Pregnancy-Related Nutrition

Geraldine S. Perry, Dr.P.H., R.D.,[1] Colette L. Zyrkowski, M.P.H., R.D.,[1]
Linda D. Clark, M.P.H., R.D.,[1] and Stella Yu, Sc.D, M.P.H, R.D.[2]

PUBLIC HEALTH IMPORTANCE

Birth outcomes are affected by many sociodemographic and physiologic variables, including ethnicity (*1–3*), socioeconomic status (*4*), maternal age (*5,6*), and nutritional risk factors such as prepregnancy weight (*7–10*), gestational weight gain (*7–9*), alcohol consumption (*11–13*), and anemia (*14–16*). The risk of infant mortality is directly related to birth weight and increases as birth weight decreases. Low birth weight is also associated with an increased risk of neurodevelopmental conditions, congenital anomalies, and lower respiratory tract infections (*17*).

One of the national *Healthy People 2000* objectives for infant health is to "reduce low birth weight to an incidence of no more than 5% of all live births and very low birth weight to no more than 1% of live births." To reach this objective, we need additional data on the many risk factors for low birth weight that have been identified in previous studies. Such information will allow states to monitor and examine the interrelationship of these variables in pregnant women and will assist health care workers in the early identification of women who are at risk of delivering low birth-weight infants.

Although numerous risk factors for low birth weight have been identified, this chapter addresses only those risk factors that are nutrition-related, including prepregnancy weight, weight gain during pregnancy, maternal anemia (as defined by CDC hemoglobin or hematocrit criteria for anemia), and alcohol consumption.

Prepregnancy Weight

Prepregnancy weight is a major factor affecting birth weight. An association between prepregnancy underweight and low birth weight was documented as early as the 1950s and has been confirmed in more recent studies (*6–9*). A significant linear relationship has been shown between prepregnancy weight (expressed as body mass index or BMI. BMI = weight in kilograms/[height in meters]^2) and birth weight, independent of gestational weight gain (*7*). Additionally, prepregnancy overweight has a significant independent effect on birth weight, with the incidence of macrosomia (high birth weight, >4,000 g) increasing with prepregnancy weight (*18*). High birth-weight infants have an increased risk of perinatal morbidity and mortality.

Gestational Weight Gain

Total gestational weight gain in full-term pregnancies is an important determinant of low birth weight (*6,8*), and adequate weight gain is even more beneficial among women who are underweight before pregnancy (*7*). The latest National Academy of Sciences prenatal weight gain recommendations are higher for women with a low prepregnancy BMI than for women with a high prepregnancy BMI (*19*). The risk of low birth weight is increased among infants born to women with inadequate weight gain during pregnancy. About 14% of low-birth-weight births in the United States can be attributed to inadequate gestational weight gain (*19*). Adequate weight gain during pregnancy is affected by many variables including socioeconomic factors. Income

[1] Division of Nutrition
National Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control and Prevention
Atlanta, Georgia

[2] Office of Vital and Health Statistics Systems
National Center for Health Statistics
Centers for Disease Control and Prevention
Hyattsville, Maryland

status is an independent predictor of low birth weight (*4*) and may also be related to gestational weight gain (*8*). The prevalence of low gestational weight gain is higher among women with <12 years of education than among women with ≥13 years of education (*20*). The risk of low birth weight decreases among women with at least 12 years of education (*8*).

Maternal Anemia

Anemia, often related to iron deficiency, is very common during pregnancy. During the third trimester, approximately 33% of all pregnant low-income women (*21*) and 41% of low-income black women aged 15–44 years are anemic (*22*). Anemia during pregnancy has been associated with adverse pregnancy outcomes such as low birth weight and preterm delivery (*14,15*); however, this is a controversial issue, and a causal relationship has not been established (*16*). Although anemia during pregnancy often reflects inadequate iron intake, the decreases in hemoglobin levels observed in pregnancy may also be related to normal blood volume expansion (hemodilution). Additionally, in the third trimester, the demand for iron is increased because of the increased fetal growth rate. These normal physiologic demands are reflected in the CDC trimester-specific reference criteria for anemia during pregnancy (*23*).

Alcohol Consumption

Alcohol consumption is associated with poor fetal outcome throughout pregnancy. Although the exact mechanism by which alcohol produces adverse pregnancy outcome is not well understood, alcohol consumption clearly may lead indirectly to poor consumption of nutritious foods, thereby affecting maternal nutritional status (*24*). However, studies have not shown that alcohol consumption causes poor gestational weight gain (*20*) (for additional information about related topics and surveillance activities, see the Behavioral Risk Factors Before and During Pregnancy, Prenatal Care, Low Birth Weight and Intrauterine Growth Retardation, and Infant Mortality chapters).

HISTORY OF DATA COLLECTION

CDC began the Pregnancy Nutrition Surveillance System (PNSS) in 1979. The PNSS collects data on risk factors for low birth weight (<2,500 g or <5 lbs 8 oz) to furnish states with timely information that will help them identify and monitor the prevalence of prenatal nutrition problems and behavioral risk factors related to adverse pregnancy outcomes (i.e., infant mortality and low birth weight) among low-income women.

When the PNSS was established, it included only five states—Arizona, California, Kentucky, Louisiana, and Oregon. By 1990, the number of states reporting data to the system had increased to 18 plus the District of Columbia and Puerto Rico. Currently, 22 states, the District of Columbia, Puerto Rico, and American Samoa report data to the PNSS. The number of surveillance records increased from <10,000 in 1979 to >378,500 in 1991. Although the system has grown, no state has consistently participated in the system every year. The surveillance system was enhanced in 1989 to collect more quantitative information on smoking behavior, alcohol consumption, weight gain, infant feeding practices, income, and federal program participation.

Another source of data on nutrition during pregnancy is the 1980 National Natality Survey (*8*). These data were used by the Institute of Medicine's Subcommittee on Nutritional Status and Weight Gain During Pregnancy, to "determine the independent effects of maternal characteristics on total weight gain" (results and recommendations of the committee can be found in *Nutrition During Pregnancy: Weight Gain, Nutrient Supplements)* (*19*).

The 1988 National Maternal and Infant Health Survey (NMHS) and the 1991 (NMIHS) Longitudinal Followup also provide information on a wide range of nutrition-related variables observed from preconception to early infancy. These variables include the mother's height, gestational weight gain, hemoglobin and hematocrit levels, blood pressure, urine glucose and protein measurements, maternal vitamin and mineral supplementation, receipt of nutrition advice, dietary

habits, and participation in the Special Supplemental Food Program for Women, Infants and Children (WIC). Information on the infant's birth weight, length, head circumference, vitamin and mineral supplementation, and feeding practices is also collected.

The CDC Pregnancy Risk Assessment Monitoring System is a state-specific, population-based survey of women who have recently given birth to live infants. It is conducted on an ongoing basis and represents about one third of U.S. births. This system includes questions on maternal height and weight, maternal weight gain during pregnancy, alcohol consumption, and prenatal nutritional counseling.

CDC SURVEILLANCE ACTIVITIES

The PNSS is designed as a state-based surveillance system. State and territorial health departments and Indian health agencies collect data on pregnant women participating in publicly funded, health, nutrition, and food assistance programs such as the WIC program, prenatal clinics funded by Maternal and Child Health Program block grants, and Commodity Supplemental Food Programs. The data are therefore collected on a convenience population. The WIC program has been the primary source of data for the surveillance system, providing >99% of the records in 1990 (no data are collected from private practices providing prenatal care to high-risk women). Because participation in these programs is based on income, women are eligible for benefits only if their family income is 185% of the poverty level as established by the state and/or federal governments. Therefore, the PNSS includes data on low-income women only.

Data

The state and territorial health departments and Indian health agencies participating in the PNSS collect information using standard questions at the time of women's enrollment into the program and at the postpartum visit. The information is recorded on the program's intake forms and stored in a state master file. Records are submitted quarterly to CDC on computer tapes and diskettes.

Data collected on women include height, weight, and hemoglobin or hematocrit level at enrollment, self-reported prepregnancy weight, total weight gain during pregnancy, parity, and trimester of initiation of prenatal care. Additionally, quantitative information is collected on smoking behavior and alcohol consumption 3 months before pregnancy and at enrollment. Information on smoking behavior and alcohol consumption during the last 3 months of pregnancy is collected on those women who are enrolled in the program at postpartum. Information on income and federal food and medical assistance program participation (e.g., food stamps, Medicaid) is also collected.

Data collected at postpartum include the infant's date of birth, birth weight, sex, status at birth and at postpartum visit, and feeding practices (e.g., breast-feeding and formula feeding), and whether the birth was singleton or multiple.

Variables

PREPREGNANCY WEIGHT

Self-reported prepregnancy weight and measured height are used to calculate prepregnancy BMI. Women are classified into one of four weight categories according to their prepregnancy BMI. The weight categories are based on the criteria recommended by the Institute of Medicine (*19*): underweight, BMI <19.8 kg/m^2; normal weight, BMI 19.8 to 26.0 kg/m^2; overweight, BMI >26.0 to ≤29.0 kg/m^2; and very overweight, BMI >29.0 kg/m^2. These criteria correspond with <90%, 90%–120%, >120%–135%, and >135% of the Metropolitan Life Insurance Company's 1959 weight-for-height standards. In this chapter, we have combined data on women in the overweight and very overweight categories.

GESTATIONAL WEIGHT GAIN

Total gestational weight gain is based on self-reported prepregnancy weight and maximum weight reached during pregnancy. Women are grouped into total gestational weight gain categories at, below, or above the Institute of Medicine's recommended levels (*19*). The recommended weight gain ranges for term gestations (based on prepregnancy weight) are 28–40 lbs for un-

derweight women, 25–35 lbs for normal weight women, 15–25 lbs for overweight women, and at least 15 lbs for very overweight women (*19*).

MATERNAL ANEMIA

CDC criteria, which take into account trimester of pregnancy, smoking status, and altitude, are used to define anemia (*23*). In the first and third trimesters, a hemoglobin level of <11.0 g/dL or a Hematocrit level of <33.0% is used to define anemia in nonsmokers residing at altitudes of <3,000 ft, and a hemoglobin level of <10.5 g/dL or a Hematocrit level of <31.5% is used in the second trimester.

ALCOHOL CONSUMPTION

In 1989, the system began collecting more quantitative information on the number of days per week pregnant women drank alcoholic beverages and the number of drinks they consumed per day.

BIRTH WEIGHT

Birth weight is reported by mothers at the first postpartum visit or at WIC enrollment for their infants. A validity study of maternally reported birth weights among WIC participants showed that very little misclassification of low birth weight occurred in the PNSS when the maternally reported birth weight was verified by birth certificate birth weight data (*25*).

Data Analysis and Reports

CDC generates agency-specific annual summary tables on nutrition-related problems and behavioral risk factors by age and race/ethnicity for each participating state or agency in the system. States also receive a summary table for each reporting county. Participating agencies are encouraged to distribute the reports to the appropriate counties, clinics, and programs for use in planning, management, evaluation, and improvement of maternal health programs. States and agencies are provided assistance in interpreting the data if needed. CDC also aggregates state data to produce a national data set in order to permit national estimates for the PNSS population. Annual reports of national and state estimates are produced. The total number of records in the total data set is used as the denominator to calculate prevalence rates.

GENERAL FINDINGS

In this chapter, we use the PNSS 1990 national data set to discuss general findings concerning the surveillance system population. Trends in prepregnancy weight and anemia are based on the 1979–1990 national data set.

Demographics

In 1990, the median age of women in the PNSS was 23 years, which was approximately the same between 1979 and 1990. About 25% of these mothers were teenagers, 34% were aged 20–24 years, 24% were aged 25–29 years, and 17% were aged 30–44 years. The racial/ethnic distribution of participants in the system was 45% white, 28% black, 21% Hispanic, 2% Asian, 1% Native American, and 3% of unknown racial or ethnic backgrounds. Of the participants who reported educational level, 25% had completed a high school education or greater (18% 12 grades, 7% >12 grades), 15% had completed grades 8–11, and 5% had completed <8 grades. The ethnic and educational makeup of the population probably indicates the income eligibility requirement of the programs that make up the surveillance system. The racial/ethnic and age distribution of the analytical samples may differ from the demographic makeup of the general surveillance population because of missing information on certain variables.

Alcohol Consumption

Approximately 14% of participants in the PNSS in 1990 reported that they consumed alcohol 3 months before pregnancy, whereas only 4% reported that they consumed alcohol during pregnancy (*21*). Mothers who were younger (12–19 years), Hispanic, and Asian had the lowest prevalence of alcohol consumption 3 months before and during pregnancy, whereas Native American and white mothers were more likely to report alcohol consumption during these periods. Although overall estimates were lower than the

prevalence of 20% reported by the 1988 Behavioral Risk Factor Surveillance System (*26*), drinking before and during pregnancy is still a public health problem for the PNSS population, especially Native American (29%) and white (19%) women. Note, however, that not all states collect information on alcohol consumption, and the response rates for those states that do collect information is low. The 1990 PNSS estimates of alcohol consumption before pregnancy were based on only 36% of the records, and estimates of alcohol consumption during pregnancy were based on only 26% of the records.

The 1990 crude incidence of low birth weight among infants born to women who consumed alcohol during pregnancy was 7.1% compared with 6.2% among nondrinkers (*21*). Further, within racial/ethnic groups, infants born to women who drank during pregnancy had a higher incidence of low birth weight than infants born to nondrinkers in the same racial/ethnic group (14.9% vs. 10% for blacks and 6.6% vs. 5.7% for whites). Drinking had a greater effect on low birth weight among black women than among white women. Older women who consumed alcohol during pregnancy were also at a greater risk of having a low birth-weight infant (11.2%) than their younger counterparts. Note that these comparisons were not adjusted for other factors that may affect birth weight, such as cigarette smoking.

Maternal Risk Factors

PREPREGNANCY WEIGHT

Estimates from the 1990 data indicate that 51% of women in the system were classified as having a normal weight according to their prepregnancy BMI whereas about 20% were underweight and 29% were overweight (*21*). Only 6% of the women were classified as being very underweight (BMI <18 kg/m^2,) but 19% were classified as being very overweight (BMI >29 kg/m^2). The percentage of women in the underweight and normal weight prepregnancy weight categories decreased as age increased. The highest prevalence of underweight was observed in younger women and Asian women, whereas older women and Native American women were most likely to be overweight.

Overall, the prevalence of prepregnancy overweight has increased steadily among low-income black, Hispanic, and white women in the United States. This finding is consistent with the overall U.S. trend of increases in the mean BMI of young women (*27*). Although the difference in the prevalence of overweight between these three ethnic groups was very small between 1979 and 1990, blacks have had the highest prevalence of overweight before pregnancy since 1983 (*21*).

GESTATIONAL WEIGHT GAIN

Calculations based on the Institute of Medicine's recommendations for gestational weight gain (*19*) indicate that approximately 39% of women in the PNSS in 1990 gained less than the recommended weight during their pregnancy (*21*). Overall, the percentages of women who gained the recommended amount of weight (28%) or more (33%) were slightly below the national estimates for married women in 1980 (*22*). Asian and Native American women were most likely to gain less than the recommended weight, and Asians were least likely to gain more than the recommended amount of weight. Blacks (34.8%) and Hispanics (34.2%) were equally likely to gain more than the recommended amount of weight. Age did not appear to affect the attainment of recommended weight.

A greater percentage of women who were underweight before pregnancy had a low-birth-weight infant than did normal-weight or overweight women (10.4% for underweight women, 6.8% for normal-weight women, and 5.5% for overweight women) (Table 1). This was true regardless of racial/ethnic group or age-group. The incidence of low birth weight was greatest for infants born to black women who were underweight before pregnancy and was lowest for infants born to normal-weight and overweight Native American women.

Overall, infants born to women who gained less than the recommended amount of weight during pregnancy were at greater risk for low birth weight (10.0%) than were infants born to women who gained the recommended weight (5.9%) or more (3.5%) (Table 1). The incidence of low birth weight was highest for infants born

TABLE 1. Incidence of low birth weight (%), by prepregnancy weight status and gestational weight gain — Pregnancy Nutrition Surveillance System, 1990

	Prepregnancy weight status (%)				Gestational weight gain (%)			
	N	Underweight	Normal	Overweight	N	Less	Recommended	More
Race/ethnicity								
White	87,975	9.9	6.1	4.5	59,974	9.7	5.4	3.3
Black	43,732	13.4	10.2	8.3	24,679	15.8	9.7	5.2
Hispanic	22,173	10.5	6.4	5.8	12,067	9.4	4.9	3.4
Native American	1,719	7.2	4.2	3.7	1,405	5.1	5.4	2.6
Asian and Other	2,706	7.4	5.1	4.5	1,924	7.1	3.7	2.5
Age (years)								
12–19	44,940	10.7	7.3	5.9	27,541	11.7	6.9	3.7
20–24	54,972	9.8	6.3	4.9	35,621	9.6	5.0	3.1
25–29	35,929	10.3	6.1	5.6	22,762	8.9	5.6	3.3
30–44	23,722	11.7	7.8	6.0	14,064	10.0	7.0	4.5
All	159,563	10.4	6.8	5.5	100,049	10.0	5.9	3.5

to black women who gained less than the recommended amount of weight and was lowest for infants born to Asian and Native American mothers who gained more than the recommended amount. Younger women were at a greater risk for delivering a low birth-weight infant than older women only if they gained less than the recommended amount of weight during pregnancy. Adequate weight gain is important in all women; however, the difference in the incidence of low birth weight among infants born to women who gained less than the recommended amount of weight and those gaining the recommended weight or more was more pronounced in black women. These differences are not likely related to race per se but to socioeconomic, geographic, and other factors. Although gaining more than the recommended amount of weight appeared to be beneficial, gaining too much weight during pregnancy may pose other risks, such as fetal macrosomia (*18*), delivery complications, and excess weight retention after pregnancy (*28*).

Use caution when interpreting gestational weight gain data, because prepregnancy weight and gestational weight gain are based on self-reported prepregnancy weight, which can be biased by a woman's current BMI. Overweight women are more likely to underreport their prepregnancy weight (*29*).

ANEMIA

In 1990, the percentage of women who were anemic increased as the trimester of pregnancy at enrollment increased (9.8% in the first trimester, 13.8% in the second trimester, and 33.0% in the third trimester) (Table 2). This pattern indicates decreasing iron stores as pregnancy progresses. The prevalence of anemia was highest for black women at each trimester. Recent evidence suggests that factors other than iron nutrition may contribute to higher rates of anemia among black women (*30*).

Women who were severely anemic during the first and second trimesters of pregnancy were at a greater risk (data were not adjusted for other factors) of having a low birth-weight infant than their nonanemic counterparts, regardless of race/ethnicity or age (Table 3). Overall, women who were severely anemic in the third trimester were at no greater risk of having a low birth-weight infant than nonanemic women. This was not true among black, Hispanic, and younger women who were anemic in the third trimester. Although the incidence of low birth weight was lower among women who were anemic in the third trimester than it was among those who were anemic in the first and second trimesters, the high prevalence of third-trimester anemia for women, especially black women (46%), is of definite concern.

TABLE 2. Prevalence of anemia in women who enrolled in participating clinics at first, second, and third trimesters, by race/ethnicity and age — Pregnancy Nutrition Surveillance System, 1990

	First Trimester		Second Trimester		Third Trimester	
	N	(%)	N	(%)	N	(%)
Race/ethnicity						
White	32,659	6.1	39,337	9.3	24,398	24.6
Black	17,174	16.9	32,015	21.4	17,603	45.8
Hispanic	12,194	9.6	22,791	11.4	11,323	31.9
Native American	439	8.4	687	11.9	399	32.8
Asian and Other	1,800	10.8	2,425	11.8	1,271	26.8
Age (years)						
12–19	16,176	10.8	26,182	15.9	14,281	36.7
20–24	21,484	8.9	33,090	13.5	19,520	32.8
25–29	16,334	10.0	23,048	12.7	12,972	31.5
30–44	11,623	10.0	17,115	12.8	9,307	30.2
All	65,617	9.8	99,538	13.8	56,144	33.0

TABLE 3. Incidence of low birth weight (%) among women who were severely anemic* in the first, second, and third trimesters of pregnancy — Pregnancy Nutrition Surveillance System, 1990

	First trimester		Second Trimester		Third Trimester	
	Anemic	Nonanemic	Anemic	Nonanemic	Anemic	Nonanemic
Race/ethnicity						
White	10.3	5.9	9.0	6.5	6.7	5.6
Black	12.1	10.1	11.7	9.9	7.8	8.4
Hispanic	9.6	6.6	8.0	6.7	4.4	5.3
Native American	†	4.2	†	5.0	†	2.5
Asian and other	†	5.1	†	6.0	†	3.4
Age (years)						
12–19	10.7	7.9	8.6	8.4	6.2	7.3
20–24	10.3	6.4	8.8	6.8	6.6	5.6
25–29	12.6	6.6	12.0	7.1	6.7	5.5
30–44	9.1	7.3	14.3	7.9	8.2	6.5
All	10.7	7.0	10.2	7.5	6.7	6.1

* Hemoglobin and hematocrit cutoff points that are 1 g/dL and 3% lower, respectively, than the CDC criteria.
† Sample size is too small to be reliable.

INTERPRETATION ISSUES

One of the most important issues to consider when using and interpreting PNSS data is that we cannot generalize these data. The surveillance data are collected from a convenience population of pregnant women and not a random sample of the general population. Therefore, the generalizability is limited to the PNSS population. Further, the data are not representative of the total state population because the PNSS is mainly composed of low-income women. The generalizability will vary by state, and in many cases, by county. Within a state, perhaps the most important issue of concern is the total number of records submitted and accepted to the system

in a given year. In general, data are not used in analyses for any state reporting <100 records. Other issues of concern include the enrollment eligibility criteria used and the number of counties and clinics reporting to the system. Often states may change their eligibility criteria because of budgetary constraints. For example, women who have an inadequate dietary intake without anemia may not be enrolled in the program. In such cases, the prevalence of anemia for the population may be lower because of this change in eligibility criteria.

Other limitations include changes in the number of states reporting data to the system; changes in a state's counties and clinics participating in the PNSS; changes in program eligibility criteria within a given county or state; differences in states' eligibility criteria; and increases in the number of records submitted by states.

Despite these limitations, the PNSS is a unique data set in that it is the largest, most diverse (racially, ethnically, and geographically) data set available on low-income pregnant women in the nation.

EXAMPLES OF USING DATA

Overall, PNSS data have enabled states to revise their existing data systems or to develop new data systems that provide more comprehensive and accessible data at the state and local levels. States have also used PNSS data to support legislative recommendations, make budget decisions, and develop program and policy planning activities. State staff supported by the PNSS grant provide other state and local health departments with training about how to use the surveillance data.

Georgia

Georgia used its PNSS grant to help develop and train staff for the new data system for the WIC program. The new data system provides local health departments with immediate information they can use to monitor the health status and behaviors of women enrolled in their health programs. The incidence of specific risk factors for poor pregnancy outcome, such as prenatal weight gain, are reviewed for all local clinics to identify those with a higher-than-expected incidence. As a result, appropriate intervention programs can be developed more rapidly. Also, the data system can assist clinic staff in coordinating services to increase accessibility and therefore improve the continuity of care received by clients.

Massachusetts

Massachusetts is using its PNSS data to conduct quality assurance and outreach programs and to develop smoking cessation interventions. Local agencies in Massachusetts use PNSS data to identify medical charts for audit as part of their clinical quality assurance program. A western Massachusetts prenatal clinic uses PNSS data annually to identify women who deliver low birthweight babies. The medical records for these women are audited to determine if the women were identified as being at risk and, if so, whether appropriate health and nutrition services were provided. To increase participation in both the prenatal clinics and the WIC program, agencies match the prenatal clinic records with WIC program records. Clients with medical records that do not indicate participation in both programs are contacted and offered the services they were lacking. PNSS data are also used by state and local staff to plan, develop, and evaluate smoking cessation programs in Massachusetts. The characteristics of women who quit smoking during pregnancy and those who continue to smoke are being examined to identify key risk factors and to more effectively target interventions. In addition, state staff are using PNSS smoking data to identify local prenatal clinics with a high percentage of smokers. These clinics are provided assistance with planning a smoking cessation program at their sites. State and local staff will use PNSS data to evaluate the effectiveness of smoking cessation strategies.

Indiana

Indiana uses PNSS data in various state and local planning activities. At the state level, the PNSS data are included in the Indiana Department of Health's year 2000 health objectives plan to

increase to at least 75% the proportion of mothers who breast-feed their babies in the early postpartum period and to increase to at least 85% the proportion of mothers who achieve the minimum recommended weight gain during their pregnancies. The PNSS demographic, health status, behavior, and pregnancy outcome data are included in the prenatal needs assessment information submitted in the Indiana Department of Health state plan, the WIC state plan and the Maternal and Child Health block grant application. PNSS data are also used in other grant applications. Future activities planned include a comparison of the pregnancy outcomes of women participating in health department programs with the pregnancy outcomes of all women in the state.

North Carolina

North Carolina uses PNSS data primarily for program planning and evaluation. State and county PNSS reports are prepared annually and are sent to all public health agencies, county boards of health, universities, the Governor's Commission on the Reduction of Infant Mortality, and other state and community groups. PNSS data are also used by the North Carolina Department of Environment, Health, and Natural Resources to conduct needs assessments for various state plans and grant applications; the department's Nutrition Services Section has used PNSS breast-feeding data to make decisions about competitive breast-feeding promotion grants to county health departments. Presentations on special studies using PNSS data have been given at various national meetings; topics have ranged from the influence of maternal weight gain on birth weight among overweight and obese pregnant women to racial differences in the effects of maternal cigarette smoking on infant birth weight among the low-income women.

FUTURE ISSUES

CDC will continue to serve as the major source for national data on nutrition-related problems and behavioral risk factors that are associated with adverse pregnancy outcomes among high-risk, low-income women. These data are needed to help states and federal programs identify and target interventions for women at risk of delivering low birth-weight infants. Such interventions are needed to meet the following year 2000 health objectives related to pregnancy nutrition:

- Objective 2.10: Reduce iron deficiency to <3% among children aged 1 to 4 years and among women of childbearing age.
- Objective 2.11: Increase to at least 75% the proportion of mothers who breast-feed their babies in the early postpartum period and to at least 50% the proportion who continue breast-feeding until their babies are 5 to 6 months old.
- Objective 14.6: Increase to at least 85% the proportion of mothers who achieve the minimum recommended weight gain during their pregnancies.

Future developments will continue to increase states' capacity to conduct nutrition surveillance and thus meet these objectives. Presently, only 22 states, the District of Columbia, Puerto Rico, and American Samoa report data to the PNSS. To increase the quality and quantity of data available to help states and other federal agencies reach these national year 2000 health objectives, we must encourage more states to participate in the PNSS. Future efforts should also include expanding pregnancy nutrition surveillance to encompass non-WIC pregnant women (both low-income and all other women) and to collect data on other important risk factors for poor pregnancy outcome, such as gestational diabetes and dietary intake information. These needs could be meet through collaborative surveillance efforts among a number of divisions within CDC.

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