# *pediatric nutrition*

## Surveillance

1997 Full Report

**U.S. Department of Health and Human Services**
Centers for Disease Control and Prevention

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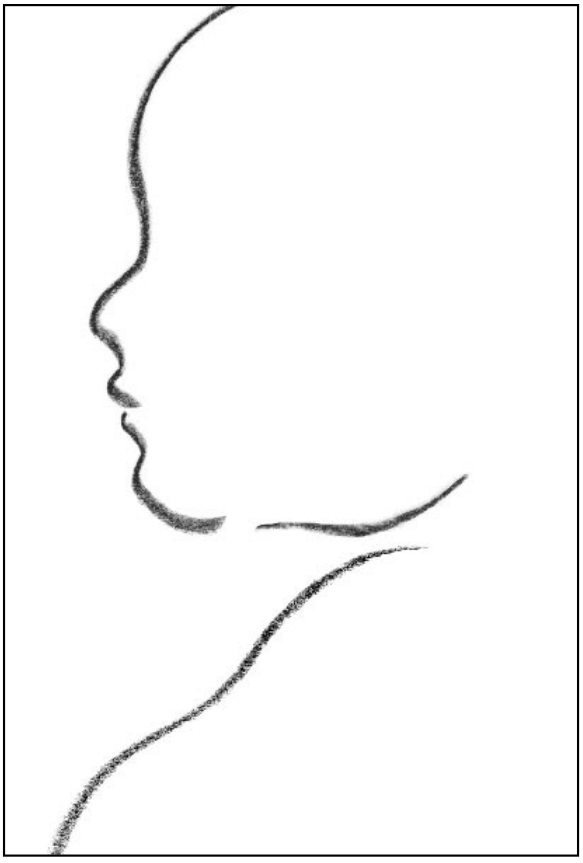
# *pediatric nutrition*



## Surveillance

1997 Full Report

# Preface

This report summarizes selected indices of health and nutritional status received from 50 state, territorial, and tribal governments that contributed to a program of pediatric nutrition surveillance in the United States.

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# Summary

A child's growth, a key indicator of nutritional status, is affected by both dietary intake and illness. Children with dietary inadequacies and frequent illness generally have lower weights and heights than other children of the same age do. In the United States, weight and height are routinely measured to assess the nutritional status of children, and anemia is routinely assessed in children as an indicator of iron deficiency, the most common micronutrient deficiency.

Few national data are continuously collected on the distribution of these nutritional indicators among children in the general U.S. population. In 1973, CDC began working with five U.S. states to develop a system for continuously monitoring the nutritional status of low-income children participating in federally funded maternal and child health and nutrition programs. By 1997, the Pediatric Nutrition Surveillance System (PedNSS) had expanded to include 44 states, the District of Columbia, and five tribal governments, which together contributed approximately 8 million records to the system that calendar year. This report presents 1997 data and highlights trends from 1989 to 1997.

All of the records originated from federally funded programs: the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC program), the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) program, Head Start, and the Title V Maternal and Child Health (MCH) program.

In the 1997 PedNSS, 41% of the records were from non-Hispanic white children, 29% from Hispanic children, 22% from non-Hispanic black children, 3% from Asian or Pacific Islander children, 1% from American Indian or Alaska Native children, and 4% from children of all other or unspecified races or ethnicities. Ninety-two percent of the 1997 PedNSS records were from children under 5 years of age, and 32% were from infants aged less than 1 year. These proportions have remained stable since 1989.

In the 1997 PedNSS, 8.8% of infants were of low birthweight (<2,500 grams). The proportion of low-birthweight infants had declined slightly from 9.3% in 1989 but was higher than the year 2000 national health objective to reduce the prevalence of low birthweight to less than 5%. Continued effort is needed to initiate and support programs aimed at preventing low birthweight.

The prevalence of short stature (low height-for-age) among children younger than 2 years declined from 10.5% in 1989 to 9.7% in 1997. During the same period, the prevalence among children aged 2 to less than 5 years declined from 7.5% to

5.7%. Despite the decline, the 1997 rate of short stature, particularly among younger children, was still higher than the expected level of 5%, which suggests that the growth of some children in the PedNSS population may be retarded because of chronic malnutrition, recurrent illness, or both. However, the year 2000 national health objective to reduce growth retardation to less than 10% was achieved among children in the PedNSS in all but five of the participating states and tribal governments. To optimize child growth, it is important to maintain and enhance programs that provide nutrition and health education to parents, comprehensive health care to all children, and nutritious supplementary foods to children at risk for poor dietary intake.

In 1997, the prevalence of underweight (low weight-for-height) was low (3.1% among children aged 2 years and younger and 1.9% among children aged 2 to less than 5 years) and had declined slightly since 1989. The low level of underweight indicates that acute malnutrition is not a significant public health problem among children participating in the PedNSS. In contrast, the prevalence of overweight (high weight-for-height) has steadily increased among the surveillance population. Among children aged 2 years and younger, overweight increased from 10.8% in 1989 to 11.3% in 1997; among children aged 2 to less than 5 years, overweight increased from 7.0% in 1989 to 8.6% in 1997. The increase in overweight among children monitored by the PedNSS is consistent with national trends among preschool and school-aged children. The reasons for the increase have not been determined and require further study.

The overall prevalence of anemia declined from 1989 to 1997 among children aged 2 years and younger (from 19.4% to 18.4%) and among children aged 2 to less than 5 years (from 19.0% to 16.9%). However, the rate for black children under 2 years of age has increased since 1989 (despite slight declines in 1996 and 1997). The high rate of anemia suggests the need for improved iron nutrition among low-income children. Programs that encourage and support breastfeeding, educate parents about sound iron nutrition during infancy and beyond, and supply iron-fortified infant foods play an important part in improving iron nutrition among children in the United States.

Among infants aged 6 to 8 months participating in the 1997 PedNSS, 46.2% were breastfed during the early postpartum period, and 20.3% were breastfed until 6 months of age. This finding represents an increase from 1989 PedNSS rates (35.3% initiated and 14.3% continued for 6 months). However, breastfeeding rates within the PedNSS population remain considerably lower than the year 2000 national health objective that 75% of infants be breastfed during the early postpartum period and 50% be breastfed until 5 or 6 months of age. The 1997 PedNSS breastfeeding rates were lowest among black infants (29.4% initiated and 12.4% continued for 6 months). Efforts are needed to develop and maintain culturally appropriate programs that encourage and support breastfeeding.

# Introduction

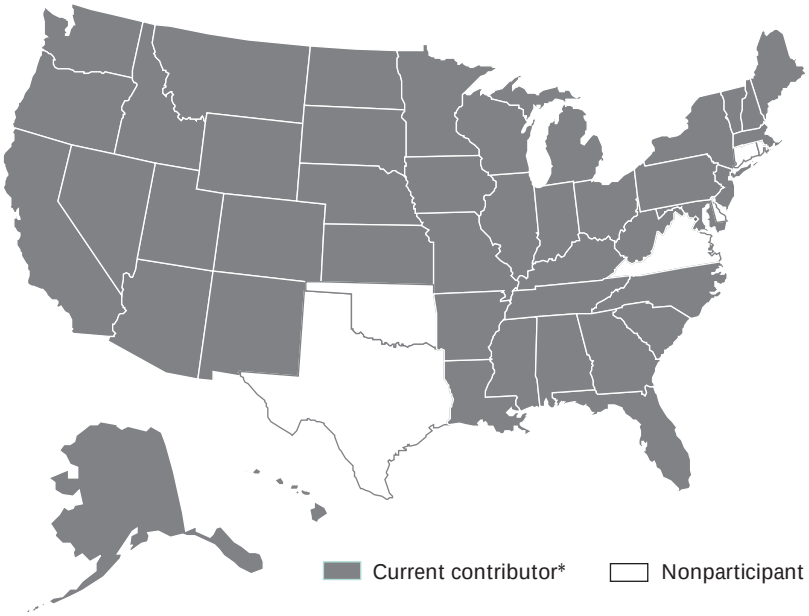
## *Features of the System*

The PedNSS monitors the growth, anemia, and breastfeeding status of low-income U.S. children who participate in federally funded maternal and child health and nutrition programs. The system is intended to describe trends and patterns of key indicators of child nutritional status so that the information can be used for program planning, targeting, and evaluation and for the development of appropriate health and nutrition interventions. Information from the PedNSS is also used to monitor progress toward the year 2000 national health objectives for the United States (1).

The demographic data collected by the PedNSS include child birth date, clinic visit date, and race or ethnicity. The source of the data (the WIC program, the EPSDT program, Head Start, or the Title V MCH program) is also identified. Nutritional status data collected for all children from birth through age 18 include weight, height, and hemoglobin concentration or hematocrit level measured at specified visits to the public health program (e.g., certification and recertification visits for the WIC program and well-child visits for MCH programs). The anthropometric and hematologic data are used to calculate the nutrition indices that define short stature (low height-for-age), underweight (low weight-for-height), overweight (high weight-for-height), and anemia (low hemoglobin concentration or low hematocrit level). Data on birthweight and breastfeeding status are collected on children from birth to age 2.

The demographic and nutrition data are routinely collected by the participating public health and nutrition program clinics. The families of children in these programs have a household income near the poverty level, as established by federal and state governments. A surveillance record is generated from each child's visit to the participating program or clinic. The surveillance records are routinely sent by the programs to states or tribal governments, which aggregate the records and submit them monthly or quarterly to CDC. CDC processes the data records, calculates the nutrition-related indices, and sends monthly nutrition data reports to the participants for use in case follow-up. In addition, CDC generates for each state or tribal government a series of semi-annual and annual tables that summarizes nutritional status and infant-feeding practice by child's age and race or ethnicity. Additional tables are produced for participating counties and clinics. Mainframe and PC versions of the PedNSS computer programs are also available for states and tribal governments to generate their own reports. These data provide state and community health professionals information for program planning, targeting, intervention, and evaluation. The system helps states build their capacity for

*Figure 1.*
Contributors to the 1997
Pediatric Nutrition Surveillance System




**Includes the District of Columbia, the Cheyenne River Sioux Tribe (SD), the Chickasaw Nation (OK), the Inter Tribal Council of Arizona, the Rosebud Sioux Tribe (SD), and the Shoshone/Arapaho Tribes (WY).*

monitoring the health and nutritional status of the children they serve.

The number of programs participating in the PedNSS is growing. In 1997, 44 states, the District of Columbia, and five tribal governments participated in the PedNSS (Figure 1). For simplicity, all contributors are hereafter referred to as "states." This report presents 1997 data and highlights trends from 1989 to 1997. The number of surveillance records has increased from nearly 5 million in 1989 to more than 8 million in 1997 (Figure 2). During this period, 59 contributors submitted data (Figure 3).

*Figure 2.*
Number of records submitted per year,
1989–1997 Pediatric Nutrition Surveillance System

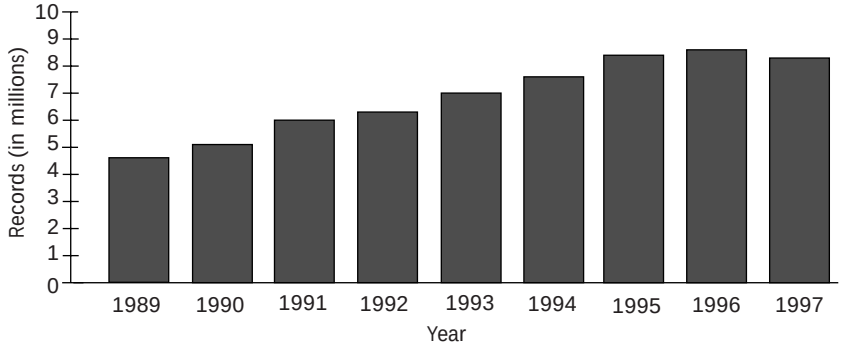


*Figure 3.*
Contributors to the 1989–1997 Pediatric Nutrition Surveillance System

| State | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|---|
| Alabama | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ |
| Alaska | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Arizona | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Arkansas | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| California | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Cheyenne River Sioux Tribe (SD) | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| Chickasaw Nation (OK) | | | | | | | | ■ | ■ |
| Colorado | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Connecticut | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| District of Columbia | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Florida | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Georgia | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Hawaii | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Idaho | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Illinois | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Indiana | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Iowa | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Inter Tribal Council of Arizona | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Kansas | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Kentucky | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Louisiana | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Maine | ■ | ■ | ■ | ■ | | | ■ | ■ | ■ |
| Maryland | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Massachusetts | ■ | | | | ■ | ■ | ■ | ■ | ■ |
| Michigan | ■ | ■ | ■ | | | | ■ | ■ | ■ |
| Minnesota | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Mississippi | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Mississippi Band of Choctaw Indians | | | | ■ | ■ | | | | |
| Missouri | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Montana | | ■ | ■ | | | ■ | ■ | ■ | ■ |
| Navajo Nation | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | |
| Nebraska | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Nevada | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| New Hampshire | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| New Jersey | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| New Mexico | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| New York | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| NIITDC* | | | | ■ | | | | ■ | |
| North Carolina | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ |
| North Dakota | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Ohio | ■ | ■ | | | | | ■ | ■ | ■ |
| Oklahoma | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| Oregon | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Pennsylvania | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Puerto Rico | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Rosebud Sioux Tribe (SD) | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| Shoshone/Arapaho Tribes (WY) | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| South Carolina | | | | | | | | | ■ |
| South Dakota | | | | | | | | ■ | ■ |
| Standing Rock Sioux Tribe (ND) | | | | ■ | ■ | ■ | ■ | ■ | |
| Tennessee | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Three Affiliated Tribes (ND) | | | | ■ | | | | | |
| Utah | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Vermont | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Virginia | ■ | ■ | ■ | | | | | | |
| Washington | | | | | | ■ | ■ | ■ | ■ |
| West Virginia | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| Wisconsin | | | | | | ■ | ■ | ■ | ■ |
| Wyoming | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ |

*Shaded area indicates that the contributor submitted more than 100 records.*
**Nebraska Indian Inter Tribal Development Corporation.*

# *Limitations of the System*

The criteria for program eligibility differ among the participating public health and nutrition programs, and the data collection methods differ among the health and nutrition clinics. Consequently, the quantity and quality of data in the PedNSS vary substantially, as does the degree of poverty represented.

CDC evaluates the completeness and quality of the data submitted and returns problematic data to the states for correction. In addition to data quality and completeness, factors that can affect the prevalence estimates generated by the PedNSS are changes in the number of states reporting data to the system and variability in program enrollment criteria among states and clinics. However, program changes within subsets of clinics are not likely to greatly affect overall trends in health and nutritional status, because the PedNSS is made up of records from a very large number of clinics across the country. Not all low-income families participate in programs that contribute data to the PedNSS, so this system does not represent all low-income children in participating states. For example, the U.S. Department of Agriculture estimates that 100% of infants and 69% of children eligible for WIC participate in that program (2). Furthermore, some states do not participate in the PedNSS.

# State and National Results

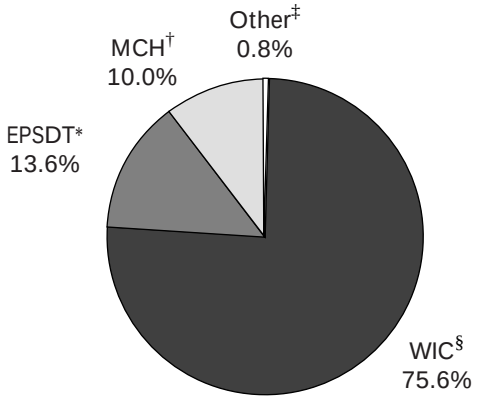
## *Demographic Characteristics*

### Program Participation

Program participation varied by state. In 44 states, WIC was the only program contributing data to the PedNSS. As in previous years, the majority of records (75.6% in 1997) were from the WIC program (Figure 4). A large proportion of the records submitted by the EPSDT, Head Start, and Title V MCH programs represented children who were also served by the WIC program.

☐ Approximately 76% of PedNSS records originate from the WIC program.

*Figure 4.*
Program composition,
1997 Pediatric Nutrition Surveillance System




*Early and Periodic Screening, Diagnosis, and Treatment program.
†Title V Maternal and Child Health program.
‡Includes Head Start.
§Special Supplemental Nutrition Program for Women, Infants, and Children.

### Age

The age distribution of children monitored by the PedNSS is determined by the age of children served by the programs that submit data. The EPSDT and Title V MCH programs enroll children up to 18 years of age, but the WIC and Head Start programs limit enrollment to children under 5 years of age. In 1997, the majority of the PedNSS records (92.1%) were from children under 5 years of age (Figure 5); 32.2% of records were from infants aged less than 1 year. The number of records declines with increasing age because of the WIC program's mandate to preferentially enroll infants and because not all children

*Figure 5.*
Age distribution of children,
1997 Pediatric Nutrition Surveillance System

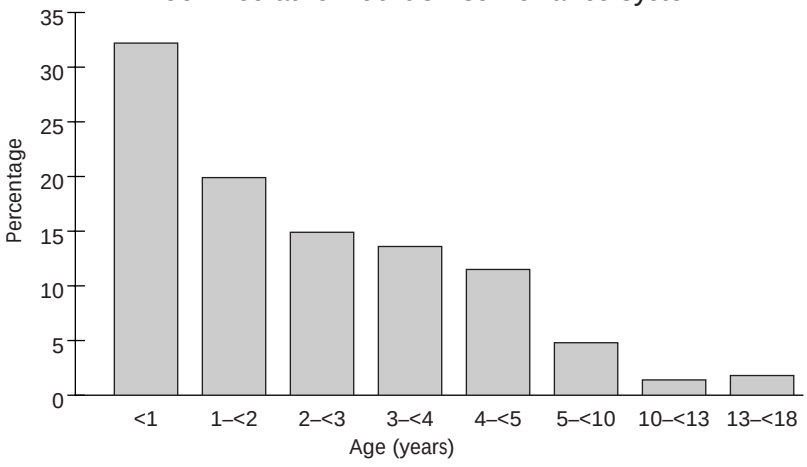
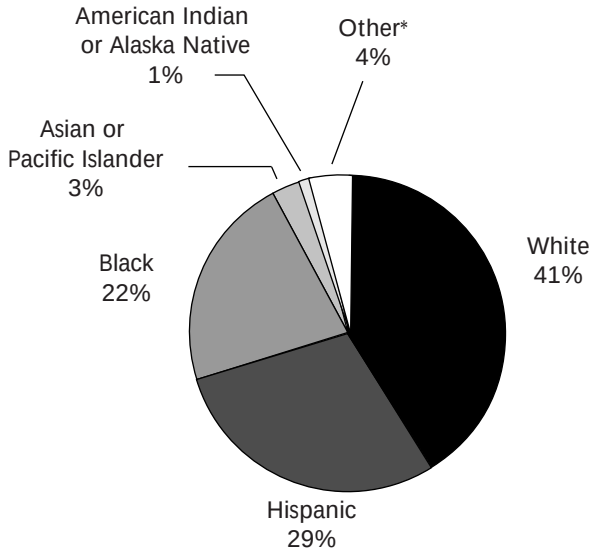
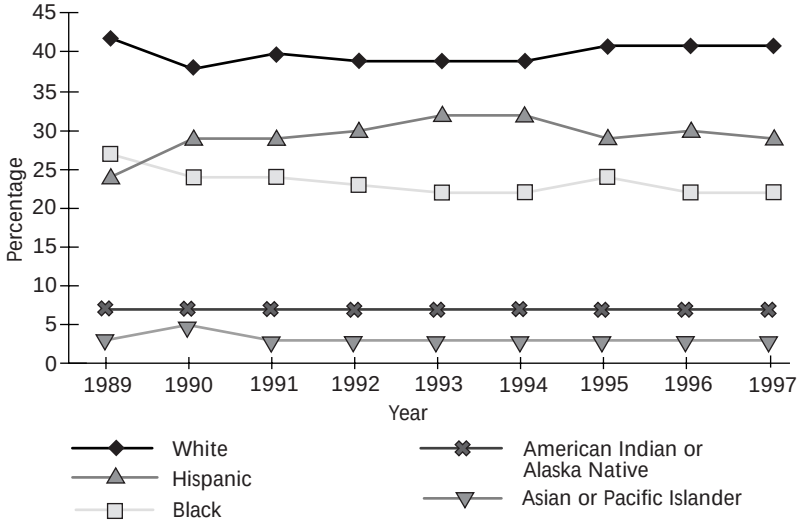


*Figure 6.*
Racial and ethnic distribution,
1997 Pediatric Nutrition Surveillance System




**Includes all other or unspecified races or ethnicities.*

*Figure 7.*
Proportion of records submitted, by race or ethnicity,
1989–1997 Pediatric Nutrition Surveillance System




remain in the program after 12 months of age. Because of differential retention, the health and nutritional status of children cannot be compared across ages. The proportion of infants and children in the PedNSS aged 1 to less than 5 years has remained stable since 1989.

☐ Ninety-two percent of children participating in the PedNSS are under 5 years of age.

## Race or Ethnicity

In 1997, 40.7% of records in the PedNSS were from non-Hispanic white children, 29.3% from Hispanic children, 22.0% from non-Hispanic black children, 3.1% from Asian or Pacific Islander children, 1.2% from American Indian or Alaska Native children, and 3.7% from children of all other or unspecified races or ethnicities[1] (Figure 6). The ethnic composition of the surveillance system changed significantly in the 1980s following the inclusion of Puerto Rico in 1984, California in 1988, and New York in 1989, all of which contributed a large number of records from Hispanic children (3); the ethnic composition of the system has changed little since 1989 (Figure 7).

☐ The PedNSS monitors the nutritional status of a racially and ethnically diverse population.

*[1] Hereafter in this report, the term "white" refers to non-Hispanic whites and the term "black" refers to non-Hispanic blacks.*

# *Birthweight Characteristics*

## Low Birthweight

Low birthweight (<2,500 grams) is the single most important factor affecting neonatal mortality and is a determinant of postneonatal mortality (4). Infants weighing 2,500 grams (5.5 pounds) or less are almost 40 times more likely to die during their first four weeks of life than are infants of normal birthweight (5). Although the infant mortality rate in the United States declined from 26 per 1,000 live births in 1960 to 8 per 1,000 live births in 1994, the nation ranks behind most industrialized countries on this health indicator (6). Low-birthweight infants who survive are at increased risk for health problems, from neurodevelopmental handicaps to lower respiratory tract conditions (5).

In the 1997 PedNSS, 8.8% of infants aged less than 12 months were of low birthweight (Table 1). By comparison, 7.3% of all infants born in the United States in 1995 were of low birthweight (7). The higher rate of low-birthweight infants among the population monitored by the PedNSS parallels the higher rates of risk factors associated with low birthweight in this low-income population.

In the 1997 PedNSS, the proportion of low- birthweight infants who were black (13.0%) exceeded the proportion who were white (8.3%), Asian or Pacific Islander (7.6%), American Indian or Alaska Native (6.7%), or Hispanic (6.4%) (Table 1). Why the rate is highest for black infants is an unanswered question of intense public health interest; further

*Table 1.*
Percent distribution of selected nutritional indicators of children aged <5 years, 1997 Pediatric Nutrition Surveillance System

| Characteristic | LBW* | Short stature† | Under-weight‡ | Over-weight§ | Anemia‖ | Ever breastfed¶ | Breastfed 6 months¶ |
|---|---|---|---|---|---|---|---|
| **Age (years)** | | | | | | | |
| <2 | 8.8 | 9.7 | 3.1 | 11.3 | 18.4 | 46.2 | 20.3 |
| 2 to <5 | | 5.7 | 1.9 | 8.6 | 16.9 | | |
| **Race or ethnicity** | | | | | | | |
| White | 8.3 | 6.3 | 1.7 | 7.1 | 15.2 | 49.5 | 20.9 |
| Black | 13.0 | 4.8 | 2.4 | 7.8 | 24.6 | 29.4 | 12.4 |
| Hispanic | 6.4 | 5.2 | 1.5 | 12.0 | 18.4 | 58.2 | 30.1 |
| American Indian or Alaska Native | 6.7 | na** | na | na | 18.6 | 56.2 | 24.7 |
| Asian or Pacific Islander | 7.6 | 8.4 | 2.2 | 9.6 | 15.1 | 55.3 | 27.3 |

**Low birthweight (<2,500 grams) for infants <1 year of age.*
*†Race- or ethnicity-specific rate for children aged 2 to <5 years; height-for-age <5th percentile of NCHS-CDC reference population.*
*‡Race- or ethnicity-specific rate for children aged 2 to <5 years; weight-for-height <5th percentile of NCHS-CDC reference population.*
*§Race- or ethnicity-specific rate for children aged 2 to <5 years; weight-for-height >95th percentile of NCHS-CDC reference population.*
*‖Race- or ethnicity-specific rate for children aged <2 years; hemoglobin concentration or hematocit level <5th percentile of NCHS-CDC reference population.*
*¶For infants 6 to 8 months of age.*
***Data not available.*

research is needed to improve understanding and prevention efforts (4).

Since 1989, the overall prevalence of low birthweight has declined slightly, from 9.3% in 1989 to 8.8% in 1997 (Figure 8). Hispanic children had the greatest absolute (1.0 percentage point) and relative (14%) decline in low birthweight.

The year 2000 national health objectives call for a reduction in low birthweight to no more than 5% of all live births (1). Only two of the 1997 PedNSS participants met this objective, the Cheyenne River Sioux and Rosebud Sioux tribal governments, both in South Dakota (Table 2). The highest rates (12.0% or more) were found in the District of Columbia and in Louisiana, Mississippi, and South Carolina (Table 2).

- ☐ The rate of low birthweight in the 1997 PedNSS was higher for infants who were black (13%) than white (8%), Asian or Pacific Islander (8%), American Indian or Alaska Native (7%), or Hispanic (6%).
- ☐ In the 1997 PedNSS, 8.8% of children under 12 months of age were low birthweight, indicating a small but steady decline from 9.3% in 1989.
- ☐ The year 2000 objectives call for a reduction in low birthweight to no more than 5% of births. Only two of the 1997 PedNSS participants met this objective.

*Figure 8.*
Prevalence of low birthweight among children <12 months of age, by race or ethnicity, 1989–1997 Pediatric Nutrition Surveillance System

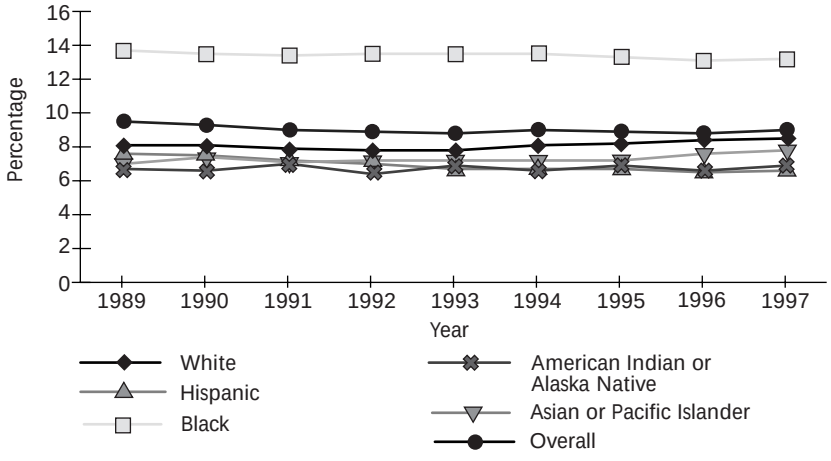


*Table 2.*

State-specific prevalence of selected nutritional indicators of children aged <5 years, 1997 Pediatric Nutrition Surveillance System

| State | LBW* | Short stature† | Under-weight‡ | Over-weight§ | Anemia‖ | Ever breastfed |
|---|---|---|---|---|---|---|
| Alabama | 11.6 | 9.5 | 3.2 | 9.0 | 26.1 | na¶ |
| Alaska | 7.2 | na | na | na | na | na |
| Arizona | 8.3 | 8.3 | 3.3 | 9.0 | 36.3 | na |
| Arkansas | 10.1 | 8.8 | 2.4 | 7.7 | 10.7 | 35.4 |
| California** | 6.6 | 6.2 | 2.5 | 13.4 | 14.2 | na |
| Cheyenne River Sioux Tribe (SD) | 4.4 | 4.8 | 1.2 | 17.4 | 31.0 | 33.7 |
| Chickasaw Nation (OK) | 6.5 | 7.3 | 3.3 | 7.6 | 29.7 | 41.7 |
| Colorado | 11.4 | 16.7 | 2.1 | 9.3 | 9.1 | 62.5 |
| District of Columbia | 13.9 | 10.2 | 3.1 | 9.8 | 24.9 | 42.1 |
| Florida | 10.3 | 8.1 | 3.4 | 9.1 | 23.8 | 51.6 |
| Georgia | 10.9 | 9.0 | 2.3 | 9.0 | 16.6 | 37.9 |
| Hawaii | 8.7 | 8.8 | 2.7 | 8.7 | 11.9 | na |
| Idaho | 7.9 | 8.7 | 1.9 | 7.5 | 13.5 | na |
| Illinois | 10.5 | 10.2 | 2.2 | 11.8 | 20.2 | 35.4 |
| Indiana | 9.2 | 7.9 | 1.7 | 8.3 | 21.8 | 41.3 |
| Iowa | 8.0 | 6.7 | 1.2 | 9.6 | 12.6 | 48.0 |
| ITCA†† | 7.0 | 7.3 | 1.1 | 15.8 | 23.7 | 62.7 |
| Kansas | 8.7 | 8.3 | 1.6 | 7.8 | 15.3 | 59.2 |
| Kentucky | 9.2 | 7.6 | 2.4 | 10.1 | 15.6 | na |
| Louisiana | 12.0 | 10.8 | 2.6 | 8.9 | 17.5 | na |
| Maine | 7.4 | 8.7 | 2.4 | 9.0 | 13.2 | 47.5 |
| Maryland | 11.5 | 5.4 | 2.2 | 8.2 | 26.0 | na |
| Massachusetts | 9.0 | 6.3 | 2.6 | 10.8 | 23.1 | 53.2 |
| Michigan | 9.7 | 9.5 | 2.0 | 9.1 | 17.1 | 41.4 |
| Minnesota | 7.9 | 7.0 | 1.5 | 9.1 | 13.8 | na |
| Mississippi | 13.1 | 7.9 | 3.4 | 8.2 | 27.8 | 40.0 |
| Missouri | 9.4 | 8.2 | 1.9 | 8.4 | 20.6 | 41.0 |
| Montana | 7.5 | 7.2 | 1.8 | 8.7 | 11.3 | 70.6 |
| Nebraska | 8.6 | 7.8 | 2.7 | 9.4 | 22.8 | 46.1 |
| Nevada | 9.0 | 9.5 | 1.4 | 9.6 | 14.5 | 51.1 |
| New Hampshire | 7.4 | 9.7 | 1.8 | 11.2 | 18.3 | 41.8 |
| New Jersey | 10.4 | 6.8 | 2.8 | 11.6 | 20.2 | 43.1 |
| New Mexico | 8.9 | 9.6 | 2.9 | 7.3 | 6.9 | na |
| New York | 9.7 | 6.2 | 3.1 | 10.9 | 17.2 | na |
| North Carolina | 10.5 | 8.4 | 5.3 | 9.7 | 14.1 | 40.3 |
| North Dakota | 6.7 | 5.4 | 1.3 | 9.3 | 9.6 | 48.5 |
| Ohio | 10.7 | 8.0 | 1.8 | 9.6 | 19.5 | 33.1 |
| Oregon | 5.8 | 7.5 | 1.5 | 10.8 | 15.5 | na |
| Pennsylvania | 10.0 | 7.8 | 2.8 | 9.0 | 14.3 | 36.4 |
| Rosebud Sioux Tribe (SD) | 4.8 | 5.2 | 1.1 | 16.9 | 23.2 | 58.0 |
| Shoshone/Arapaho Tribes (WY) | 6.6 | 7.3 | 1.7 | 18.3 | 12.5 | 62.1 |
| South Carolina | 14.8 | 14.8 | 4.0 | 7.7 | 20.7 | na |
| South Dakota | 6.6 | 6.6 | 1.9 | 8.9 | 10.5 | 48.8 |
| Tennessee | na | 7.6 | 2.8 | 8.1 | 11.9 | na |
| Utah | 8.1 | 8.4 | 2.1 | 5.8 | 9.8 | 72.2 |
| Vermont | 8.4 | 7.0 | 1.4 | 9.4 | 3.8 | na |
| Washington | 7.0 | 6.1 | 1.3 | 10.2 | 12.5 | 66.8 |
| West Virginia | 10.0 | 7.7 | 2.7 | 7.9 | 8.1 | 34.5 |
| Wisconsin | 9.0 | 7.7 | 1.6 | 8.7 | 17.2 | 48.4 |
| Wyoming | 10.0 | 9.2 | 2.4 | 5.6 | 9.7 | na |
| All states | 9.2 | 7.9 | 2.5 | 10.3 | 17.0 | 46.4 |

**Low birthweight (<2,500 grams).*

*†Height-for-age <5th percentile of NCHS-CDC reference population.*

*‡Weight-for-height <5th percentile of NCHS-CDC reference population.*

*§Weight-for-height >95th percentile of NCHS-CDC reference population.*

*‖Hemoglobin concentration or hematocrit level <5th percentile of NCHS-CDC reference population.*

*¶Data not available.*

***Includes children aged >5 years.*

*††Inter Tribal Council of Arizona.*

# *Indicators of Nutritional Status*

## Short Stature

Short stature is defined as a length or height less than the 5th percentile of the age- and sex-specific length or height reference population defined by CDC's National Center for Health Statistics (NCHS) (8). Short stature, also referred to as low length-for-age or height-for-age, chronic malnutrition, growth retardation, or stunting, may reflect the long-term health and nutritional history of a child or a population.

Children's length or height is routinely measured during clinic visits, as part of individual growth monitoring, to screen for health and nutritional disorders that may require further evaluation or follow-up.[2] Short stature may reflect the normal variation of growth within a population; 5% of children are expected to fall below the established cutoff that defines short stature. For example, short stature in some children is related to short parental stature or low birthweight. Short stature can also be the result of growth retardation that results from chronic malnutrition due to inadequate food intake, recurrent illness, or both. On a population level, an increased prevalence of shortness (above the expected 5% level) suggests that the growth of some children in the population is retarded.

In the 1997 PedNSS, the prevalence of short stature among children under 2 years of age was 9.7%, nearly twice the expected level of 5%. For children aged 2 to less than 5 years, the prevalence was only slightly higher than the 5% level (5.7%) (Table 1). The rates above the expected level, particularly among children under 2 years old, suggest that some of the children had growth retardation as a result of inadequate food intake, recurrent illness, or both.

Among children aged 2 to less than 5 years, in 1997, Asian or Pacific Islander children had the highest rate of short stature (Table 1). The height gap between these children and those of other races or ethnicities participating in the PedNSS has closed considerably since the early 1980s. At that time, the dramatic disparity in stature was due to increased representation of refugee children of poor nutritional status (9).

The high prevalence of short stature among black infants aged less than 12 months (14.8%) probably reflects the relatively high rate of low birthweight among this group. A longitudinal study of children participating in the PedNSS showed that black infants had the lowest height-for-age at birth but that by age 2, black children had improved height status and were, on average, taller than children from other racial or ethnic groups (Z. Mei, M.D., M.P.H., and R. Yip, M.D., M.P.H., unpublished data, 1998). In addition, a longitudinal analysis of a cohort of low-birthweight PedNSS children showed that by age 2, low-birthweight black infants experienced more catch-up growth in height than did infants of other races or ethnicities (Z. Mei, M.D., M.P.H., and R. Yip, M.D., M.P.H., unpublished data, 1998). It is unclear whether the increased growth of low-birthweight black children relative to that of low-birthweight children

[2] *On average, each child represented in the PedNSS contributed 2.1 growth measurements per year.*

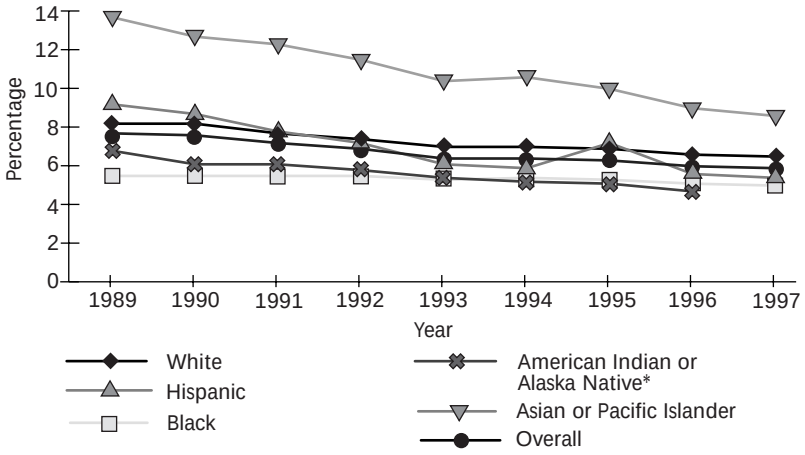
of other races or ethnicities in this PedNSS study reflects improved nutritional status or normal catch-up growth or whether minor variations in childhood growth patterns exist among different racial and ethnic groups.

The overall prevalence of short stature among children aged 2 to less than 5 years participating in the PedNSS has steadily declined, from 7.5% in 1989 to 5.7% in 1997 (Figure 9). Asian or Pacific Islander children showed the greatest improvement in height status. Although short stature among these children continued to decline in the 1990s, the rate of decline was less than that observed in the 1980s (9, 10). Among children under 2 years of age, the prevalence of short stature has decreased, from 10.5% in 1989 to 9.7% in 1997 (data not shown).

The year 2000 objective to reduce the prevalence of short stature to less than 10% has been achieved in 44 of the 49 states that submitted height data to the 1997 PedNSS. The rate is very close to 10% in the District of Columbia, Illinois, and Louisiana and is slightly higher in Colorado and South Carolina (Table 2).

- In the 1997 PedNSS, the prevalence of short stature among children aged 2 to less than 5 years was 5.7%, a decline from 7.5% in 1989.
- The year 2000 objective to reduce the prevalence of short stature to less than 10% has been achieved in 44 of the states that participated in the 1997 PedNSS.

*Figure 9.*
Trends in prevalence of short stature among children aged 2 to <5 years, by race or ethnicity, 1989–1997 Pediatric Nutrition Surveillance System




**Data not available for 1997.*

## Underweight

Underweight in children is defined as weight-for-height less than the 5th percentile of the NCHS/CDC age- and gender-specific weight-for-height reference (3, 8). Also referred to as low weight-for-height, thinness, acute malnutrition, or wasting, underweight is often associated with recent severe illness. In developing countries, underweight can indicate acute malnutrition due to severe food deprivation, persistent diarrhea, or both.

The low prevalence of underweight among children in the PedNSS indicates that acute malnutrition is not a major public health problem in the population monitored (Table 1). In the 1997 PedNSS, the prevalence was low among children under 2 years of age (3.1%) and among those aged 2 to less than 5 years (1.9%). This rate was considerably lower than the expected 5% level.

The prevalence of underweight was highest among black children and Asian or Pacific

Islander children (Table 1). Black infants aged 0 to 2 months had the highest rate of underweight (data not shown). This statistic may reflect the high rate of low-birthweight infants in this group.

Among children aged 2 to less than 5 years participating in the PedNSS, the prevalence of underweight has decreased, from 2.8% in 1989 to 1.9% in 1997 (data not shown). All age groups and all racial and ethnic groups showed a slight decrease in prevalence and an overall low rate.

## Overweight

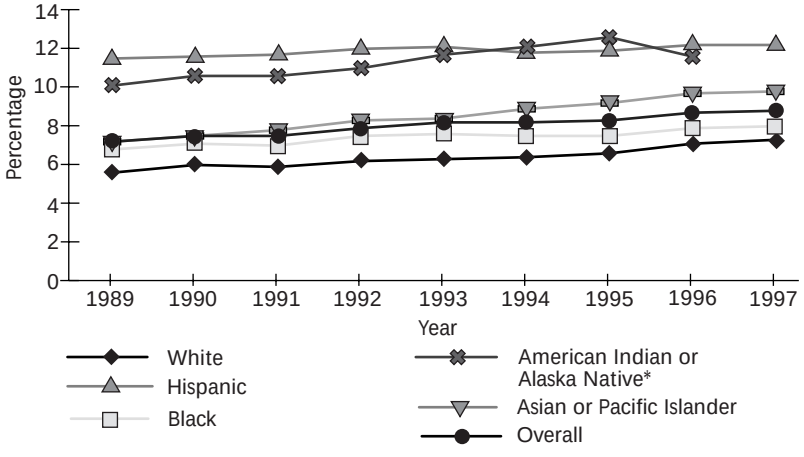
Overweight is defined as a weight-for-height above the 95th percentile of the NCHS-CDC age- and sex-specific weight-for-height reference population (3, 8). Overweight, or high weight-for-length or weight-for-height, indicates excess energy intake, low energy expenditure, or both. The contribution of these factors to overweight among preschool-aged children has not been determined. However, the health problems associated with childhood overweight and obesity have been studied; they include high blood pressure (11–14), high cholesterol (14, 15), glucose intolerance (16, 17), orthopedic disorders (18), and psychosocial disorders (14, 19). In addition, longitudinal studies show that overweight in childhood is associated with overweight in adulthood (20, 21), which is a recognized health risk (22).

The prevalence of overweight among children under 2 years of age participating in the 1997 PedNSS (11.3%) was more than twice what was expected, and the prevalence among children aged 2 to less than 5 years was 8.6% (Table 1). The higher prevalence at less than age 2 is partially due to the disjunction in the growth reference charts, which are based on one reference population for recumbent length (children under 2 years of age) and another for height (children aged 2 and older) (23).

The prevalence of overweight was highest among Hispanic children and lowest among white children (Table 1). These racial and ethnic differences are consistent with published studies of children from higher income families (24, 25).

Of particular concern is that the prevalence of overweight in the population aged 2 to less than 5 years monitored by the PedNSS has increased steadily over the last eight years, from 7.0% in 1989 to 8.6% in 1997. This increase has been observed for all racial and ethnic groups (Figure 10). During the same period, overweight among the population under age 2 increased as well, from 10.8% to 11.3% (data not shown). This increasing trend of overweight among the PedNSS population was confirmed in a recently published study limited to the 19 states that participated in the PedNSS each year from 1983 to 1995 (26). The findings from the PedNSS are consistent with trends of increasing overweight among children in the general U.S. population (24, 25).

*Figure 10.*
Trends in prevalence of overweight among children aged 2 to <5 years, by race or ethnicity, 1989–1997 Pediatric Nutrition Surveillance System




**Data not available for 1997.*

- The prevalence of underweight among children aged 2 to less than 5 years in the PedNSS declined from 2.8% in 1989 to 1.9% in 1997; the prevalence of overweight increased, from 7.0% to 8.6%.

## Anemia

Anemia, defined by a low hemoglobin (Hb) concentration or a low hematocrit (Hct) level, is often used as an indicator of iron deficiency, the most common nutritional deficiency in the world (27). Iron deficiency is associated with developmental delays and behavioral disturbances in children (28–30). Anemia associated with iron deficiency represents the final stage of iron deficiency, when the production of Hb (and other iron-containing functional compounds) falls below normal levels due to insufficient iron (31). In addition to iron deficiency, anemia can be caused by other nutritional deficiencies (e.g., folate or vitamin B12 deficiency), hereditary defects in red blood cell production (e.g., thalassemia and sickle cell disease), recent or current infection, and chronic inflammation (32, 33). As iron-deficiency anemia among U.S. children declines as a result of increased iron intake during infancy, anemia becomes less predictive of iron deficiency (34–38).

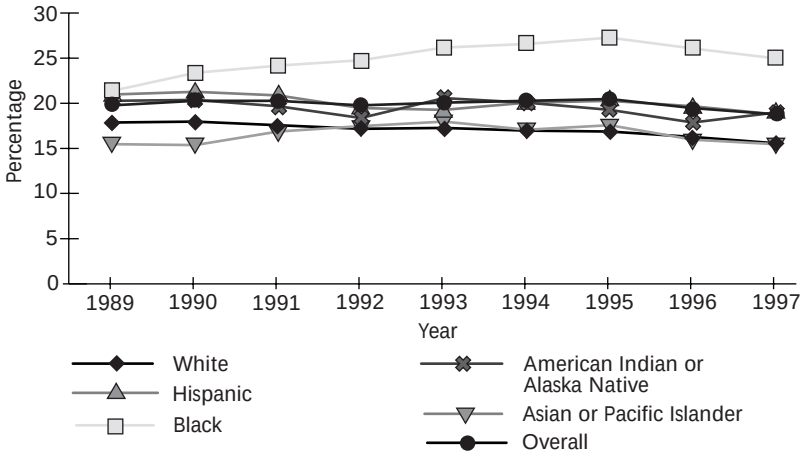
For children aged 1 to less than 2 years, anemia is defined as an Hb concentration <11.0 g/dL or an Hct level <33%. For children aged 2 to less than 5 years, anemia is defined as an Hb concentration <11.2 g/dL or an Hct level <34% (38). In 1998, CDC recommended a slight change in the Hb and Hct cutoffs to define anemia (33); however, consistent with earlier analyses, this report is based on the 1989 anemia criteria that were used by CDC and states in 1997. The 1989 cutoff criteria for anemia represent the 5th percentile values of the Second National Health and Nutrition Examination Survey after excluding persons with a higher likelihood of iron deficiency (36, 38, 39).

Programs participating in the PedNSS periodically measure Hb concentration or Hct level in young children to screen for iron deficiency.[3] The prevalence of anemia based on Hb concentration only is higher than the rate based on Hct level because of minor differences in screening cutoff values. For this report, anemia is based on a low Hb concentration or a low Hct level.

In the 1997 PedNSS, 18.4% of children under 2 years of age and 16.9% of children aged 2 to less than 5 years had anemia (Table 1). For 1988–1991, the anemia rates were 15.0% among children aged 1 to less than 3 years and 6.8% among children aged 3 to less than 6 years in the general U.S. population (40). Two factors partly account for the higher rate among children in the 1997 PedNSS. First, low-income children have a higher risk for iron deficiency (34). Reasons for this higher risk are poorly understood, but CDC plans to study this question further. Such studies will examine dietary, biochemical, clinical, and behavioral factors not currently included in the PedNSS. A second reason for the higher rates among children in the PedNSS is that programs such as WIC preferentially enroll and retain children with anemia. However, the higher rate may also be due to variability in blood collection methods

[3] *Although other biochemical tests (i.e., transferrin saturation, erythrocyte protoporphyrin concentration, and serum ferritin concentration) indicate earlier changes in iron deficiency, in most public health settings it is not feasible to use these additional tests for screening.*

*Figure 11.*
Trends in prevalence of anemia among children aged <2 years, by race or ethnicity, 1989–1997 Pediatric Nutrition Surveillance System




using capillary sampling (P. Scariati, D.O., M.P.H., unpublished data, 1995; I. Parvanta, M.S., unpublished data, 1996).

The rate of anemia among the 1997 PedNSS participants was higher among black children (24.6%) than among American Indian or Alaska Native (18.6%), Hispanic (18.4%), white (15.2%), and Asian or Pacific Islander (15.1%) children (Table 1). This finding is consistent with results from previous studies, which showed a lower Hb distribution among black children than among white children (32, 41–47).

The overall prevalence of anemia among children under 2 years of age participating in the PedNSS has changed slightly, from 19.4% in 1989 to 18.4% in 1997 (Figure 11). The declining trend of childhood anemia may suggest improved iron status; however, further study is needed to explain why the decline in anemia has not been observed among black children, among whom the rate has actually increased since 1989 (from 21.0% in 1989 to 24.6% in 1997).

The anemia rate was highest (25% or higher) in Alabama, Arizona, the Chickasaw Nation in Oklahoma, the District of Columbia, Maryland, and Mississippi (Table 2). The rate was less than 10% in Colorado, New Mexico, North Dakota, Utah, Vermont, West Virginia, and Wyoming. The lowest rate was in Vermont (3.8%) and represents a decline in that state since 1981 (48).

- In the 1997 PedNSS, about 18% of children under 2 years of age and 17% of children aged 2 to less than 5 years had anemia.

# *Infant-Feeding Practices*

The nutritional, immunologic, allergenic, economic, and psychological advantages of breastfeeding are well recognized. Breast milk, which is nutritionally superior to any alternative milk supply, provides immunity to many viral and bacterial diseases; enhances infants' immunologic defenses; prevents or reduces risk of respiratory and diarrheal diseases; promotes correct development of jaws, teeth, and speech patterns; decreases tendency toward childhood obesity; and facilitates mother-infant attachment (49, 50).

During each visit to a maternal and child health program monitored by the PedNSS, the mother of a participating child under 2 years of age is asked whether the child

was ever breastfed and, if yes, the duration of breastfeeding. This report highlights results on "ever breastfed" and "breastfed until 6 months of age" among children aged 6 to 8 months. These two measures are monitored to assess progress toward the year 2000 national health objective to increase to 75% the proportion of children who are ever breastfed and to 50% the proportion of children who are breastfed until 5 or 6 months of age.

In the 1997 PedNSS, 46.2% of infants aged 6 to 8 months were ever breastfed, and 20.3% were breastfed until 6 months of age (Table 1). Black infants were less likely to be breastfed than infants who were white, Hispanic, American Indian or Alaska Native, or Asian or Pacific Islander (Figure 12). The reasons for this discrepancy are not fully understood, but clearly, culturally appropriate strategies are needed to encourage and support breastfeeding among all women.

The prevalence of breastfeeding among children in the PedNSS has increased since 1989, from 35.3% in 1989 to 46.2% in 1997 (Figure 13). Other national data sources indicate that the rate among all U.S. women has increased somewhat, from 52% in 1988 to 60% in 1995 (51).

Among the 33 states submitting breastfeeding data to the PedNSS, the lowest rates of breastfeeding (less than 35% of children were ever breastfed) were found in Ohio, West Virginia, and the Cheyenne River Sioux Tribe in South Dakota. The highest rates (more than 60% of children were ever breastfed) were found in Colorado, Montana, Utah, Washington, the Inter Tribal Council of Arizona, and the Shoshone/Arapaho Tribes in Wyoming (Table 2).

*Figure 12.*
Breastfeeding duration, by race or ethnicity, 1997 Pediatric Nutrition Surveillance System

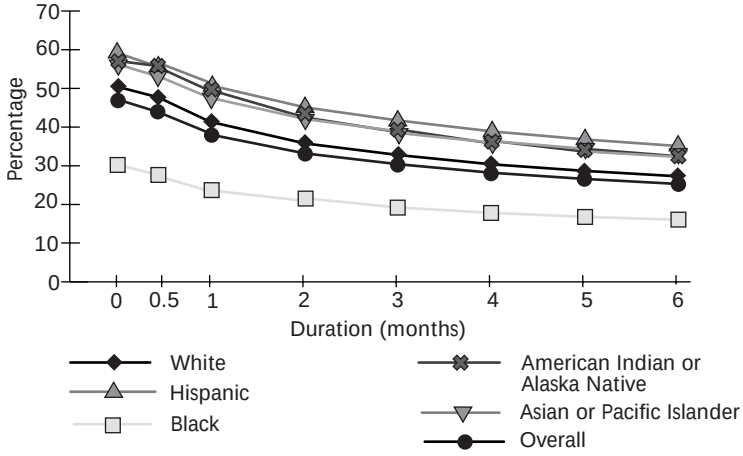
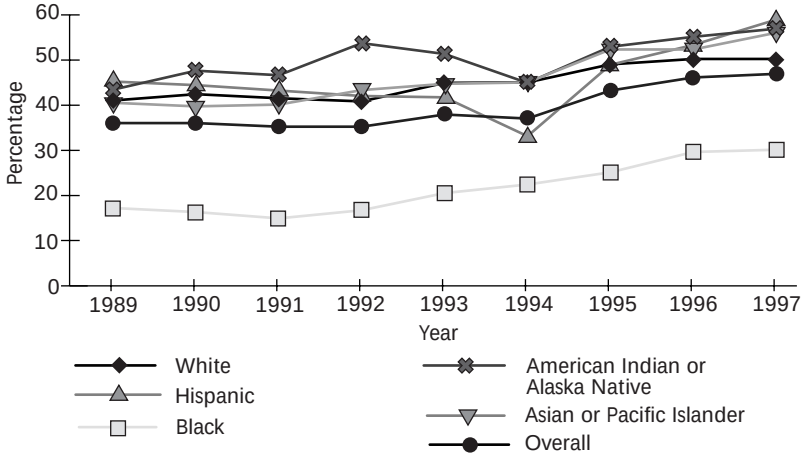



*Figure 13.*
Proportion of infants ever breastfed, by race or ethnicity, 1989–1997 Pediatric Nutrition Surveillance System




- In the 1997 PedNSS, about 46% of infants aged 6 to 8 months were ever breastfed, and 20% were breastfed until 5 or 6 months of age.
- The year 2000 national health objectives call for increasing to at least 75% the proportion of children who are ever breastfed and to at least 50% the proportion who are breastfed until age 5 or 6 months. These objectives have not been met in the population monitored by the PedNSS.

# Conclusions and Recommendations

Data from the PedNSS demonstrate that progress has occurred in many areas of pediatric health among low-income families participating in publicly supported health and nutrition programs but that effort is still needed to achieve national objectives for health and nutritional status of the children monitored. For example, although the prevalence of low birthweight declined from 9.3% to 8.8% between 1989 and 1997, the year 2000 national health objective to reduce the rate to less than 5% had been achieved by only two of the 1997 PedNSS state participants.

From 1989 to 1997, the overall prevalence of short stature declined from 10.5% to 9.7% among children under 2 years of age and from 7.5% to 5.7% among children aged 2 to less than 5 years. These findings suggest reduced growth retardation due to chronic malnutrition or poor health status. In fact, the national health objective to reduce the prevalence of short stature to less than 10% has been achieved in 44 of the states that submitted height data to the 1997 PedNSS.

The overall prevalence of underweight in the PedNSS is low and continues to decline each year, indicating that acute malnutrition is not a significant public health problem in the population monitored. In contrast, the PedNSS data show that the prevalence of overweight is high and continues to increase each year. Among the population aged 2 to less than 5 years monitored by the PedNSS, the prevalence of overweight increased from 7.0% in 1989 to 8.6% in 1997. This increase was observed for all racial and ethnic groups. Effective public health strategies are urgently needed to reverse this trend.

The prevalence of anemia was high in the 1997 PedNSS (18.4%) and has declined only slightly since 1989 (19.4%). The anemia rate actually increased among black children (from 21% in 1989 to 24.6% in 1997), highlighting a need for further study. The causes of anemia in the general PedNSS population will be studied by CDC.

Breastfeeding rates among infants participating in the PedNSS have increased since 1989 (from 35.3% in 1989 to 46.2% in 1997) but are still far below year 2000 national health objectives for breastfeeding. Breastfeeding rates are lowest among black women, a finding that emphasizes the need for culturally appropriate strategies to promote and support breastfeeding among all women.

# Nutritional and Behavioral Risk Factor Reduction

National and state public health programs are needed to support the following nutritional and behavioral interventions. Research into strategies that successfully reduce risk and achieve the nutritional and behavioral interventions described here should be a high priority.

1. Provision of preconception nutrition care, integrated into primary care, to address prepregnancy nutritional risks, such as underweight, obesity, and anemia.
2. Outreach activities promoting early identification of pregnancy and early entry into comprehensive prenatal care, including WIC program services, that emphasizes good nutrition (including adequate iron intake), appropriate weight gain during pregnancy, and cessation of smoking and alcohol use.
3. Promotion of optimal child growth (including parental education about feeding infants and young children), provision of nutritious foods to supplement the diet of children at risk of poor dietary intake, and comprehensive health care to reduce illness.
4. Implementation of innovative strategies to reverse the rising trend of overweight among young children, including the early identification of children at risk for later obesity (e.g., children with overweight parents) and parental education regarding food choices, feeding interactions, and physical activity.
5. Promotion of adequate dietary iron intake and screening of children at risk for iron deficiency.
6. Establishment of breastfeeding as an accepted practice by society as well as policies to support breastfeeding at work and in public places. Continued development and implementation of effective and culturally appropriate strategies to promote the initiation and continuation of breastfeeding.

# Nutrition Monitoring

The following actions will further enhance the representativeness, quality, and usefulness of the PedNSS.

1. Expansion of state, U.S. territory, tribal government, and managed care program participation in the PedNSS.
2. Provision of CDC technical assistance to participating government agencies to support system initiation and maintenance, resolve problems of data quality and incompleteness, and participate in interpreting data.
3. Enhancement of the PedNSS to include data on dietary intake, parental strategies, physical activity, food insecurity, household socioeconomic status, WIC nutritional risk factors, and parental characteristics such as body mass index.

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