highest rates of overweight among WIC children, are pervasive across the weight-for-height distribution. Exhibit 4.10 shows the distribution of weight-for-height by racial/ethnic group, displayed as deviations from the overall distribution of WIC children.²⁶

As seen in Exhibit 4.10, below the 65th percentile of weight-for-height, Native American and Hispanic WIC children are under-represented in each decile, compared to the distribution of all WIC children. Above the 75th percentile of weight-for-height, Native American and Hispanic WIC children are over-represented in each decile, compared to the distribution of all WIC children. White, black, and Asian children differ from the population mean by less than one percent in most deciles; showing a positive deviation from the population mean below the 45th percentile and a negative deviation from the population mean above the 75th percentile. Examination of the full distribution of weight-for-height shows that racial/ethnic differences in prevalence of overweight reflect, not just a larger concentration of heavy children among some racial/ethnic groups, but also differences along the whole range of the weight-for-height distribution.

²⁶ At each decile of the distribution, the percent of children within racial/ethnic group in that decile is measured as a difference from the percent of all WIC children in that decile.

Exhibit 4.10

Weight-for-Height Distribution of WIC Children by Race, 1998
Displayed as Deviation from Overall Mean



5. Prevalence and Co-occurrence of Nutrition Risks in Overweight WIC Children

The WIC program provides healthy foods, nutrition education, and social service and health care referrals to low-income children who have nutritional need. As we have seen in previous sections, increasingly larger proportions of children enrolled in WIC are overweight. Because of this trend, WIC may be one of the most important avenues through which to address a tendency toward overweight among preschool children. But overweight status is just one of many nutrition risks that qualify children for WIC certification. Different nutrition risks may compete for attention when designing nutrition education programs and food packages aimed at improving the nutrition and health status of children.

This section provides information about the co-occurrence of nutrition risks in overweight WIC children and the prevalence of nutritional risks by overweight status. The WIC program screens for nutritional risk in five broad categories during the certification process: anthropometric, biological, clinical, dietary, and predisposing. (Specific risks appear in Exhibit 5.2.²⁷) The finding of nutritional risk is recorded during the certification process and these data are submitted to the WIC PC studies.

One difficulty in examining the prevalence and co-occurrence of nutritional risks is that, because one risk is sufficient for certification, all risks may not be recorded during the certification process. If all risks are not documented by WIC agencies, then our examination of the co-occurrence of risks with overweight will be biased.

In 1998, 62 percent of State WIC agencies reported that they require all risk criteria be recorded at certification.²⁸ To test whether State reporting requirements are reflected in the data, we compared the number of risks reported for overweight children in States where all risks are documented, with the number of reported risks in States where all risks need not be documented. If only a single risk is reported then we observe *no other risk* in addition to overweight. Exhibit 5.1 (bottom panel) shows that, in States with a strict reporting requirement, only 11.1 percent of overweight children are reported to have a single risk; in States without a strict reporting requirement, 26.1 percent of overweight children are reported to have only one risk. Because lack of strict reporting requirements appears to result in underreporting of nutritional risks, we restrict the analysis in the remainder of this

²⁷ Institute of Medicine (1996) contains a comprehensive discussion of the nutritional risk criteria used by the WIC program.

²⁸ Based on author's tabulations of data from the *PC98 Survey of State WIC Agencies*.

section to data from States that require reporting of all nutritional risks during the WIC certification process.²⁹

Exhibit 5.1

Prevalence of Overweight and Percent of Overweight WIC Children with No Other Nutritional Risk, By State Nutritional Risk Reporting Requirements, 1998

	States Reporting All Risks		States NOT Reporting All Risks	
	Number Children	Percent Overweight	Number Children	Percent Overweight
All Children	2,372,162	13.7	1,421,993	12.4
Gender				
Boys	1,203,494	14.4	719,723	13.0
Girls	1,168,668	13.1	702,270	11.7
Age				
Age 1	795,015	15.9	507,608	15.1
Age 2	601,338	15.0	359,092	12.7
Age 3	547,190	11.7	314,195	10.0
Age 4	404,441	10.5	222,214	8.9
Age not reported	24,178	9.6	18,884	14.7
Race				
White	741,218	10.9	751,709	11.3
Black	496,762	12.3	400,513	12.1
Hispanic	972,691	16.6	217,706	15.8
American Indian	42,850	17.1	22,662	21.5
Asian	104,875	12.7	20,258	11.3
Race not reported	13,766	13.7	9,145	12.3

	States Reporting All Risks		States NOT Reporting All Risks	
	Number Overweight Children	Percent With No Other Risk	Number Overweight Children	Percent With No Other Risk
All Children	325,613	11.1	176,219	26.1
Gender				
Boys	172,671	10.8	93,886	25.5
Girls	152,942	11.4	82,334	26.9
Age				
Age 1	126,558	9.4	76,520	24.4
Age 2	90,336	10.1	45,566	26.1
Age 3	64,058	12.7	31,551	27.9
Age 4	42,337	15.8	19,800	31.7
Age not reported	2,324	8.8	2,782	14.9
Race				
White	80,808	9.4	84,891	25.4
Black	61,241	8.6	48,630	27.4
Hispanic	161,006	13.2	34,417	26.7
American Indian	7,319	6.0	4,871	21.8
Asian	13,351	9.5	2,287	25.8
Race not reported	1,888	5.8	1,123	28.9

Notes: Number of children excludes those with missing data for weight, height, or gender.
Overweight is determined by measured weight-for-height at or above the 95th percentile of the CDC Revised Growth Charts (May 2000).

Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.

The 55 States requiring that all risks be reported are: Alabama, Arkansas, California, Colorado, Connecticut, Delaware, Georgia, Hawaii, Idaho, Illinois, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New York, North Dakota, Oklahoma, Oregon, Rhode Island, South Dakota, Texas, Utah, Vermont, Virginia, Wisconsin, Wyoming and 28 ITOs.

²⁹ The PC data set contains information on a maximum of three nutritional risks per participant. Therefore, even in States where all risks are recorded at certification, the PC data may understate the number of risks present.

Data from in States requiring full reporting of nutritional risks shows that the great majority of overweight children have risks in addition to overweight status (only 11.1 percent have no risk other than overweight). The likelihood that overweight is the only nutritional risk increases with age and varies by racial/ethnic group (Exhibit 5.1).

The number and type of risks that co-occur with overweight are presented in Exhibit 5.2. Aside from overweight status, overweight children are similar to other WIC children in that their most common nutritional risks are inadequate or inappropriate nutrient intake and low hematocrit or hemoglobin.

Exhibit 5.2

Prevalence of Reported Nutritional Risks By Overweight Status, 1998

	Measured Weight-for-Height < 95th Percentile	Measured Weight-for-Height ≥ 95th Percentile
Anthropometric (excluding overweight)	19.2	15.9
Low weight-for-height	3.6	0.5
Short stature	7.9	5.9
Inappropriate growth	9.7	9.9
Low birthweight/premature birth	0.5	0.3
Other anthropometric risk	0.5	0.2
High weight-for-height	6.3	78.0
Biological Risk	25.8	23.9
Hematocrit/hemoglobin below state standard	25.6	23.8
Other biochemical risk	0.3	0.2
Clinical Risk	21.0	20.4
Nutrition-related risks	9.1	8.4
Other health risk	8.4	7.6
Dietary Risk	79.8	68.5
Inadequate/inappr. nutrient intake	77.3	64.9
Other dietary risk	7.6	8.0
Nutritional Risk	3.0	1.4
Regression	1.7	0.3
Transfer (risk unknown)	0.1	0.1
Homelessness/migrancy	0.1	>0
Other nutritional risks	0.8	0.7
Risks Not Applicable to Children	6.5	6.5
Number of reported nutritional risks		
None	1.7	0.5
One	50.1	20.3
Two	35.5	48.9
Three	12.7	30.2
Number Children	2,046,549	325,613

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Notes: Overweight is determined by measured weight-for-height at or above the 95th percentile of the CDC Revised Growth Charts (May 2000)./
 Number of children excludes those with missing data for weight, height, or gender.
 Table shows data for the 55 WIC State agencies requiring all nutrition risks be recorded during the certification process.
 Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.

The percent of overweight children with anthropometric risk in addition to overweight is 15.9; 5.9 percent have short stature and 9.9 percent show inappropriate growth. These anthropometric risks are somewhat more common among children who are not overweight, but rates of incidence for both groups are below 10 percent.

The incidence of biological and clinical risks is similar for overweight children and other children. In both groups, about one-fourth of children have low hematocrit or hemoglobin and about 20 percent have clinical risks. Dietary risks are less prevalent in overweight children; 64.9 percent of overweight children (compared to 77.3 percent of others) have inadequate or inappropriate nutrient intake. Other risks, such as regression and homelessness/migrancy have low incidence (less than 2 percent) in both groups.

The distribution of the number of reported risks for WIC children is shown at the bottom of Exhibit 5.2. Overweight children are more likely to have multiple nutritional risks, compared to other WIC children: 79.1 percent of overweight WIC children have two or three nutritional risks, whereas 48.2 percent of other children have two or three risks.³⁰

Exhibit 5.3 shows the prevalence of nutritional risks for overweight WIC children and non-overweight WIC children, by race. There are some large racial differences in the prevalence of nutritional risks, but within race, there are no large differences between overweight children and other children. For example, black children are nearly twice as likely to have biological risks as white children, and this pattern holds among overweight black and white children.

³⁰ The apparent inconsistency between Exhibits 5.1 and 5.2 is due to the substantial number of children *measured* overweight who do not have a reported nutritional risk of overweight. Exhibit 5.2 shows that 20.3 percent of overweight children have one reported risk; Exhibit 5.1 shows that 11.1 percent of overweight children have one risk and that risk is overweight status. Taken together, these numbers show that 9.2 percent of overweight children have a single risk reported but that risk is not overweight.

Exhibit 5.3

Prevalence of Reported Nutritional Risks By Overweight Status and Race, 1998

	Measured Weight-for-Height < 95th Percentile					Measured Weight-for-Height >= 95th Percentile				
	White	Black	Hispanic	Amer. Indian	Asian	White	Black	Hispanic	Amer. Indian	Asian
Anthropometric (excluding overweight)	21.8	22.0	15.5	17.2	21.2	21.8	21.2	10.8	17.8	16.8
Low weight-for-height	4.2	5.4	1.9	3.7	4.1	0.6	0.9	0.2	0.3	0.2
Short stature	10.0	9.4	5.0	9.0	9.9	6.0	7.4	5.1	5.3	7.3
Inappropriate growth	10.2	10.0	9.4	4.2	9.5	15.8	13.8	5.8	6.2	9.8
Low birthweight/premature birth	0.8	0.8	0.1	0.3	0.3	0.6	0.4	0.1	0.3	0.2
Other anthropometric risk	0.8	0.2	0.3	2.8	0.5	0.1	0.1	>0	6.2	>0
High weight-for-height	5.6	6.1	7.0	9.7	3.9	70.8	73.0	83.9	81.9	70.2
Biological Risk	17.6	32.8	29.6	13.6	22.4	15.6	28.9	26.8	13.8	22.4
Hematocrit/hemoglobin below state standard	17.5	32.4	29.5	13.5	22.3	15.5	28.5	26.7	13.7	22.3
Other biochemical risk	0.2	0.7	0.1	>0	0.2	0.1	0.6	0.1	>0	0.1
Clinical Risk	19.4	14.6	25.2	31.2	22.4	19.7	13.8	22.8	33.6	19.6
Nutrition-related risks	8.1	6.4	10.8	22.3	8.3	7.2	5.5	9.6	23.6	6.5
Other health risk	8.1	5.8	10.2	5.7	7.2	8.5	5.8	8.1	6.1	5.7
Dietary Risk	82.9	79.8	77.2	84.6	78.2	74.4	71.8	63.9	73.4	68.1
Inadequate/inappr. nutrient intake	81.1	78.1	73.8	82.4	74.5	71.6	68.9	59.6	71.1	64.2
Other dietary risk	7.0	5.8	8.7	5.2	11.6	7.8	6.3	8.7	5.4	10.1
Nutritional Risk	3.2	2.9	2.3	4.7	7.8	1.6	1.1	0.8	2.2	8.7
Regression	1.7	1.7	1.6	3.0	1.0	0.4	0.3	0.3	0.8	0.4
Transfer (risk unknown)	0.1	0.1	0.1	0.1	>0	0.2	0.1	0.1	>0	0.1
Homelessness/migrancy	>0	>0	0.1	0.1	>0	>0	>0	0.1	>0	>0
Other nutritional risks	0.7	0.3	0.4	0.8	6.6	0.6	0.2	0.3	0.4	8.1
Risks Not Applicable to Children ¹	5.4	4.4	8.1	6.0	10.1	5.8	3.8	7.7	6.2	9.4
Number of reported nutritional risks										
None	1.7	1.6	1.8	1.3	2.5	0.6	0.6	0.5	0.5	0.8
One	52.4	47.6	49.7	46.6	48.4	20.4	18.9	21.1	13.0	22.2
Two	33.9	36.8	35.9	39.9	35.8	51.5	48.5	47.7	51.1	47.7
Three	12.0	14.0	12.5	12.2	13.3	27.5	32.0	30.8	35.5	29.2
Number Children	660,410	435,521	811,685	35,531	91,524	80,808	61,241	161,006	7,319	13,351

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¹ Risks not applicable to children are not included in the calculation of the distribution of children by number of reported risks.

Notes: Overweight is determined by measured weight-for-height at or above the 95th percentile of the CDC Revised Growth Charts (May 2000).
 Number of children excludes those with missing data for weight, height, or gender.
 Table shows data for the 56 WIC State agencies requiring all nutrition risks be recorded during the certification process.
 Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.
 Total number children does not sum to Exhibit 5.2 because children with missing race are not shown.

6. Conclusion

Through provision of healthy foods and nutrition education, the WIC program provides early intervention in the eating habits of low-income preschool children in the United States and has the potential to affect the trend toward increasing overweight prevalence that began in the 1960s. Equally important, the WIC program's data collection activities allow monitoring of the patterns and trends in overweight prevalence among low-income preschool children, at levels of aggregation unmatched by national survey data.

Using the NCHS **revised** growth charts with WIC data from 1992 to 1998 shows that overweight prevalence among WIC children increased 20 percent over this 6-year period. The percent of overweight children varies by race, age, gender, and geographic area:

- Hispanic and Native American children show the highest rates of overweight prevalence
- White children show the greatest increase in overweight prevalence from 1992-98
- Overweight prevalence decreases with age
- A larger percent of boys are overweight than girls
- Overweight prevalence is higher in metropolitan areas than in non-metropolitan areas

Changes in the weight-for-height distribution of all WIC children, between 1992 to 1998, suggest a shift of the entire distribution, with increases in overweight children offset by decreases in children at the low end of the weight-for-height distribution.

It is generally accepted that being overweight at a preschool age does not pose serious immediate health risks during childhood; the main risk is that overweight may persist into adulthood and increase the likelihood of adult morbidity. WIC program data show that a majority of overweight WIC children have additional nutritional risks. Sixty-five percent of overweight children are identified as receiving inadequate or inappropriate nutrient intake at the time of their most recent WIC certification, and 24 percent of overweight children have low blood iron levels. It is clear that overweight children who participate in WIC have health concerns that are more complicated than simple excess weight.

A challenge for future research is to determine the extent to which the WIC program successfully intervenes in the eating habits of low-income children.

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Appendix A: Detailed Tables

Appendix A1: Total Number WIC Children and Percent Missing Overweight Measurement, By State

	1992		1994		1996		1998	
	Number Children	Percent Missing Overweight	Number Children	Percent Missing Overweight	Number Children	Percent Missing Overweight	Number Children	Percent Missing Overweight
Total	2,732,811	10.1	3,464,632	8.7	3,982,815	12.4	4,121,017	6.0
Alabama	74,620	11.9	68,129	10.1	64,108	5.3	52,516	1.1
Alaska	4,586	0.6	8,811	1.4	12,555	0.8	13,262	1.1
Arizona	19,289	1.6	37,601	1.3	59,982	1.2	62,123	8.6
Arkansas	40,553	2.3	47,723	5.9	44,351	2.3	42,709	2.8
California	79,724	21.1	314,554	23.6	596,238	13.4	721,069	8.4
Colorado	29,078	8.9	36,576	2.6	39,397	15.1	42,918	1.1
Connecticut	38,842	5.0	41,049	5.6	33,992	9.4	32,112	4.1
Delaware	7,358	1.1	8,019	8.2	8,362	0.9	8,261	0.8
Dist. of Columbia	8,819	5.2	10,162	11.8	8,077	0.6	8,657	0.5
Florida	123,900	3.7	165,571	4.4	194,759	1.9	200,384	1.5
Georgia	123,020	5.4	117,458	6.3	119,954	2.2	134,732	5.0
Hawaii	7,760	56.7	12,521	2.7	14,207	1.8	21,483	2.8
Idaho	16,882	6.7	19,445	6.7	18,579	0.5	18,153	3.4
Illinois	115,795	74.4	120,602	39.7	134,239	100.0	132,339	2.9
Indiana	74,624	31.8	79,639	0.8	76,383	0.8	72,041	0.8
Iowa	34,943	4.8	36,539	6.1	38,788	10.1	37,185	5.3
Kansas	22,133	0.5	31,021	0.6	29,648	0.7	28,586	1.8
Kentucky	56,096	0.7	62,981	0.8	65,927	0.6	67,295	0.7
Louisiana	39,758	1.9	49,610	1.5	55,834	0.7	61,030	1.3
Maine	13,327	2.9	17,131	1.3	16,249	1.1	15,242	1.5
Maryland	29,667	0.8	38,570	0.4	40,514	0.3	43,266	0.6
Massachusetts	57,268	2.2	71,903	2.0	73,621	1.8	71,865	1.2
Michigan	92,249	9.0	151,374	24.1	127,504	8.2	131,694	6.1
Minnesota	54,939	7.6	62,523	2.6	60,331	0.8	55,805	1.1
Mississippi	60,155	0.6	57,646	0.7	57,171	0.9	49,011	5.5
Missouri	50,077	12.2	68,182	0.4	78,650	3.6	77,096	4.0
Montana	11,310	1.0	12,172	0.9	12,475	0.8	11,911	0.5
Nebraska	18,544	4.4	20,058	0.5	21,201	0.7	15,125	1.7
Nevada	6,057	2.2	12,454	1.0	17,374	1.2	23,305	4.8
New Hampshire	11,020	26.4	11,155	6.7	10,998	4.6	10,481	5.2
New Jersey	73,252	6.6	75,039	6.1	82,933	8.9	85,429	14.8
New Mexico	24,616	2.1	34,857	0.9	37,458	0.7	35,508	0.6
New York	202,799	3.8	248,354	4.0	263,339	4.1	267,018	4.6
North Carolina	78,636	0.7	82,229	9.9	97,780	7.6	98,549	7.5
North Dakota	9,474	8.7	9,863	5.5	9,139	4.3	8,113	2.3
Ohio	118,986	na	133,286	6.5	137,608	1.8	133,533	2.8
Oklahoma	31,967	9.2	33,899	3.2	47,702	2.8	46,713	2.4
Oregon	29,363	10.4	41,589	10.3	49,392	12.9	52,569	18.0
Pennsylvania	171,074	6.8	168,026	3.6	158,363	3.5	139,235	0.5
Rhode Island	9,736	14.0	11,434	9.0	13,914	4.2	13,495	15.6
South Carolina	51,387	3.6	59,854	0.8	63,311	5.0	56,357	4.6
South Dakota	10,394	na	11,318	0.9	11,403	0.1	10,542	1.7
Tennessee	49,289	4.2	58,087	5.1	66,480	2.0	75,690	1.0
Texas	239,336	7.5	305,047	2.8	355,812	14.2	360,438	4.8
Utah	29,598	1.0	32,603	0.4	27,665	1.7	28,173	1.4
Vermont	8,744	23.7	9,416	2.2	9,359	1.4	9,559	2.0
Virginia	71,151	13.4	83,443	8.2	87,865	41.7	87,074	4.7
Washington	28,358	30.3	44,813	7.7	75,962	6.1	86,772	4.4
West Virginia	23,522	5.3	26,226	0.5	29,517	1.7	28,581	1.2
Wisconsin	48,998	0.9	61,264	1.6	61,044	1.4	63,913	1.7
Wyoming	5,132	2.3	5,892	1.4	6,212	1.6	5,829	2.6
Indian Tribal Orgs	29,764	9.2	33,296	8.9	35,035	2.3	32,923	2.1
Total, excluding territories	2,667,969	10.0	3,361,014	8.1	3,858,761	10.4	3,987,669	4.7
Territories								
American Samoa	na	-	na	-	416	6.7	4,058	1.8
Guam	1,793	100.0	2,592	100.0	3,187	5.7	3,010	1.9
Puerto Rico	60,161	9.3	97,218	27.4	115,148	80.1	120,910	47.7
Virgin Islands	2,888	34.9	3,808	4.1	5,303	12.9	5,370	15.5

na American Samoa was not a WIC agency prior to 1996.
 - Data not available.

Appendix A2: Prevalence of Overweight among WIC Children By Gender, Race, and Age

Boys and Girls

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
All Races	2,395,279	11.0	3,064,899	11.9	3,452,459	12.5	3,794,155	13.2
Age 1	962,026	13.2	1,204,393	14.5	1,191,652	14.8	1,302,623	15.6
Age 2	607,532	10.8	775,478	11.9	900,356	13.2	960,430	14.2
Age 3	470,780	8.8	634,785	9.4	791,834	10.4	861,385	11.1
Age 4	295,136	8.1	408,352	8.6	554,140	9.1	626,655	9.9
Not reported	59,805	7.9	41,891	9.9	14,477	9.7	43,062	11.9
White	1,149,496	9.2	1,380,493	10.1	1,429,659	10.3	1,492,928	11.1
Age 1	455,738	11.1	518,838	12.7	509,259	12.7	533,240	13.5
Age 2	293,994	8.9	350,233	9.8	366,304	10.4	377,572	11.5
Age 3	231,657	7.4	296,396	7.9	322,450	8.3	330,041	9.1
Age 4	147,442	7.0	192,269	7.3	224,098	7.3	230,432	7.9
Not reported	20,665	7.4	22,757	9.3	7,548	8.9	21,643	9.0
Black	713,244	11.3	831,217	11.8	854,767	11.6	897,276	12.2
Age 1	294,645	14.3	326,414	15.1	293,155	15.2	313,479	15.8
Age 2	181,280	10.7	207,905	11.2	221,956	11.8	222,968	12.4
Age 3	138,017	8.4	172,378	8.9	197,304	8.7	204,006	9.3
Age 4	83,706	7.7	110,018	8.2	137,235	8.1	148,027	8.6
Not reported	15,596	8.4	14,502	9.3	5,117	9.1	8,796	8.8
Hispanic	423,434	14.4	701,133	15.2	979,929	16.0	1,190,397	16.4
Age 1	170,362	16.2	297,949	17.0	325,939	17.7	385,362	18.4
Age 2	103,852	15.5	178,305	15.8	262,228	17.8	306,531	18.4
Age 3	78,708	12.7	135,543	12.7	228,399	14.1	279,695	14.4
Age 4	50,409	11.4	86,245	11.5	162,068	12.2	212,950	12.8
Not reported	20,103	6.5	3,091	14.9	1,295	13.7	5,859	12.7
American Indian	53,416	16.9	61,797	17.5	67,744	17.7	65,512	18.6
Age 1	18,737	19.6	21,091	20.8	20,940	21.3	20,032	21.8
Age 2	13,438	17.7	16,154	18.6	17,571	19.6	15,289	19.5
Age 3	11,520	13.1	14,398	14.2	16,669	15.0	14,084	14.4
Age 4	7,402	12.4	9,593	12.6	12,343	12.3	10,731	12.7
Not reported	2,319	23.4	561	29.9	221	33.5	5,376	27.0
Asian	43,681	11.2	77,960	11.5	104,056	13.2	125,134	12.5
Age 1	18,279	11.1	34,765	11.0	35,980	12.2	41,631	11.6
Age 2	11,075	12.7	19,814	13.5	28,129	15.8	32,219	15.0
Age 3	8,369	11.8	13,778	11.8	23,617	13.6	28,911	12.7
Age 4	4,918	8.2	8,834	9.3	16,067	10.4	21,335	10.1
Not reported	1,040	7.3	769	7.4	263	8.7	1,038	14.0
Race not reported	12,006	11.1	12,294	12.9	16,305	13.1	22,911	13.1
Age 1	4,264	14.8	5,335	14.5	6,379	14.6	8,880	14.9
Age 2	3,892	10.3	3,066	13.8	4,168	14.7	5,851	13.8
Age 3	2,509	8.2	2,292	10.2	3,396	10.8	4,649	11.0
Age 4	1,259	7.1	1,391	9.3	2,329	9.7	3,181	10.5
Not reported	—	—	210	13.3	—	—	350	9.7

— Fewer than 100 children.

Notes: Number of children excludes those with missing data for weight, height, or gender.

Overweight is determined by measured weight-for-height above the 95th percentile of the CDC Revised Growth Charts (May 2000).

Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.

Appendix A2: Prevalence of Overweight among WIC Children By Gender, Race, and Age — Continued

Boys

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
All Races	1,209,927	11.6	1,551,984	12.5	1,749,756	13.1	1,923,217	13.9
Age 1	486,641	14.6	609,322	15.7	603,697	16.2	659,457	17.1
Age 2	307,595	10.7	392,692	11.7	457,166	13.0	488,367	13.9
Age 3	237,106	9.1	322,183	9.8	401,572	10.8	436,225	11.5
Age 4	148,602	8.7	206,522	9.1	279,888	9.7	317,293	10.6
Not reported	29,983	6.3	21,265	9.2	7,433	10.0	21,875	11.6
White	583,427	10.0	702,396	10.8	728,661	11.1	760,706	11.9
Age 1	230,992	12.7	264,146	14.1	259,473	14.4	270,931	15.2
Age 2	149,662	8.9	177,897	9.9	187,466	10.5	193,164	11.6
Age 3	117,746	7.8	150,986	8.3	164,052	8.8	167,898	9.6
Age 4	74,474	7.9	97,770	7.8	113,757	7.8	117,570	8.5
Not reported	10,553	6.4	11,597	8.9	3,913	9.1	11,143	9.0
Black	357,345	11.9	418,268	12.3	430,403	12.1	451,524	12.8
Age 1	147,992	15.7	163,585	16.1	147,460	16.4	157,596	17.3
Age 2	91,036	10.7	104,823	11.2	111,743	11.6	112,594	12.1
Age 3	68,845	8.6	87,188	9.3	99,602	9.0	102,738	9.6
Age 4	41,757	7.8	55,392	8.4	69,030	8.2	74,131	8.8
Not reported	7,715	6.5	7,280	7.9	2,568	8.9	4,465	7.7
Hispanic	213,836	14.6	354,347	15.6	495,591	16.4	602,665	16.9
Age 1	86,572	17.2	150,591	18.2	164,775	18.8	194,905	19.7
Age 2	52,676	14.9	90,034	15.1	132,791	17.1	155,591	17.7
Age 3	39,286	12.9	68,581	13.0	115,739	14.5	141,562	14.7
Age 4	25,352	12.0	43,545	12.2	81,626	13.0	107,738	13.8
Not reported	9,950	4.0	1,596	15.0	660	14.1	2,869	12.5
American Indian	26,826	17.6	30,740	18.4	33,981	18.4	32,720	19.1
Age 1	9,469	20.6	10,506	21.9	10,599	22.5	10,052	23.0
Age 2	6,641	17.0	8,085	18.8	8,739	18.9	7,628	18.9
Age 3	5,805	14.4	7,162	14.9	8,431	15.7	7,047	14.9
Age 4	3,727	13.9	4,685	14.3	6,083	13.9	5,301	13.5
Not reported	1,184	22.6	302	29.1	129	36.4	2,692	27.6
Asian	22,503	11.8	40,032	12.1	52,944	13.7	64,013	13.3
Age 1	9,445	12.8	17,731	11.8	18,234	13.5	21,497	12.9
Age 2	5,714	12.4	10,337	13.1	14,319	15.3	16,442	14.7
Age 3	4,188	11.3	7,118	12.5	12,024	13.8	14,611	13.5
Age 4	2,623	9.0	4,471	10.6	8,222	11.4	10,929	11.5
Not reported	533	4.5	375	6.4	145	13.1	534	14.6
Race not reported	5,990	11.9	6,203	12.8	8,176	13.7	11,587	14.1
Age 1	2,170	15.6	2,763	14.8	3,156	16.1	4,476	16.8
Age 2	1,867	10.7	1,517	13.4	2,108	14.1	2,947	14.0
Age 3	1,236	9.5	1,148	9.3	1,725	11.2	2,368	11.5
Age 4	669	7.8	659	9.3	1,170	10.1	1,624	10.7
Not reported	—	—	116	11.2	—	—	172	11.0

— Fewer than 100 children.

Notes: Number of children excludes those with missing data for weight, height, or gender.
 Overweight is determined by measured weight-for-height above the 95th percentile of the CDC Revised Growth Charts (May 2000).
 Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.

Appendix A2: Prevalence of Overweight among WIC Children By Gender, Race, and Age — Continued

Girls

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
All Races	1,185,353	10.3	1,512,913	11.3	1,702,704	11.8	1,870,938	12.6
Age 1	475,385	11.7	595,071	13.3	587,955	13.4	643,167	14.1
Age 2	299,936	11.0	382,785	12.1	443,190	13.5	472,062	14.4
Age 3	233,674	8.4	312,602	9.0	390,263	9.9	425,160	10.7
Age 4	146,535	7.5	201,830	8.1	274,252	8.6	309,362	9.3
Not reported	29,823	9.7	20,625	10.7	7,044	9.5	21,187	12.1
White	566,069	8.4	678,099	9.4	700,998	9.4	732,221	10.3
Age 1	224,746	9.4	254,693	11.2	249,786	11.0	262,309	11.8
Age 2	144,333	8.9	172,336	9.7	178,838	10.3	184,408	11.3
Age 3	113,911	7.0	145,410	7.4	158,398	7.7	162,143	8.6
Age 4	72,967	6.2	94,500	6.7	110,341	6.8	112,861	7.3
Not reported	10,112	8.3	11,160	9.7	3,635	8.6	10,500	9.1
Black	355,898	10.7	412,951	11.4	424,364	11.1	445,751	11.7
Age 1	146,653	12.9	162,829	14.1	145,695	13.9	155,884	14.4
Age 2	90,243	10.7	103,083	11.3	110,213	12.0	110,373	12.7
Age 3	69,172	8.1	85,190	8.5	97,702	8.4	101,267	9.1
Age 4	41,949	7.7	54,626	8.0	68,205	7.9	73,896	8.4
Not reported	7,881	10.3	7,223	10.6	2,549	9.3	4,331	10.0
Hispanic	209,600	14.1	346,786	14.7	484,338	15.5	587,733	15.9
Age 1	83,791	15.2	147,358	15.9	161,164	16.4	190,457	17.0
Age 2	51,176	16.2	88,271	16.6	129,437	18.5	150,940	19.1
Age 3	39,423	12.5	66,962	12.4	112,660	13.8	138,134	14.0
Age 4	25,057	10.7	42,700	10.7	80,442	11.4	105,212	11.9
Not reported	10,153	8.8	1,495	14.9	635	13.2	2,990	12.9
American Indian	26,593	16.2	31,057	16.6	33,763	17.0	32,791	18.1
Age 1	9,269	18.5	10,585	19.6	10,341	20.1	9,979	20.5
Age 2	6,797	18.3	8,069	18.4	8,832	20.2	7,661	20.1
Age 3	5,715	11.7	7,236	13.4	8,238	14.3	7,037	13.9
Age 4	3,676	10.8	4,908	11.0	6,260	10.7	5,430	12.0
Not reported	1,136	24.2	259	30.9	—	—	2,684	26.5
Asian	21,178	10.6	37,929	11.0	51,112	12.7	61,118	11.7
Age 1	8,833	9.3	17,034	10.2	17,746	11.0	20,133	10.3
Age 2	5,361	13.0	9,477	13.9	13,810	16.4	15,776	15.3
Age 3	4,181	12.3	6,660	10.9	11,593	13.3	14,299	11.9
Age 4	2,296	7.2	4,364	8.0	7,845	9.2	10,406	8.6
Not reported	507	10.3	394	8.4	118	3.4	504	13.3
Race not reported	6,017	10.3	6,091	13.1	8,130	12.5	11,324	12.2
Age 1	2,094	14.0	2,572	14.2	3,223	13.0	4,404	13.0
Age 2	2,026	9.9	1,549	14.3	2,060	15.3	2,904	13.5
Age 3	1,273	6.9	1,144	11.1	1,672	10.4	2,281	10.4
Age 4	590	6.3	732	9.3	1,159	9.4	1,557	10.2
Not reported	—	—	—	—	—	—	178	8.4

— Fewer than 100 children.

Notes: Number of children excludes those with missing data for weight, height, or gender.
 Overweight is determined by measured weight-for-height above the 95th percentile of the CDC Revised Growth Charts (May 2000).
 Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.

Appendix A3: Prevalence of Overweight among WIC Children By State and Race, 1998

	Percent Overweight					
	All Races	White	Black	Hispanic	American Indian	Asian
Total	13.3	11.1	12.2	16.6	18.6	12.8
Alabama	13.0	12.7	12.9	18.8	15.4	15.9
Alaska	16.4	8.7	8.6	14.9	29.0	16.6
Arizona	12.9	9.2	11.5	14.6	17.8	8.9
Arkansas	8.8	8.4	9.0	12.1	5.0	6.6
California	15.9	12.1	13.0	17.2	20.3	13.1
Colorado	6.6	5.3	5.3	8.4	10.1	6.6
Connecticut	12.8	10.3	11.3	16.1	—	9.6
Delaware	11.5	9.7	10.9	17.8	—	—
Dist. of Columbia	11.4	—	9.5	21.3	—	12.2
Florida	12.6	10.6	12.1	16.2	12.8	9.2
Georgia	11.2	10.6	10.5	17.2	9.9	9.6
Hawaii	11.9	9.9	11.7	11.2	—	12.3
Idaho	10.5	8.2	10.5	15.2	24.5	6.8
Illinois	15.6	11.5	14.8	20.8	—	13.2
Indiana	11.0	10.7	10.4	16.0	—	6.7
Iowa	11.7	11.0	12.0	16.8	22.5	10.1
Kansas	10.8	9.9	9.7	14.2	12.3	9.4
Kentucky	14.0	13.9	14.3	16.5	14.0	18.5
Louisiana	11.7	10.7	12.1	15.2	19.0	12.8
Maine	12.4	12.3	13.1	17.0	—	10.3
Maryland	13.5	11.9	13.0	22.1	—	11.8
Massachusetts	14.7	12.8	15.5	18.4	18.0	10.3
Michigan	11.9	11.6	11.2	17.3	16.1	12.4
Minnesota	14.4	12.0	14.0	19.0	25.2	20.8
Mississippi	13.6	12.6	13.9	18.4	—	11.6
Missouri	11.4	11.3	11.0	17.6	12.8	11.2
Montana	11.1	8.0	11.5	12.2	20.1	7.3
Nebraska	15.8	14.0	12.8	23.2	21.6	19.5
Nevada	12.1	9.8	9.9	14.2	16.6	11.8
New Hampshire	12.4	12.4	—	22.4	—	—
New Jersey	16.6	13.9	13.9	21.5	13.0	11.5
New Mexico	9.4	7.2	8.0	9.9	15.8	6.0
New York	14.8	11.2	13.9	19.8	11.2	9.6
North Carolina	10.6	9.4	10.6	14.3	12.2	12.0
North Dakota	10.7	8.9	10.0	13.7	19.2	—
Ohio	11.1	11.4	10.0	14.6	—	10.0
Oklahoma	10.8	9.9	10.8	15.0	14.1	9.7
Oregon	14.6	12.9	15.4	18.4	20.3	13.3
Pennsylvania	12.0	11.1	12.6	16.4	13.2	12.8
Rhode Island	14.7	11.9	15.2	18.5	—	14.1
South Carolina	15.5	14.7	15.8	21.1	13.9	11.5
South Dakota	9.6	7.5	13.3	11.1	14.5	—
Tennessee	11.7	11.6	11.7	16.2	—	13.4
Texas	12.8	9.8	11.7	13.8	15.3	10.1
Utah	10.7	8.4	10.3	15.0	25.7	13.6
Vermont	10.7	10.7	—	—	—	6.8
Virginia	12.8	12.3	11.8	21.4	11.0	12.4
Washington	12.5	10.7	11.0	15.7	21.1	10.8
West Virginia	11.3	11.3	11.8	—	—	5.9
Wisconsin	11.5	10.5	9.8	15.0	21.4	16.2
Wyoming	7.5	6.5	8.2	12.6	—	—
Indian Tribal Organizations	17.0	12.1	14.3	13.8	17.6	—
Territories						
American Samoa	22.8	—	—	—	—	22.8
Guam	12.3	—	—	—	—	12.2
Puerto Rico	19.0	17.9	—	19.0	—	—
Virgin Islands	10.2	—	9.4	13.7	—	—

— Fewer than 100 children.
 Notes: Number of children excludes those with missing data for weight, height, or gender.
 Overweight is determined by measured weight-for-height above the 95th percentile of the CDC Revised Growth Charts (May 2000).
 Excludes U.S. territories: American Samoa, Guam, Puerto Rico, U.S. Virgin Islands.

Appendix A4: Prevalence of Overweight among WIC Children By State, Year, and Race

All Races

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
Total	2,451,605	11.1	3,139,050	12.1	3,483,329	12.5	3,868,812	13.3
Alabama	64,979	10.8	61,075	11.0	60,471	12.3	51,808	13.0
Alaska	4,557	16.7	8,650	17.1	11,939	16.4	13,122	16.4
Arizona	18,917	13.4	37,034	13.0	59,161	11.2	56,738	12.9
Arkansas	39,501	8.5	44,808	7.3	43,186	8.4	41,437	8.8
California	62,683	16.8	239,551	16.4	515,080	16.5	659,726	15.9
Colorado	26,429	6.3	35,572	6.4	33,385	6.2	42,385	6.6
Connecticut	36,889	10.9	38,682	13.2	30,731	12.5	30,753	12.8
Delaware	7,268	8.7	7,350	9.6	8,279	10.4	8,180	11.5
Dist. of Columbia	8,335	14.8	8,934	16.5	8,005	16.4	8,597	11.4
Florida	118,913	11.3	158,026	11.2	190,708	11.8	197,167	12.6
Georgia	116,211	9.1	109,751	9.8	117,077	9.4	127,749	11.2
Hawaii	3,344	6.6	12,147	10.2	13,908	11.0	20,772	11.9
Idaho	15,740	6.7	18,122	8.5	18,467	8.9	17,516	10.5
Illinois	29,395	17.0	54,276	14.1	na	na	128,191	15.6
Indiana	50,844	8.6	78,889	9.4	75,715	10.1	71,336	11.0
Iowa	33,240	9.1	34,296	10.0	34,814	11.2	35,186	11.7
Kansas	21,990	9.6	30,806	8.9	29,430	9.5	28,054	10.8
Kentucky	55,581	11.2	62,325	16.1	65,419	13.0	66,726	14.0
Louisiana	38,690	10.9	48,530	9.9	55,310	9.4	60,094	11.7
Maine	12,902	9.4	16,884	10.9	16,060	10.5	14,991	12.4
Maryland	29,344	13.0	38,312	12.8	40,308	13.4	42,944	13.5
Massachusetts	55,794	14.0	70,326	13.2	72,164	14.2	70,858	14.7
Michigan	83,633	11.9	114,677	12.1	116,834	11.3	123,362	11.9
Minnesota	50,724	9.7	60,852	10.8	59,811	14.4	55,102	14.4
Mississippi	59,721	11.4	57,143	11.8	56,579	12.3	46,229	13.6
Missouri	43,820	11.0	67,777	10.2	75,722	10.5	73,916	11.4
Montana	11,185	10.9	12,047	8.2	12,354	9.6	11,828	11.1
Nebraska	17,715	8.6	19,938	9.2	21,036	9.3	14,835	15.8
Nevada	5,905	10.9	12,310	10.3	17,157	10.6	22,151	12.1
New Hampshire	8,096	9.3	10,387	10.6	10,478	11.7	9,916	12.4
New Jersey	68,263	14.1	70,332	14.1	75,390	15.2	72,658	16.6
New Mexico	24,060	7.1	34,462	7.6	37,089	8.5	35,201	9.4
New York	194,656	14.2	238,164	14.2	252,284	14.8	254,502	14.8
North Carolina	77,927	9.5	73,956	9.7	90,126	9.7	91,027	10.6
North Dakota	8,637	7.8	9,307	9.5	8,736	9.7	7,925	10.7
Ohio	118,986	9.5	124,367	14.8	134,975	10.6	129,613	11.1
Oklahoma	28,902	8.0	32,762	9.2	46,294	9.3	45,542	10.8
Oregon	26,260	11.8	37,178	11.4	42,897	11.8	43,012	14.6
Pennsylvania	159,132	9.9	161,661	11.4	152,570	11.8	138,433	12.0
Rhode Island	8,343	15.2	10,369	13.4	13,290	14.4	11,363	14.7
South Carolina	49,436	12.7	59,159	14.0	59,899	14.9	53,568	15.5
South Dakota	10,394	8.2	11,200	10.2	11,378	10.0	10,349	9.6
Tennessee	47,123	11.2	55,041	10.5	65,096	10.9	74,821	11.7
Texas	220,985	9.7	296,156	10.8	304,742	11.9	342,824	12.8
Utah	29,281	6.5	32,443	6.7	27,141	10.2	27,728	10.7
Vermont	6,649	8.4	9,193	9.5	9,222	10.9	9,359	10.7
Virginia	61,533	8.4	76,488	10.9	51,142	11.6	82,848	12.8
Washington	19,712	12.3	41,289	11.9	71,252	11.7	82,886	12.5
West Virginia	22,256	11.0	26,047	11.2	29,001	11.2	28,214	11.3
Wisconsin	48,438	10.4	60,151	10.2	60,082	10.5	62,758	11.5
Wyoming	5,004	6.5	5,801	6.5	6,107	7.7	5,676	7.5
Indian Tribal Orgs	26,958	17.1	29,895	17.6	34,158	16.5	32,179	17.0
Territories								
American Samoa	na	na	na	na	375	34.7	3,965	22.8
Guam	na	na	na	na	2,990	13.0	2,943	12.3
Puerto Rico	54,449	17.8	70,506	19.5	22,894	16.3	63,214	19.0
Virgin Islands	1,877	13.1	3,646	11.6	4,611	12.0	4,534	10.2

na: Height and weight data were not reported by Illinois (1996) and Guam (1992-94). American Samoa was not in WIC prior to 1996. Hawaii did not report race in 1992-94. Michigan reported race as white, black, and other in 1992-96; other appears on Hispanic table.

Notes: Number of children excludes those with missing data for weight, height, or gender.

Overweight is determined by measured weight-for-height above the 95th percentile of the CDC Revised Growth Charts (May 2000).

Appendix A4: Prevalence of Overweight among WIC Children By State, Year, and Race — Continued

White

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
Total	1,149,533	9.2	1,380,995	10.1	1,429,971	10.3	1,493,615	11.1
Alabama	27,100	10.5	25,784	10.5	25,229	12.0	22,579	12.7
Alaska	2,086	9.5	3,791	8.9	5,400	8.5	5,948	8.7
Arizona	6,965	8.9	11,989	8.6	17,367	8.0	16,716	9.2
Arkansas	24,106	7.9	27,005	6.7	25,801	7.8	24,490	8.4
California	11,292	13.2	29,427	13.0	59,175	12.4	82,799	12.1
Colorado	14,976	5.4	20,296	5.5	17,383	5.0	21,672	5.3
Connecticut	12,355	7.5	12,187	12.8	9,277	9.8	9,338	10.3
Delaware	2,796	8.8	2,984	9.0	3,328	9.1	3,158	9.7
Dist. of Columbia	—	—	—	—	—	—	—	—
Florida	48,577	9.3	66,121	9.3	74,928	9.7	75,564	10.6
Georgia	43,909	8.6	40,125	9.0	40,209	8.6	42,439	10.6
Hawaii	—	—	2,496	10.2	2,585	8.9	3,315	9.9
Idaho	11,780	4.9	13,037	6.8	12,720	7.0	12,046	8.2
Illinois	7,892	12.6	15,338	11.4	na	na	40,067	11.5
Indiana	38,550	8.3	59,146	9.1	55,144	9.7	50,903	10.7
Iowa	28,843	9.0	28,943	9.6	28,512	10.8	28,152	11.0
Kansas	15,610	9.0	21,121	8.4	18,946	9.0	17,379	9.9
Kentucky	48,257	11.0	53,870	16.0	56,374	12.9	57,605	13.9
Louisiana	14,349	9.6	16,610	8.4	19,670	7.9	21,050	10.7
Maine	12,581	9.4	16,352	10.9	15,427	10.6	14,370	12.3
Maryland	12,278	10.3	15,189	10.0	14,552	11.0	14,600	11.9
Massachusetts	25,135	12.0	31,630	11.2	32,797	12.1	33,051	12.8
Michigan	51,002	10.6	68,392	11.1	69,518	10.8	72,656	11.6
Minnesota	35,404	8.0	40,736	9.1	38,506	12.3	34,262	12.0
Mississippi	17,928	10.0	16,325	11.0	16,221	11.3	12,861	12.6
Missouri	28,249	10.2	48,162	9.7	53,096	10.1	52,583	11.3
Montana	7,638	7.6	8,481	6.0	8,680	6.9	8,350	8.0
Nebraska	13,104	8.1	14,370	8.2	14,225	8.0	9,518	14.0
Nevada	2,936	8.0	5,176	8.4	6,319	8.4	7,613	9.8
New Hampshire	7,786	9.1	9,936	10.4	10,152	11.7	9,727	12.4
New Jersey	16,233	11.6	16,340	11.6	17,553	12.8	16,607	13.9
New Mexico	5,668	5.5	7,671	5.3	7,906	6.7	7,289	7.2
New York	64,452	10.0	78,864	9.9	79,186	10.5	77,772	11.2
North Carolina	33,794	8.4	33,380	8.7	38,168	8.9	37,540	9.4
North Dakota	6,775	6.3	7,343	8.2	6,752	8.2	6,065	8.9
Ohio	79,456	9.4	79,214	14.5	84,902	10.7	82,047	11.4
Oklahoma	21,309	7.1	23,387	8.6	31,449	8.6	30,166	9.9
Oregon	19,461	10.7	26,217	10.0	28,755	10.4	28,077	12.9
Pennsylvania	104,564	8.6	105,347	10.0	98,603	10.8	88,761	11.1
Rhode Island	4,839	11.7	5,667	11.3	6,494	12.0	5,422	11.9
South Carolina	17,056	11.4	20,845	12.7	20,992	14.4	19,951	14.7
South Dakota	7,744	6.9	8,280	8.9	7,803	8.6	6,992	7.5
Tennessee	34,959	11.0	38,820	10.0	44,962	10.6	50,251	11.6
Texas	39,431	7.5	51,498	8.2	52,887	8.9	57,716	9.8
Utah	22,993	5.2	25,229	5.4	19,407	8.2	18,445	8.4
Vermont	6,531	8.5	8,988	9.5	8,936	11.0	9,104	10.7
Virginia	25,935	7.6	32,706	10.3	20,752	10.8	36,718	12.3
Washington	11,305	10.2	22,482	10.6	36,796	9.9	41,984	10.7
West Virginia	20,992	11.0	24,604	11.1	27,093	11.1	26,238	11.3
Wisconsin	27,709	8.9	32,735	8.9	31,930	9.4	33,917	10.5
Wyoming	4,118	6.1	4,732	6.0	4,978	6.8	4,540	6.5
Indian Tribal Orgs	626	12.0	1,079	11.1	1,761	11.2	2,422	12.1
Territories								
American Samoa	na	na	na	na	—	—	—	—
Guam	na	na	na	na	136	11.8	—	—
Puerto Rico	—	—	472	22.0	139	22.3	554	17.9
Virgin Islands	—	—	—	—	—	—	—	—

— Fewer than 100 children.

na: Height and weight data were not reported by Illinois (1996) and Guam (1992-94). American Samoa was not in WIC prior to 1996. Hawaii did not report race in 1992-94. Michigan reported race as white, black, and other in 1992-96; other appears on Hispanic table.

Notes: Number of children excludes those with missing data for weight, height, or gender.

Overweight is determined by measured weight-for-height above the 95th percentile of the CDC Revised Growth Charts (May 2000).

Appendix A4: Prevalence of Overweight among WIC Children By State, Year, and Race — Continued

Black

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
Total	714,901	11.3	834,420	11.8	858,635	11.6	901,110	12.2
Alabama	37,298	11.0	34,460	11.4	33,875	12.4	27,290	12.9
Alaska	345	9.3	730	8.4	987	7.7	1,016	8.6
Arizona	1,062	13.1	2,038	12.6	3,030	8.9	2,747	11.5
Arkansas	14,726	9.4	16,581	8.2	15,196	8.8	13,982	9.0
California	6,652	15.0	19,808	13.8	43,848	13.0	54,804	13.0
Colorado	1,870	7.0	2,867	5.8	2,518	4.6	2,927	5.3
Connecticut	10,392	11.8	11,577	12.7	9,060	11.7	9,248	11.3
Delaware	3,632	8.6	3,449	9.2	3,653	10.2	3,502	10.9
Dist. of Columbia	6,956	13.3	7,263	14.0	6,572	14.0	6,963	9.5
Florida	47,450	11.3	59,198	11.1	69,198	11.5	68,368	12.1
Georgia	67,758	9.3	62,924	9.9	66,339	9.2	69,461	10.5
Hawaii	—	—	644	7.6	696	8.4	1,010	11.7
Idaho	120	1.7	143	7.7	180	10.6	191	10.5
Illinois	13,360	16.3	22,082	13.3	na	na	43,583	14.8
Indiana	10,284	9.0	15,823	9.4	15,420	10.1	14,166	10.4
Iowa	2,635	9.1	2,886	11.0	2,817	11.3	2,661	12.0
Kansas	3,282	9.0	4,366	7.9	4,252	8.8	3,771	9.7
Kentucky	6,825	12.8	7,739	17.2	8,146	13.4	7,936	14.3
Louisiana	23,684	11.7	31,153	10.6	34,448	10.1	37,626	12.1
Maine	128	7.0	185	11.4	228	10.5	222	13.1
Maryland	14,965	14.4	20,259	13.6	22,009	13.6	23,053	13.0
Massachusetts	11,146	15.1	14,185	14.3	13,954	14.5	13,283	15.5
Michigan	27,313	13.8	39,941	13.2	40,288	11.2	39,889	11.2
Minnesota	5,525	9.5	7,787	10.5	7,859	13.3	7,312	14.0
Mississippi	41,384	12.1	40,408	12.1	39,842	12.7	32,791	13.9
Missouri	14,610	12.4	17,734	11.2	19,710	11.1	17,352	11.0
Montana	—	—	123	14.2	165	5.4	122	11.5
Nebraska	2,647	8.2	2,660	9.4	2,775	8.4	1,728	12.8
Nevada	865	11.3	1,668	8.6	2,225	9.5	2,850	9.9
New Hampshire	113	9.7	140	10.8	103	10.7	—	—
New Jersey	26,756	12.1	26,786	11.8	27,764	13.0	25,792	13.9
New Mexico	685	7.0	959	7.1	961	6.2	870	8.0
New York	59,158	13.7	71,071	13.6	73,733	13.7	74,583	13.9
North Carolina	39,796	10.3	36,812	10.3	42,035	9.8	39,711	10.6
North Dakota	164	5.5	163	9.8	196	11.7	210	10.0
Ohio	35,956	9.6	40,083	14.7	43,491	10.1	40,344	10.0
Oklahoma	4,031	9.8	4,784	9.7	7,386	9.6	7,179	10.8
Oregon	1,445	12.7	1,674	12.5	1,638	12.4	1,376	15.4
Pennsylvania	39,041	11.2	39,902	12.8	37,410	12.6	33,496	12.6
Rhode Island	1,231	17.6	1,380	13.3	2,049	14.1	1,672	15.2
South Carolina	31,800	13.4	37,324	14.6	37,380	15.1	31,613	15.8
South Dakota	191	13.7	174	12.6	259	9.6	241	13.3
Tennessee	11,821	12.0	15,675	11.8	18,679	11.5	23,138	11.7
Texas	37,886	8.7	45,168	9.9	42,543	11.2	45,882	11.7
Utah	416	7.7	455	7.0	409	10.3	399	10.3
Vermont	—	—	—	—	129	12.4	—	—
Virginia	31,571	8.4	37,403	10.4	25,843	10.9	36,597	11.8
Washington	1,453	12.2	3,118	9.8	5,548	9.8	6,258	11.0
West Virginia	1,138	12.5	1,283	11.2	1,689	12.3	1,727	11.8
Wisconsin	11,370	10.9	15,840	9.8	15,822	9.4	15,711	9.8
Wyoming	113	7.1	126	6.4	125	8.0	135	8.2
Indian Tribal Orgs	—	—	130	10.8	285	11.9	336	14.3
Territories								
American Samoa	na	na	na	na	—	—	—	—
Guam	na	na	na	na	—	—	—	—
Puerto Rico	—	—	—	—	—	—	—	—
Virgin Islands	1,653	12.5	3,129	11.4	3,820	10.9	3,758	9.4

— Fewer than 100 children.

na: Height and weight data were not reported by Illinois (1996) and Guam (1992-94). American Samoa was not in WIC prior to 1996. Hawaii did not report race in 1992-94. Michigan reported race as white, black, and other in 1992-96; other appears on Hispanic table.

Notes: Number of children excludes those with missing data for weight, height, or gender.

Overweight is determined by measured weight-for-height above the 95th percentile of the CDC Revised Growth Charts (May 2000).

Appendix A4: Prevalence of Overweight among WIC Children By State, Year, and Race — Continued

Hispanic

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
Total	478,054	14.8	771,490	15.6	1,003,378	16.0	1,253,623	16.6
Alabama	202	8.9	387	15.0	802	17.6	1,292	18.8
Alaska	166	14.5	371	12.9	670	12.7	792	14.9
Arizona	9,451	16.4	21,195	15.2	36,635	12.7	35,329	14.6
Arkansas	464	9.3	944	10.0	1,894	12.8	2,661	12.1
California	37,780	18.5	168,015	17.8	370,062	17.7	472,196	17.2
Colorado	8,803	7.3	11,374	8.0	12,446	8.4	16,007	8.4
Connecticut	13,630	13.0	14,219	13.6	11,884	15.4	11,726	16.1
Delaware	580	8.8	781	13.2	1,094	15.1	1,234	17.8
Dist. of Columbia	1,240	24.0	1,475	29.0	1,269	29.6	1,408	21.3
Florida	21,836	15.7	31,146	15.4	44,485	15.9	50,826	16.2
Georgia	3,550	13.4	5,377	15.6	8,674	14.6	12,859	17.2
Hawaii	—	—	420	7.7	559	10.9	903	11.2
Idaho	3,193	10.9	4,292	12.0	4,880	12.4	4,639	15.2
Illinois	7,509	23.2	15,053	18.1	na	na	39,076	20.8
Indiana	1,609	13.6	3,166	14.3	4,255	15.6	5,140	16.0
Iowa	981	12.0	1,602	16.2	2,606	16.4	3,500	16.8
Kansas	2,479	13.6	4,396	12.1	5,320	12.1	6,049	14.2
Kentucky	288	13.9	443	17.4	613	14.0	729	16.5
Louisiana	315	12.4	423	14.9	—	—	880	15.2
Maine	—	—	—	—	—	—	118	17.0
Maryland	1,597	21.6	2,195	23.5	2,907	23.8	4,336	22.1
Massachusetts	15,646	17.3	20,035	15.8	21,004	17.7	20,244	18.4
Michigan	4,674	15.3	6,293	15.1	7,024	16.0	8,467	17.3
Minnesota	1,878	14.0	2,994	15.3	4,256	19.3	4,922	19.0
Mississippi	107	14.0	155	11.6	296	12.2	384	18.4
Missouri	430	11.4	1,052	15.5	1,713	15.3	2,410	17.6
Montana	260	6.5	349	14.8	337	9.5	360	12.2
Nebraska	1,364	13.4	2,164	14.8	3,195	15.6	2,907	23.2
Nevada	1,967	15.2	5,150	12.8	8,086	12.5	10,931	14.2
New Hampshire	150	17.3	240	17.2	178	12.4	107	22.4
New Jersey	23,523	18.4	25,006	18.5	27,249	19.1	26,953	21.5
New Mexico	16,416	7.3	23,925	8.0	26,514	8.9	25,631	9.9
New York	58,546	19.8	73,583	20.1	81,930	20.6	82,253	19.8
North Carolina	2,320	11.7	1,291	12.5	7,370	13.6	10,999	14.3
North Dakota	185	18.9	199	10.6	249	14.5	292	13.7
Ohio	2,671	11.0	3,321	20.5	4,157	14.3	4,352	14.6
Oklahoma	1,877	11.1	2,401	13.0	4,386	12.9	5,057	15.0
Oregon	3,915	16.1	7,510	15.5	10,420	15.0	11,453	18.4
Pennsylvania	12,949	15.2	13,532	17.1	13,718	16.5	13,412	16.4
Rhode Island	1,851	23.8	2,757	18.3	4,060	18.5	3,754	18.5
South Carolina	390	18.2	732	19.1	1,194	19.3	1,602	21.1
South Dakota	116	0.0	153	12.4	195	9.7	226	11.1
Tennessee	—	—	—	—	510	12.9	1,172	16.2
Texas	141,733	10.6	196,519	11.7	206,140	12.9	235,550	13.8
Utah	3,452	9.3	4,389	10.5	5,462	14.3	7,040	15.0
Vermont	—	—	—	—	—	—	—	—
Virginia	3,063	16.3	4,684	19.7	3,390	21.6	7,217	21.4
Washington	3,690	15.2	9,219	14.1	18,159	15.0	22,152	15.7
West Virginia	—	—	—	—	100	13.0	—	—
Wisconsin	3,557	13.9	4,762	13.9	5,882	13.2	6,939	15.0
Wyoming	636	8.0	783	8.4	833	10.9	842	12.6
Indian Tribal Orgs	216	19.9	367	15.5	733	14.7	942	13.8
Territories								
American Samoa	na	na	na	na	—	—	—	—
Guam	na	na	na	na	—	—	—	—
Puerto Rico	54,416	17.8	69,885	19.5	22,705	16.3	62,504	19.0
Virgin Islands	202	18.3	472	12.5	730	16.7	707	13.7

— Fewer than 100 children.

na: Height and weight data were not reported by Illinois (1996) and Guam (1992-94). American Samoa was not in WIC prior to 1996. Hawaii did not report race in 1992-94. Michigan reported race as white, black, and other in 1992-96; other appears on Hispanic table.

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Appendix A4: Prevalence of Overweight among WIC Children By State, Year, and Race — Continued

American Indian

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
Total	53,417	16.9	61,821	17.5	67,754	17.7	65,536	18.6
Alabama	108	15.7	121	28.1	158	22.8	169	15.4
Alaska	1,783	27.6	3,386	29.0	4,241	29.1	4,568	29.0
Arizona	1,307	16.6	1,446	18.3	1,545	18.9	1,396	17.8
Arkansas	—	—	114	10.5	114	10.5	121	5.0
California	1,496	22.8	1,879	21.6	3,438	21.0	4,253	20.3
Colorado	242	11.6	269	11.2	277	9.0	365	10.1
Connecticut	110	25.0	133	40.8	115	12.2	—	—
Delaware	—	—	—	—	—	—	—	—
Dist. of Columbia	—	—	—	—	—	—	—	—
Florida	119	9.2	201	9.0	247	8.5	319	12.8
Georgia	—	—	232	10.3	430	13.5	141	9.9
Hawaii	—	—	—	—	—	—	—	—
Idaho	539	21.5	506	22.5	526	24.7	494	24.5
Illinois	—	—	—	—	na	na	—	—
Indiana	—	—	—	—	—	—	—	—
Iowa	237	15.6	216	17.1	173	19.1	178	22.5
Kansas	391	6.6	560	4.6	316	11.7	269	12.3
Kentucky	—	—	—	—	—	—	100	14.0
Louisiana	—	—	—	—	—	—	119	19.0
Maine	—	—	—	—	—	—	—	—
Maryland	—	—	—	—	—	—	—	—
Massachusetts	—	—	128	14.1	116	16.4	111	18.0
Michigan	—	—	—	—	—	—	830	16.1
Minnesota	2,543	17.0	3,110	18.8	2,773	23.4	2,376	25.2
Mississippi	—	—	—	—	—	—	—	—
Missouri	—	—	102	13.7	115	12.2	125	12.8
Montana	3,099	19.0	2,960	13.9	3,068	17.4	2,887	20.1
Nebraska	350	15.1	359	15.0	339	13.9	199	21.6
Nevada	—	—	—	—	103	14.6	145	16.6
New Hampshire	—	—	—	—	—	—	—	—
New Jersey	202	10.4	301	10.6	422	14.7	399	13.0
New Mexico	1,138	12.3	1,586	13.3	1,410	14.1	1,170	15.8
New York	457	10.9	653	11.6	849	12.8	1,151	11.2
North Carolina	1,563	7.1	1,394	12.7	1,399	9.7	1,366	12.2
North Dakota	1,433	14.0	1,491	16.1	1,426	15.6	1,272	19.2
Ohio	—	—	—	—	113	13.3	—	—
Oklahoma	1,322	12.9	1,839	10.8	2,384	11.4	2,292	14.1
Oregon	590	19.8	758	17.8	769	17.7	809	20.3
Pennsylvania	186	11.8	175	19.4	195	12.8	212	13.2
Rhode Island	—	—	—	—	—	—	—	—
South Carolina	—	—	—	—	—	—	115	13.9
South Dakota	2,267	12.9	2,515	14.2	3,053	13.8	2,829	14.5
Tennessee	123	8.9	168	7.1	282	14.2	—	—
Texas	383	7.2	709	12.5	335	14.0	268	15.3
Utah	1,325	19.8	1,146	17.3	860	25.5	697	25.7
Vermont	—	—	—	—	—	—	—	—
Virginia	137	9.5	132	12.1	—	—	163	11.0
Washington	1,668	21.8	2,382	20.5	2,731	20.4	2,791	21.1
West Virginia	—	—	—	—	—	—	—	—
Wisconsin	1,466	16.0	1,660	15.6	1,648	17.1	1,639	21.4
Wyoming	109	11.9	121	14.0	106	20.8	—	—
Indian Tribal Orgs	25,987	17.3	28,284	17.9	31,013	17.0	28,421	17.6
Territories								
American Samoa	na	na	na	na	—	—	—	—
Guam	na	na	na	na	—	—	—	—
Puerto Rico	—	—	—	—	—	—	—	—
Virgin Islands	—	—	—	—	—	—	—	—

— Fewer than 100 children.

na: Height and weight data were not reported by Illinois (1996) and Guam (1992-94). American Samoa was not in WIC prior to 1996. Hawaii did not report race in 1992-94. Michigan reported race as white, black, and other in 1992-96; other appears on Hispanic table.

Notes: Number of children excludes those with missing data for weight, height, or gender.

Overweight is determined by measured weight-for-height above the 95th percentile of the CDC Revised Growth Charts (May 2000).

Appendix A4: Prevalence of Overweight among WIC Children By State, Year, and Race — Continued

Asian

	1992		1994		1996		1998	
	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight	Number Children	Percent Overweight
Total	43,687	11.2	78,017	11.5	107,276	13.3	131,969	12.8
Alabama	155	9.0	323	7.4	165	8.5	478	15.9
Alaska	146	7.5	287	13.9	452	18.1	518	16.6
Arizona	132	7.6	366	8.5	584	8.9	550	8.9
Arkansas	125	3.2	161	2.5	180	6.1	182	6.6
California	5,228	12.7	19,251	12.3	38,214	14.7	44,047	13.1
Colorado	504	8.1	715	7.1	634	4.6	790	6.6
Connecticut	402	13.7	566	14.5	395	7.8	374	9.6
Delaware	—	—	—	—	—	—	—	—
Dist. of Columbia	—	—	128	10.2	102	17.6	115	12.2
Florida	931	7.6	1,360	9.6	1,850	9.3	2,090	9.2
Georgia	907	7.9	1,093	9.1	1,425	9.5	1,674	9.6
Hawaii	—	—	7,633	10.7	8,949	11.8	15,286	12.3
Idaho	108	3.7	144	6.2	161	5.6	146	6.8
Illinois	295	12.9	836	11.8	na	na	2,077	13.2
Indiana	238	7.6	366	5.5	292	9.2	239	6.7
Iowa	544	7.7	649	7.2	706	8.9	695	10.1
Kansas	228	17.1	363	16.5	596	6.9	586	9.4
Kentucky	152	9.9	208	9.1	225	12.4	356	18.5
Louisiana	246	11.4	270	10.0	—	—	415	12.8
Maine	—	—	161	7.4	174	6.9	146	10.3
Maryland	428	9.6	630	13.5	774	15.0	882	11.8
Massachusetts	3,796	10.3	4,348	11.1	4,293	12.2	4,169	10.3
Michigan	—	—	—	—	—	—	1,518	12.4
Minnesota	5,374	15.7	6,225	16.7	6,417	21.2	6,230	20.8
Mississippi	276	7.2	228	9.2	187	10.7	161	11.6
Missouri	228	9.2	438	8.0	604	9.6	634	11.2
Montana	107	18.5	—	—	103	10.7	109	7.3
Nebraska	218	6.0	336	6.8	368	7.1	297	19.5
Nevada	—	—	223	7.6	424	10.6	612	11.8
New Hampshire	—	—	—	—	—	—	—	—
New Jersey	1,229	10.5	1,529	10.9	2,349	12.6	2,716	11.5
New Mexico	151	4.0	253	4.0	272	4.8	235	6.0
New York	6,706	10.0	8,961	9.3	10,537	10.4	12,921	9.6
North Carolina	454	9.9	1,079	10.8	1,154	11.3	1,411	12.0
North Dakota	—	—	111	9.0	113	10.6	—	—
Ohio	710	16.3	1,016	15.4	889	10.7	816	10.0
Oklahoma	363	3.7	335	8.4	674	10.1	814	9.7
Oregon	849	10.4	1,019	9.3	1,315	10.9	1,297	13.3
Pennsylvania	2,374	13.1	2,705	14.6	2,644	13.6	2,552	12.8
Rhode Island	404	11.4	504	10.9	614	14.7	454	14.1
South Carolina	147	7.5	190	8.1	253	13.4	287	11.5
South Dakota	—	—	—	—	—	—	—	—
Tennessee	157	10.8	284	8.4	663	11.0	246	13.4
Texas	1,552	5.7	2,263	7.6	2,837	10.4	3,408	10.1
Utah	994	9.2	1,151	9.9	857	14.2	858	13.6
Vermont	—	—	—	—	104	7.7	103	6.8
Virginia	751	5.5	1,381	10.5	1,097	12.0	1,760	12.4
Washington	1,153	8.8	2,343	9.2	4,290	10.3	4,919	10.8
West Virginia	—	—	—	—	107	6.5	136	5.9
Wisconsin	4,331	14.4	5,152	14.6	4,800	15.8	4,552	16.2
Wyoming	—	—	—	—	—	—	—	—
Indian Tribal Orgs	—	—	—	—	—	—	—	—
Territories								
American Samoa	na	na	na	na	375	34.7	3,961	22.8
Guam	na	na	na	na	2,810	13.1	2,819	12.2
Puerto Rico	—	—	—	—	—	—	—	—
Virgin Islands	—	—	—	—	—	—	—	—

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