Preventing Low Birthweight: Summary

Committee to Study the Prevention of Low Birthweight,
Division of Health Promotion and Disease Prevention
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Division of Health Promotion and Disease Prevention
INSTITUTE OF MEDICINE

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NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to the procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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Introduction

Low birthweight is a major determinant of infant mortality in the United States. Infants weighing 2,500 grams (5.5 pounds) or less are almost 40 times more likely to die during their first 4 weeks of life than the normal birthweight infant. In addition, low birthweight survivors are at increased risk of health problems ranging from neurodevelopmental handicaps to lower respiratory tract conditions.

To determine whether opportunities exist to reduce the incidence of low birthweight in this country, the Institute of Medicine convened an interdisciplinary committee in 1983 to study the causes and prevention of premature birth and intrauterine growth retardation, the twin contributors to low birthweight. The committee was asked to define those measures likely to be most effective in preventing low birthweight and to consider their costs in relation to the costs of caring for low birthweight infants. As background to such an analysis, the group was also asked to assess the relationship of low birthweight to mortality and morbidity, to review existing information on the physiological causes of low birthweight and the risk factors associated with it, and to examine trends over time.

The committee concluded that the prevention of low birthweight could contribute significantly to a reduction in infant mortality in the United States and, more generally, to improved child health. Despite many unanswered questions about causation and the interplay of important risk factors, policy-makers and health professionals have enough information at present to intervene more vigorously to improve pregnancy outcome. Useful approaches include placing greater emphasis on identifying and reducing risks before pregnancy, increasing the accessibility of early and regular high-quality prenatal care for all pregnant women, enriching the content of prenatal care and endowing it with sufficient flexibility to meet the needs of both high-and low-risk women, and developing a long-term public information program to convey messages about ways to reduce low birthweight. All of these efforts should be supported by research activities that will increase their effectiveness.

Progress in the directions recommended by the committee will require recognition of the low birthweight problem as an important national issue. This was partially achieved in 1980, when the Surgeon General of the United States specified a reduction in the low birthweight rate as one of the objec

tives for the nation for 1990.* But much more needs to be done. Congress, state governments, professional groups, business and labor organizations, church and women's groups, schools, and the media all have a role to play in improving the health of the nation's infants. The committee recommends that leadership in the effort to reduce the occurrence of low birthweight be assumed by the executive branch of the federal government, especially the Department of Health and Human Services. Such leadership should include an increased commitment of resources to a range of activities likely to decrease low birthweight.

The committee's conclusions and recommendations, and the data supporting them, have been published in a comprehensive report available from the National Academy Press. This summary volume is intended to provide a brief overview of the issues covered in the full report and is directed to health care practitioners, legislators and their staffs, government administrators, and all others interested in the prevention of low birthweight in infants.

Support for the Committee to Study the Prevention of Low Birthweight was provided principally by the Commonwealth Fund, with additional support from the Ford Foundation, the March of Dimes Birth Defects Foundation, the National Institute of Child Health and Human Development, and the National Research Council Fund.

The Low Birthweight Problem

In 1982, 6.8 percent of newborns in the United States were low birthweight (2,500 grams or less), and slightly more than 1 percent were very low birthweight (1,500 grams or less). Low birthweight is an indicator of inadequate fetal growth, resulting from premature birth (duration of pregnancy less than 37 weeks from the last menstrual period), poor weight gain for a given duration of gestation (intrauterine growth retardation), or both.

To determine the consequences for child health of being born at low birthweight, the committee reviewed the literature on the relationships between low birthweight and both mortality and morbidity. Two-thirds of deaths in the neonatal period (the first 28 days of life) occur among infants born at 2,500 grams or less. The risk of mortality increases with decreasing birthweight—the risk of neonatal death is 200 times greater for the very low birthweight infant than for the normal birthweight infant.

The link between birthweight and death in the postneonatal period (between 28 days and 1 year of age) is less pronounced, but still significant. Low birthweight infants are five times more likely than normal birthweight infants to die later in the first year and account for 20 percent of postneonatal deaths.

High rates of low-weight births also contribute to differences in infant mortality found among particular groups of the population in the United States. For example, the higher neonatal mortality rates observed for non

* "By 1990, low birthweight babies … should constitute no more than 5 percent of all live births … (and) no county and no racial or ethnic group of the population (e.g,. black, Hispanic, American Indian) should have a rate of low birthweight infants … that exceeds 9 percent of all live births."[1]

white mothers, adolescent mothers, and mothers with less than a high school education are largely explained by higher proportions of low birthweight infants in these groups.

For postneonatal mortality, the association is somewhat different. Even after controlling statistically for birthweight, postneonatal mortality rates remain higher for nonwhite infants, infants of teenage mothers, and infants of mothers of low educational attainment. Thus, factors typical of socioeconomic disadvantage are linked to increased infant mortality through both higher low birthweight rates and a birthweight independent risk of postneonatal death.

CURRENT TRENDS

Between 1965 and 1980, the infant mortality rate in the United States dropped by almost 50 percent, from 24.7 to 13.1 per 1,000 live births. This decrease has not been matched by a comparable decline in the rate of low birthweight. Between 1971 and 1982, low-weight births declined moderately from 76 to 68 per 1,000 live births. Analysis of national and state data shows that the decline in low birthweight has been confined to the group weighing between 1,501 grams and 2,500 grams. No decline has been observed in the proportion of very low birthweight infants.

Evidence from a variety of sources indicates that the recent decline in infant mortality, especially neonatal mortality, can be attributed largely to improved survival of low birthweight infants, resulting primarily from more specialized hospital-based management through neonatal intensive care programs. The moderate improvement in the low birthweight rate has played a relatively small role. Sustaining the decline in infant mortality will require major new actions to prevent low birthweight—an approach that may well prove to be considerably less costly, both socially and economically, than additional investments in neonatal intensive care.

LOW BIRTHWEIGHT AND MORBIDITY.

Low birthweight infants appear to be at increased risk of a variety of health problems, although the impact of low birthweight on morbidity is less well established than its contribution to mortality.

The association between low birthweight and neurodevelopmental problems, such as cerebral palsy and seizure disorders, was first documented in the 1950s. Low birthweight infants are three times as likely as normal birthweight infants to have neurodevelopmental handicaps, and the risk increases with decreasing birthweight—8 to 19 percent of very low birthweight infants may be severely affected.

The risk of other developmental problems, especially those related to success in school, is more difficult to evaluate. It appears that these problems are more common among children whose birthweights were low for gestational age, but the evidence is not conclusive.

Low birthweight infants also are more likely to have significant congenital anomalies than normal birthweight infants and are more susceptible to conditions such as lower respiratory tract infections. They are also vulnerable to the potential side effects of neonatal intensive care interventions. In

addition to prolonged hospitalization at birth, almost 40 percent of very low birthweight infants are rehospitalized more than once during the first year, for an average of 16 days. This compares with 19 percent of all low birthweight infants for an average of 12.5 days, and 8.7 percent of normal birthweight infants for an average of 8 days.

The birth of a low birthweight infant and the problems that follow may place substantial emotional and financial stress on a young family. The effects of this stress on the well-being of the infant, on the parent-child bond, and on siblings and the marital relationship are still being investigated.

Decreasing Mortality: The Effect on Morbidity

Greater success in saving the lives of low birthweight infants has not increased our burden of babies with handicaps, according to recent studies. The proportion with severe congenital malformations or retarded development remains the same, and there has been a decrease in the proportion of those with less severe problems related to birth. Concern remains, however, about the effects of increased survival of the very smallest infants, those less than 1,000 grams. These survivors constitute a relatively new population that will require long-term follow-up and evaluation.

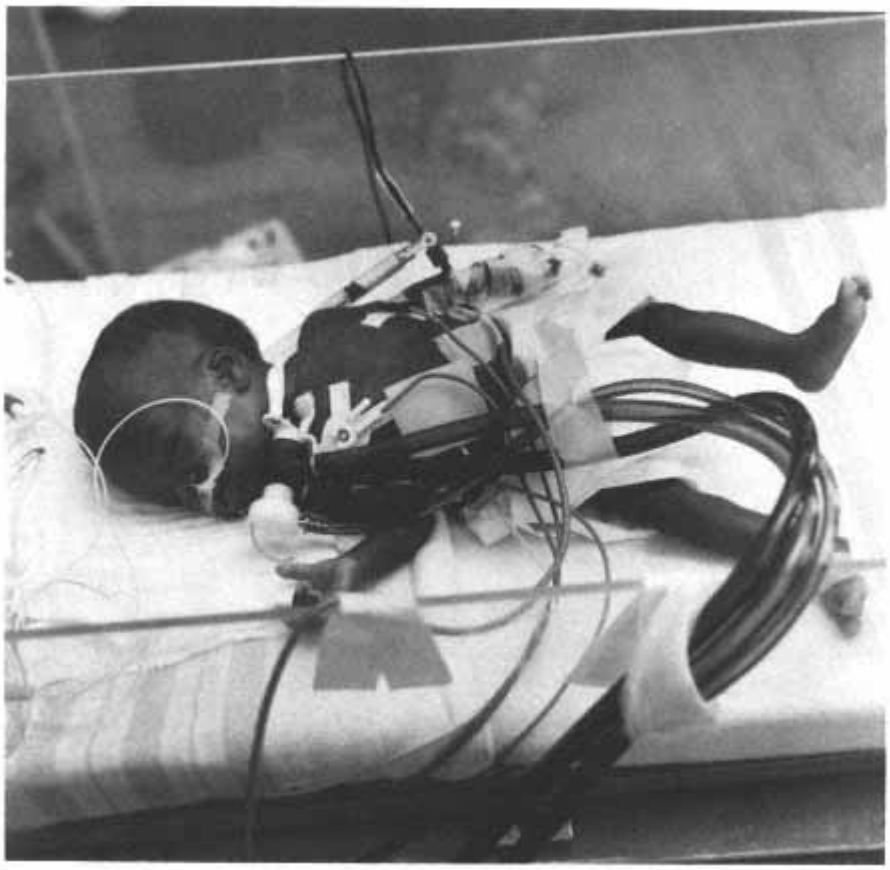
Causes of Low Birthweight

An analysis of the causes of low birthweight must differentiate between those responsible for premature birth and those leading to intrauterine growth retardation (IUGR). Trying to separate the two conditions is complicated, however, because IUGR and prematurity occur together in a substantial portion of low birthweight cases.

The physiological and biochemical events that initiate and maintain normal human labor are not well understood, although recent investigations have produced important new clues about hormonal factors in the process. Theoretical models based on these clues have allowed researchers to begin studying variations from the normal pattern that might lead to premature labor. Certain clinical conditions, discussed in the following section on risk factors, appear to cause changes in the hormonal environment and metabolic state of the uterus and cervix. These changes probably result from complex interactions involving progesterone, estrogen, oxytocin, and other hormones; prostaglandins; calcium ions; adrenergic agents and receptors; catecholamines; and uteroplacental blood flow.

IUGR is associated with conditions that interfere with the blood circulation to and efficiency of the placenta, with the development of the fetus, or with the general health and nutrition of the pregnant woman. In many cases, however, no relevant pathogenic factors can be found. Maternal vascular diseases, such as chronic hypertension, chronic renal disease, or sickle-cell disease, may hamper delivery of nutrients or oxygen to the fetus. Multiple pregnancies may result in IUGR because the placenta cannot supply sufficient nutrients to more than one fetus. Fetal factors associated with IUGR include chromosomal disorders, chronic fetal infections such as congenital rubella and syphilis, and radiation injury. All of these associations suggest

possible pathogenic mechanisms, but the underlying physiological processes have not been identified.



MARCH OF DIMES BIRTH DEFECTS FOUNDATION

RISK FACTORS

In the absence of adequate information about the basic causes of low birthweight, a large body of information has developed about "risk factors," or factors whose presence in an individual woman indicates an increased chance of bearing a low birthweight infant. These factors, which will be outlined further in the following pages, are listed in Table 1. They include demographic characteristics, medical risks that can be identified before pregnancy and those that can only be identified during pregnancy, behavioral and environmental factors, risks associated with health care (such as inadequate prenatal care), and a separate group of factors whose relationship to low birthweight is more tenuous, such as stress, uterine irritability, and inadequate plasma volume expansion.

Grouping the risk factors as noted on the table helped the committee identify those that can be detected before pregnancy and reinforced the concept that interventions can begin before the prenatal period. Smoking is perhaps the best example of this perspective. The grouping also emphasizes the importance of behavioral and environmental risks and the need for interventions that go beyond medical care. The demographic measures can help to define target populations. The cluster of health care factors highlights the fact that not all risks for low birthweight derive from characteristics of

women themselves. And finally, the category of evolving concepts of risk suggests some important research areas. These themes appear throughout the main report.

The committee concluded that a variety of factors are clearly and consistently linked to low birthweight. These factors should be used to help define high-risk groups and to develop and target interventions. It is apparent, however, that the magnitude of risk posed by each factor for an individual or for a group cannot always be calculated easily, that the risks for low birthweight are widely distributed throughout the population, and that a substantial number of low birthweight deliveries will continue to occur outside of groups currently defined as high-risk. These circumstances highlight the need for greater understanding of risk and causation, but should not be used to minimize the value of using existing risk information for targeting interventions.

Demographic Risks

Because the major demographic risk factors are often interrelated, it has been difficult to determine the precise association between any single factor and low birthweight. Nonetheless, careful research is gradually defining the independent effects of many factors.

Race Black newborns are more than twice as likely to weight less than 2,500 grams as white infants. The race-specific low birthweight rates among live births in the United States in 1981 were 12.5 percent for blacks and 5.7 percent for whites. The reasons for the higher risk among blacks are not clear. It has been speculated that maternal age may account for part of the difference—twice as many black births are to teenagers—but when black and white mothers of the same age are compared, blacks are at higher risk of low birthweight in every age group. Similarly, black mothers as a group have less education that white mothers, but when blacks and whites are matched by level of education, blacks still have a higher risk of low birthweight. Other factors that have been studied but fail to account for the white-black differential include delay in initiating prenatal care, smoking status, height and weight distributions of the mother, and obstetric history.

The committee's analysis of national and statewide trends in the whiteblack differential in low birthweight indicates that the gap is not closing. For the United States as a whole, the relative decline in white low birthweight rates between 1971 and 1981 exceeded the corresponding relative decline in black low birthweight rates. White low birthweight rates declined by 14 percent between 1971 and 1981, while black rates declined by only 6 percent. The absolute declines among whites and blacks, however, were more comparable. It appears, therefore, that characterizing trends in the difference between black and white rates of low birthweight depends to some extent on the measures used.

The issue of race and low birthweight is further complicated by the different birthweight-specific neonatal mortality rates of white and black infants. Black infants weighing less than 2,500 grams have long been recognized to have better rates of survival in the neonatal period than white infants of

similar birthweight. Based on this observation, some researchers have suggested that the 2,500-gram marker of low birthweight may not have the same implications for nonwhite infants as for whites; however, this line of reasoning is overshadowed by the more imposing fact that nonwhite infants are twice as likely to be born at low birthweight and twice as likely to die in the neonatal period as white infants.

TABLE 1 Principal Risk Factors for Low Birthweight

I. DEMOGRAPHIC RISKS

A. Age (less than 17; over 34)
B. Race (black)
C. Low socioeconomic status
D. Unmarried
E. Low level of education

II. MEDICAL RISKS PREDATING PREGNANCY

A. Parity (0 or more than 4)
B. Low-weight for height
C. Genitourinary anomalies/surgery
D. Selected diseases such as diabetes, chronic hypertension
E. Nonimmune status for selected infections such as rubella
F. Poor obstetric history including previous low birthweight infant,
G. Maternal genetic factors (such as low maternal weight at own birth)

III. MEDICAL RISKS IN CURRENT PREGNANCY

A. Multiple pregnancy
B. Poor weight gain
C. Short interpregnancy interval
D. Hypotension
E. Hypertension/preeclampsia/toxemia
F. Selected infections such as symptomatic bacteriuria, rubella,
G. 1st or 2nd trimester bleeding
H. Placental problems such as placenta previa, abruptio placentae
I. Hyperemesis
J. Oligohydramnios/polyhydramnios
K. Anemia/abnormal hemoglobin
L. Isoimunization
M. Fetal anomalies
N. Incompetent cervix
O. Spontaneous premature rupture of membranes

IV. BEHAVIORAL AND ENVIRONMENTAL RISKS

A. Smoking
B. Poor nutritional status
C. Alcohol and other substance abuse
D. DES exposure and other toxic exposures, including occupational hazards multiple spontaneous abortions
E. High altitude

V. HEALTH CARE RISKS

A. Absent or inadequate prenatal care
B. Iatrogenic prematurity

VI. EVOLVING CONCEPTS OF RISK

A. Stress, physical and psychosocial
B. Uterine irritability
C. Events triggering uterine contractions
D. Cervical changes detected before onset of labor and cytomegalovirus
E. Selected infections such as mycoplasma and Chlamydia trachmatis
F. Inadequate plasma volume expansion
G. Progesterone deficiency

The conclusion to be drawn from the complicated data on race, low birthweight, and race-specific birthweight mortality rates is that the reasons for the risk differentials between white and black newborns are not well understood. The cumulative effects over time of black poverty and lower social status, and the interaction of such factors with biological processes, undoubtedly have played a role in these racial differences; other factors remain to be defined. Research should be pursued to improve our understanding of these important issues.

Age Teenage mothers and those age 35 years or older have higher rates of low birthweight than mothers in their twenties and early thirties. The risk is highest for young mothers, especially among whites; however, childbearing in the teen years is more prevalent among blacks. In 1980, 211 percent of all black births were to teenagers, compared with 12.1 percent of white births and 15.3 percent of Hispanic births.

Studies indicate that young age is not an independent risk factor for low birthweight. Teenage mothers have many other characteristics that increase the likelihood of a low-weight birth. They are more likely to be black, of low socioeconomic status, and unmarried than older mothers. Also, they are shorter and lighter, less educated, and more likely to report late for prenatal care than their older counterparts.

Socioeconomic Status Low socioeconomic status (SES), measured in terms of social class, income, education, or census tract, is clearly associated with an increased risk of preterm delivery and IUGR. The literature suggests that at least some of the excess risk arises from separate factors linked both to low social class and low birthweight. These include smoking, low maternal weight gain and short stature, obstetric complications such as hypertension and preeclampsia (a toxic condition of late pregnancy), some types of genitourinary tract infections, and limited access to high-quality prenatal care. The effect of socioeconomic status probably represents the sum of many factors, each of which may increase the risk of poor pregnancy outcomes.

Education The risk of low birthweight declines sharply among mothers with at least 12 years of education. The relationship between education and low birthweight is independent of maternal age and race. The committee's analysis of national data indicates that the gap in low birthweight rates among mothers with different levels of education is not closing and may be widening. This finding is especially important given that the educational attainment of mothers has increased significantly during the past 10 to 15 years. The widening gap suggests that the poorly educated may constitute an increasingly high-risk group.

Marital Status Unmarried mothers have a consistently higher risk of bearing a low birthweight infant than those who are married. This risk is not attributable to differences in age or race. In 1980, the low birthweight rate for infants born to unmarried mothers was 11.6 percent, compared with 5.8 percent for babies whose mothers were married. The significance of marital status as a risk factor is underscored by the increase in childbearing among unmarried women. Between 1976 and 1981, the proportion of white mothers reported to be unmarried increased from 7 percent to 12 percent; for blacks, the proportion increased from 51 percent to 56 percent.

Medical and Obstetric Risks

Medical and obstetric risks for low birthweight can be divided between those detectable before pregnancy, such as chronic illness in the mother or a history of poor pregnancy outcome, and those that can be noted only during pregnancy, such as placenta previa. The committee focused on a subset of

these problems: hypertension/preeclampsia, diabetes, obstetric history (including previous induced abortion), multiple pregnancy, and infection.

Hypertension/Preeclampsia Hypertension is the disease most often associated with fetal growth retardation; it also can be associated with preterm delivery. In one study population in the 1970s, researchers found that 27 percent of IUGR with an identifiable cause could be attributed to severe preeclampsia, chronic hypertensive vascular disease, or chronic renal disease.[2] Infants with IUGR were born to 30 percent of patients with a diagnosis of chronic hypertension and to 46 percent of patients with severe preeclampsia. Elevated maternal blood pressure also may cause preterm labor (often precipitated by premature detachment of the placenta), or necessitate medical intervention to deliver the baby and thereby avoid more serious problems.

Diabetes Maternal diabetes mellitus is frequently associated with babies born large for gestational age, but the disease also may lead to IUGR or preterm delivery. In the past, diabetes-related premature births often resulted from physician interventions to avoid unexpected intrauterine death. These early deliveries were appropriate in some cases but not in others. Improved management of diabetes and new techniques to assess fetal wellbeing, gestational age, and lung maturity have reduced the number of unnecessary early deliveries associated with maternal diabetes. Premature delivery may still be necessary in some cases, however, for pregnant women with insulin-dependent diabetes complicated by diabetic vasculopathy. In such women, preterm delivery may be required because of worsening maternal retinopathy, nephropathy, or hypertension.

Increasing evidence indicates that poor control of maternal diabetes during the early weeks of embryonic development may contribute both to poor fetal growth and congenital defects. Researchers have shown that excellent control of diabetes before conception and during the early weeks of pregnancy can decrease the risk of fetal malformation, [3] but the effects of such control on fetal growth have not been explored.

Obstetric History The history of a woman's previous pregnancies is of prime importance in the prediction of a subsequent low birthweight infant. A detailed study of the weights and gestational ages of all births in Norway from 1967 through 1973 showed that a premature first birth is the best predictor of a premature second birth and that growth retardation in a first pregnancy is the most powerful predictor of growth retardation in a second pregnancy.[4] Previous fetal and neonatal deaths also are strongly associated with preterm low birthweight, and the risk increases as the number of poor fetal outcomes increases.

The effect of the interaction between maternal age and birth order on low birthweight has been well documented. The incidence of low birthweight is high for women between 15 and 19 bearing their second or later child, low for women age 25 to 34 bearing their third or later child, and increases sharply among women having their first child after age 29.

Special tabulations on 1981 live births performed for the committee by the National Center for Health Statistics show that interval between pregnancies

also affects low birthweight. The risk is sharply elevated for an interval of less than 6 months, decreases moderately from 6 months to between 24 months and 36 months, and then rises gradually. However, short interpregnancy interval is not associated with an increased risk of low birthweight if the previous pregnancy ended in a fetal death.

Previous Induced Abortion Because about 1,500,000 legal induced abortions occur annually in the United States, the committee believed it was important to assess the impact of such procedures on the incidence of IUGR and preterm delivery in subsequent pregnancies. A review of the literature showed that:

- the risk of low birthweight or preterm delivery in a pregnancy following one that is terminated by vacuum aspiration abortion in the first trimester (the most common abortion procedure in the United States) is no greater than the risk of adverse outcome expected for a first pregnancy; and
- the effect of multiple abortions on subsequent pregnancies is unclear; some studies have shown an increased risk of low birthweight and others have not—the outcome may depend on the type of abortion procedure performed. There is some concern that abortion techniques requiring cervical dilatation of more than 12 millimeters may lead to problems of cervical incompetence, and therefore an increased risk of prematurity in subsequent pregnancies.

The committee concluded that research is needed to investigate further the relationship of induced abortion to the outcome of future pregnancies.

Multiple Pregnancy Pregnancies with twins, triplets, or more carry an increased risk both of preterm delivery and low birthweight. Even at full term, infants in plural deliveries are 11 times more likely to be of low birthweight than singleton deliveries. Neonatal mortality also is greatly increased in multiple pregnancies, and morbidity is high among survivors.

Infections A variety of infections have been linked with both preterm delivery and intrauterine growth retardation. For some infectious agents, a causal role in low birthweight has been established; for others, the association is less clear. Many of these infections can be prevented or treated, reducing the risk of an adverse pregnancy outcome.

Congenital rubella syndrome and cytomegalovirus infection, both commonly associated with congenital defects, also can cause intra-uterine growth retardation. The incidence of rubella virus infection in the United States and the number of congenitally infected newborns have decreased significantly since the introduction of the rubella vaccine.

Untreated or inadequately treated symptomatic urinary tract infections are known to cause a variety of problems for both mother and fetus, including low birthweight. Pregnant women with no symptoms of such infections (asymptomatic) should be screened routinely for bacteriuria (the presence of bacteria in the urine), because symptomatic infections can be prevented in most patients by treatment of asymptomatic infections. Culture techniques are inexpensive and easy to use; patients with known infections can be taught to culture their urine at home.

Another organism that may lead to low birthweight as a result of maternal

genitourinary infection is mycoplasma. In one recent study, mycoplasma-infected women treated with a 6-week course of erythromycin showed a markedly reduced incidence of low birthweight.[5] More research is needed to confirm this effect and to explore its significance.

Some researchers believe that certain genital pathogens may trigger preterm labor, as well as affect intrauterine growth. To explore these relationships further, future studies must examine comprehensively the flora of the cervix and vagina, identify local and systemic immune responses, and assess their combined influence on pregnancy outcome.

Nutrition.

Four types of research have been used to examine the effect of nutrition during pregnancy on birth outcomes: animal studies, human war famine studies, nutritional intake/fetal outcome correlational studies, and experimental nutrition intervention studies. They all point to the common conclusion that good nutrition has a positive influence on birthweight, but the extent of the effect is unclear. The magnitude of nutritional effects on low birthweight is not easily assessed because nutritional status is difficult to isolate from other socioeconomic characteristics and because of the complicated relationship between prepregnant weight and weight gain during pregnancy. While researchers have found positive relationships between birthweight and nutritional status, there is wide variability in the degree of these associations. A reasonable conclusion is that poor nutritional status before pregnancy and inadequate nutrition during pregnancy have a negative impact on fetal weight gain, thereby increasing the risk of IUGR.

One recent study explored the relationship between a mother's weight gain during pregnancy and the occurrence of low birthweight by analyzing data from the 1980 National Natality and Fetal Mortality Surveys. The investigators found that many groups of women known to have an increased risk of delivering a low birthweight infant also were more likely to have inadequate weight gains. For example, they found that black mothers were twice as likely as white mothers to gain less than 16 pounds during pregnancy. In addition, mothers 35 years of age or older and teenage girls were less likely to gain at least 16 pounds, as were unmarried women, poorly educated women, and women of lower socioeconomic status. A further analysis of numerous risk factors among white mothers only indicated that, except for period of gestation, weight gain has the strongest impact on birthweight. [6]

BEHAVIORAL AND ENVIRONMENTAL RISKS

Smoking Smoking is one of the most important and preventable determinants of low birthweight in the United States. A recent survey of the literature on smoking and birthweight indicates that smoking during pregnancy is associated with a reduction in birthweight ranging from 150 to 250 grams. This relationship has persisted for at least 20 years, despite reported reductions in the average tar and nicotine yields of cigarettes on the market.[7] The reasons for the detrimental effects of cigarette smoking are not fully understood, but the fact that an estimated 20 to 30 percent of pregnant women in the United States smoke underscores the importance of this risk factor.

Alcohol Use The data on maternal alcohol consumption and its association with low birthweight are not as uniform as for smoking. It is reasonably certain that pregnant women who drink heavily are at risk of delivering a baby with fetal alcohol syndrome—characterized by IUGR and a variety of other problems. The impact of moderate alcohol use is less clear. A 1983 review of the literature suggested that regular drinking of fewer than two drinks per day probably is not an important determinant of IUGR,[7] but two more recent studies contradict this conclusion. In one, a prospective study of 30,000 pregnancies, women who drank one or two drinks per day proved to have an increased risk of IUGR even after the figures were adjusted for maternal age, race, education, marital status, and a variety of other risk factors.[8]

Uncertainty over the effects of alcohol on fetal development warrants caution: the Surgeon General of the United States has advised pregnant women not to drink alcoholic beverages.

Iatrogenic Risks

Iatrogenic prematurity refers to the birth of a physiologically immature and/or low-weight infant who is delivered prematurely as a result of medical intervention. Some cases are justifiable—the decision to end a pregnancy early may be made to avert more serious consequences for the mother or infant—but others are practitioners' mistakes. Studies conducted in the early and mid-1970s found that from 4 to 8 percent of infants admitted to neonatal intensive care units in three cities had been born prematurely as a result of labor inductions and electively timed cesarean sections.[9–11]

Accurate prenatal assessment of gestational age, combined with selected use of ultrasound examination and new techniques to test fetal lung maturity, could reduce the number of cases of accidental Iatrogenic prematurity. Iatrogenic prematurity also could be reduced by decreasing the number of primary and repeat cesarean sections.

Evolving Concepts of Risk

A desire to improve the health care professional's ability to identify pregnant women at risk of a low-weight birth has led researchers to study a variety of other possible risk factors. Those described in the full report include stress, uterine irritability and the notion of “triggering factors,” certain cervical changes detected before labor begins, inadequate plasma volume expansion, and progesterone deficiency. The first three factors only are outlined below.

Stress The relationship between socioeconomic status and low birthweight suggests that a woman's response to her environment may have an impact on pregnancy outcome; it may be, for example, that poverty is a risk factor for low birthweight because of the high levels of stress associated with being poor. Two types of stress have been examined in numerous studies: physical stress and fatigue, particularly as related to employment during pregnancy, and psychological distress resulting from maternal attitudes toward the pregnancy or from external stressors in the environment.

Major studies of physical stress (usually in a work-related setting) indicate

that there may be some association between low birthweight (both IUGR and prematurity) and activities that require long periods of standing or other significant amounts of physical stress. There is no conclusive evidence, however, that maternal employment per se increases the risk of low birthweight.

HEALTHY MOTHERS/HEALTHY BABIES COALITION

Numerous reports suggest a link between stress and conditions that increase the risk of IUGR and pre-term labor, such as preeclampsia, but relatively little data exist to support a strong, direct relationship between maternal psychological stress and low birthweight. Some data link psychological stress to a number of other poor pregnancy outcomes such as fetal distress, neonatal motor immaturity, perinatal deaths, and congenital anomalies.

Research in this area is plagued by a variety of problems, including the absence of a clear measure, or marker, of stress. Many studies suffer from a major methodological flaw—the stress is not assessed until after the event. This introduces the potential for recall bias, which could increase the reporting of stress among mothers with poor pregnancy outcomes. Also, concepts and definitions of stress vary substantially among studies, and sample sizes are often too small to isolate specific outcomes such as low birthweight. Finally, most current projects evaluating the effects of stress fail to control for smoking, a major correlate of low birthweight.

Uterine Irritability The concept of uterine irritability and the possibility that certain external factors can stimulate or "trigger" uterine contractions are just beginning to be explored. Some studies suggest that excessive uterine activity may be a component of the events leading to preterm labor. For example, in a recent study comparing the rhythm of uterine contractions in the latter part of pregnancy over a 24-hour period in normal pregnancies and in pregnant women at high-risk of preterm labor, the women with normal pregnancies were found to have long periods during which the uterus was quiet each night. In contrast, the high-risk women had uterine activity throughout the 24-hour cycle.[12] Assessing the extent of uterine activity could be part of the surveillance of pregnant women at risk of preterm labor. Similarly, it may prove prudent to advise high-risk women to avoid those activities (which vary among individual women) that stimulate uterine contractions.

Cervical Changes Recently, interest has grown in increasing the number of cervical assessments made in later pregnancy in order to identify changes that occur several days and sometimes even weeks before the onset of preterm labor. The presence of a short cervix or dilatation may lead the clinician to initiate some form of intervention to forestall preterm labor. Some prenatal care specialists advocate regular pelvic exams in later pregnancy to

detect these changes, but others have expressed concern that these exams might lead to premature rupture of the membranes or other problems. No conclusive data exist on the risks of frequent cervical exams prior to term.

RISK ASSESSMENT

In an effort to use risk factor data to help structure prenatal care for pregnant women, researchers have developed a variety of techniques to measure risk status, including scoring systems (risk assessment instruments) to distinguish women at high-risk of preterm labor and/or IUGR from women at low risk. The committee examined the predictive capabilities of 13 risk classification systems; a complete description of the results appears in the main report. An important finding was that the majority of these systems correctly identify as high-risk about 65 percent or more of those pregnancies with eventual adverse outcomes.

In addition to distinguishing high-risk from low-risk women, well-constructed risk assessment systems have the potential to reduce the misdiagnosis both of IUGR and preterm labor and are helpful additions to clinical judgement in evaluating the risk of low birthweight. They also offer the possibility of grouping risk factors by their preventability or modifiability, thereby suggesting possible interventions. And risk assessment systems can encourage more appropriate referrals for care and more reasonable resource allocations for the management of preterm birth.

The limitations of these instruments also must be recognized. First, because the performance of a risk assessment instrument is to some extent dependent on the prevalence in a population of the adverse outcome being assessed, it is unlikely to produce the same results in every setting. Second, the instrument is a statement of probability only and cannot be viewed as a definitive predictor for a specific woman. Third, the instrument cannot be used in a rote manner to substitute for high-quality professional care. The not infrequent occurrence of low birthweight deliveries in low-risk women suggests that additional research is needed to improve the predictive capability of these systems. It also indicates that clinicians must be alert to the possibility of low birthweight even in pregnant women judged to be at low risk of such an outcome.

RESEARCH

A major theme that emerges from the voluminous information on the causes and risks of low birthweight is the critical need for additional research in many areas. In particular, our understanding of the physiological processes involved in premature labor and IUGR is seriously inadequate. Efforts to prevent low birthweight will remain limited until more is known about basic causal mechanisms.

In addition, more research is needed on specific risk factors, not only those somewhat speculative in nature, but also those clearly linked to low birthweight. For example, little is known about the ways in which race exerts an effect on birthweight, and prevention strategies aimed at certain other risk factors, such as alcohol abuse, could be improved if there were a better definition of the magnitude of risk at various levels of consumption. Studies

of evolving concepts of risk should focus on both the nature and the magnitude of the risk. Stress, various infections, inadequate plasma volume expansion, uterine irritability, and the other, somewhat speculative risk factors noted earlier are potentially very important in the development of low birthweight and merit careful study.

For both known and less certain risk factors, efforts should be made to distinguish risks for very low birthweight (1,500 grams or less) from risks for moderately low birthweight (1,501 to 2,500 grams) at various gestational ages. These subcategories of low birthweight may be associated with different causal mechanisms and health consequences and therefore may require different preventive interventions.

Improved understanding of low birthweight also will depend on more timely data analysis and reporting (particularly of vital statistics data) and on greater uniformity of reporting procedures and terminology across states. In addition, high priority should be given to more detailed studies of selected cohorts of pregnant women, because vital record data alone do not provide sufficient information on important aspects of maternal behavior (such as smoking) and pregnancy history or on the content of prenatal care.

All of these efforts will contribute to improvements in the science of risk assessment, among other benefits. Additional ways to strengthen the impact of risk assessment include: establishing more uniform outcome definitions to allow comparisons among risk assessment systems, testing of various risk assessment methods in the same population, testing of individual risk assessment instruments on populations other than those contributing to their development, and designing systems to permit some degree of individualization of the risk score.

Opportunities for Prevention.

Against a background of the data summarized briefly above on trends in low birthweight and on associated causes and risks, the committee outlined several approaches to reducing the occurrence of low birthweight in infants. The next several sections describe those strategies found most promising and feasible.

Planning for Pregnancy

Numerous opportunities exist before pregnancy to reduce the incidence of low birthweight, yet these are often overlooked in favor of interventions during pregnancy. In a fundamental sense, healthy pregnancies begin before conception. Therefore, the committee emphasizes the importance of prepregnancy risk identification, counseling, and risk reduction; health education related to pregnancy outcome generally and to low birthweight in particular; and full availability of family planning services, especially for low-income women and adolescents.

PREPREGNANCY RISK IDENTIFICATION AND REDUCTION

Among the risk factors that can be recognized and addressed before pregnancy are certain maternal chronic illnesses, smoking, moderate-to

heavy alcohol use, inadequate weight for height, poor nutritional status, susceptibility to rubella and other infectious agents, age (under 17 and over 34), the possibility of a very short interval between pregnancies, and high parity.

For some of these factors, reducing the risk before conception may offer more protection than doing so once pregnancy has been established. For example, the famine studies following World War II demonstrated the importance of adequate nutritional status during the period immediately before pregnancy.[13] Similarly, some chronic maternal illness such as hypertension or diabetes presents a less serious risk to both mother and fetus if the condition is adequately controlled before pregnancy. Also, reducing high levels of alcohol and tobacco consumption before conception may exert more of a protective effect with regard to low birthweight than reduction during pregnancy.

Accordingly, some experts have suggested that more attention be given to prepregnancy counseling aimed at detecting risk factors and intervening, where possible, to reduce them. Prepregnancy counseling is especially important for women who already have experienced a poor pregnancy outcome. As noted earlier, when a woman has had a preterm birth or a baby with IUGR, the risk of the same problem in subsequent pregnancies increases substantially. Health care professionals should pay special attention to risk factor identification and reduction in these women.

Prepregnancy consultations should be available from a variety of professionals in different settings. Obstetricians and gynecologists, nurses and nurse-midwives, family planning personnel, and primary care providers generally should be made aware of the importance of prepregnancy risk identification. Pediatricians, in particular, have an important role to play. For example, in working with families having a child born at low birthweight, pediatricians and related health care providers can counsel about risk reduction if a future pregnancy is anticipated. Also, in caring for adolescent girls, pediatricians and other primary care providers have an opportunity to reduce selected risks (for example, by immunizing against rubella) and to introduce basic concepts of planning for pregnancy.

Realizing the benefits of prepregnancy risk identification will require widespread education of both health care professionals and the general public about this concept. Success also will depend on the willingness of third-party payers to reimburse for such services and on the availability of health resources to manage problems once they have been identified. Further research is needed to define these prepregnancy services further and to determine their effectiveness.

ENLARGING THE CONTENT OF HEALTH EDUCATION

A second strategy available before pregnancy involves health education related to reproduction. Education about reproduction, contraception, pregnancy, and associated topics already is provided in a variety of ways: through public information campaigns; in school-based classes, group sessions, lectures, and related printed materials; and in various health care settings. To increase the impact of these education programs on the problem

of low birthweight, they should be expanded to include the following six topics:

1. a description of the principal factors that place a woman at risk of poor pregnancy outcome, including low birthweight;
2. the general concept of reducing specific risks before conception and the advisability of counseling before pregnancy to identify and reduce risks associated with low birthweight;
3. the importance of early pregnancy diagnosis and of early, regular prenatal care (including how to obtain such services);
4. the importance of immunizing against rubella and of identifying other infection-related risks to the fetus;
5. the value of altering behavior to reduce a range of risks associated with low birthweight, including smoking, poor nutrition, and moderate-to-heavy alcohol consumption; and
6. the heightened vulnerability of the fetus to environmental and behavioral dangers in the early weeks of pregnancy, often before pregnancy is suspected or diagnosed, and therefore the need to avoid x-rays, alcohol and drug use, selected toxic substances, and similar threats in the first 3 months of pregnancy.

These health education themes should be included in a variety of health care settings, including family planning clinics where many women of reproductive age receive care. National organizations of family planning providers should promote the use of educational materials encompassing these themes, particularly for their clients who are considering becoming pregnant. Private practitioners also should offer comprehensive health education related to reproduction, incorporating these same topics.

Of equal importance are the sex education and family life education curricula and teaching materials of schools. Although these issues may be discussed in some settings, the little information available on school-based health education suggests that they are of low priority.

THE ROLE OF FAMILY PLANNING

Family planning services should be an integral part of overall strategies to reduce the incidence of low birthweight. Several studies suggest that family planning has made a considerable contribution to reducing the infant mortality rate in the United States over the past 20 years and has also played a role in the gradual decrease in the rate of low birthweight.

Family planning helps to decrease the occurrence of low birthweight by reducing the number of births to women with a variety of high-risk characteristics, including extreme youth or age, a large number of previous births, chronic severe hypertension, severe heart and kidney diseases, and other risk conditions. These services also reduce the probabilities of a low-weight birth by increasing the interval between births for many women; an interval of less than 6 months is associated with a sharply elevated risk of low birthweight.

The committee explored the concept that family planning also reduces low birthweight by increasing the proportion of pregnancies that are intended

and wanted at the time of conception. It is apparent, for example, that both teenagers and unmarried women experience higher than average rates of low birthweight; they also report higher rates of unintended pregnancies. It has been suggested that a woman who has planned for and welcomes her pregnancy will follow the health practices necessary to increase the chances of a successful pregnancy outcome more adequately than a woman with an undesired pregnancy. Recent data from the 1980 National Natality Survey support this thesis. In the portion of that survey focused on married women only, wantedness of pregnancy had a strong relationship to seeking prenatal care. Women who wanted a child at the time they became pregnant were more likely to receive care early in pregnancy than were those who would have preferred to have had a child at a later time. Women who had not planned to have another child showed the most delay in seeking prenatal care. These factors accounted for about a third of the black/white differential in the number of prenatal visits.[14]

Unmet Need for Family Planning

The large number of unintended pregnancies in the United States, the percentage of women at risk of unintended pregnancy who do not use contraception, and the number of abortions indicate that existing family planning strategies are not fully adequate. The reasons for this problem range from service inadequacies to the knowledge, attitudes, and practices of individual couples.

The unmet need appears to be largest among two groups at particularly high-risk of low birthweight, the poor and the young. It has been estimated that in 1981, about 9.5 million low-income and 5 million sexually active teenagers needed subsidized (i.e., supported at least in part by public funds) family planning care, but over 40 percent of both groups did not obtain medically supervised contraceptive care.[15]

For this reason, the committee emphasizes the importance of Title X of the Public Health Service Act. Title X authorizes project grants to public and private nonprofit organizations for the provision of family planning services to all who need and want them, including sexually active teenagers, but with priority given to low-income persons. The committee urges that federal funds be made generously available to meet the documented need for family planning. The Title X program and family planning services generally should be regarded as important parts of the public effort to prevent low birthweight.

The prevention of unwanted pregnancies in sexually active adolescents, particularly those under 17 who are unmarried, should receive special attention. Infants born to members of this group have substantially higher rates of low birthweight, neonatal mortality, and postneonatal mortality and morbidity than infants born to older mothers.

The Impact of Prenatal Care

After a comprehensive review of the literature on the value of prenatal care, the committee concluded that the overwhelming weight of the evidence is that prenatal care reduces low birthweight. This finding is strong

enough to support a broad, national commitment to ensuring that all pregnant women in the United States, especially those at medical or socioeconomic risk, receive high-quality prenatal care.

PRENATAL CARE STUDIES

SUZIE FITZHUGH

In reaching this conclusion, the committee reviewed two groups of studies designed to determine the value of prenatal care in the prevention of low birthweight. The first group consisted of studies involving large data sets, usually a year of live births in a large geographic area or in the nation as a whole. The second included studies evaluating the impact on pregnancy outcome of specific programs offering prenatal care and related services. Conclusions drawn from both classes of studies are limited by a variety of problems inherent in all studies of the effectiveness of prenatal care. These problems, detailed in the full report, involve difficulties in research design, inadequate definitions of the content of prenatal care, selection bias, and other issues.

The committee noted that a major theme of virtually all the studies reviewed is that prenatal care is most effective in reducing the chance of low birthweight among high-risk women, whether the risk derives from medical factors, sociodemographic factors, or both. This finding has important implications for targeting interventions; it also suggests that differences in the risk status of various study populations may partially explain variations in the prenatal care effects observed across studies.

All of the studies reviewed that are based on large numbers of cases, particularly those using vital statistics data, show that prenatal care exerts a positive effect on birthweight. Unfortunately, because content of prenatal care is not defined carefully in many of these studies, it is not possible to trace the benefits of care to specific aspects of the total care package.

More variation exists among the results of studies evaluating special programs, although the majority show that prenatal care is associated with improved birthweight. Those special programs that have shown positive impact on birthweight usually offer prenatal care that goes beyond more routine services to include flexible combinations of education, psychosocial and nutrition services, and certain clinical interventions such as careful screening for medical risks and a rapid response to the first signs of early

labor. The successful projects also offer a package of services that often is carefully defined and described in written standards.

The limited impact of prenatal care suggested by some of the special programs may result from the fact that the care was not organized to address what is now known about the causes and risks of low birthweight. For example, the care may not have focused on such factors as smoking reduction, adequate weight gain, reducing alcohol and other substance abuse, patient and provider education about prevention of prematurity, or specific medical risks associated with low birthweight, such as bacteriuria.

EFFECT OF PRENATAL CARE ON HEALTH CARE EXPENDITURES

The economic impact of prenatal care and other strategies to reduce low birthweight is difficult to evaluate because adequate cost information is rarely available. Nevertheless, informed public policy requires consideration of the costs as well as the benefits of proposed health promotion strategies.

The committee found that while it was not possible to complete a formal cost-effectiveness analysis of each of the strategies it recommended to reduce low birthweight, it was possible to estimate some of the financial implications of providing prenatal services to certain groups of high-risk pregnant women.

The committee defined a high-risk target population of women with less than a high school education and on welfare, who often do not begin prenatal care in the first 3 months (trimester) of pregnancy. The current low birthweight rate in this group is about 11.5 percent. The committee estimated the increased expenditures that would be required to provide routine prenatal care to all members of the target population from the first trimester to the time of delivery. These expenditures were compared with savings that could be anticipated through a decreased incidence of low birthweight resulting from the improved utilization of prenatal care by the target population. These savings were estimated for a single year and consisted of initial hospitalization costs, rehospitalization costs, and ambulatory care costs associated with general illness. The many assumptions that shaped these calculations are detailed in the report.

The analysis showed that if the expanded use of prenatal care reduced the low birthweight rate in the target group from 11.5 percent to only 10.76 percent, the increased expenditures for prenatal services would be approximately equal to a single year of cost savings in direct medical care expenditures for the low birthweight infants born to the target population. If the rate were reduced to 9 percent (the 1990 goal set by the Surgeon General for a maximum low birthweight rate among high-risk groups), every additional dollar spent for prenatal care within the target group would save $3.38 in the total cost of caring for low birthweight infants requiring expensive medical care.

The committee emphasizes that net savings in government expenditures is a limited criterion. A society concerned with the health and productivity of all its citizens might well choose to reduce low-weight births through additional investments in prenatal care or other approaches even if the budgetary outlays were to exceed savings.

Ensuring Access to Prenatal Care

Efforts to reduce the nation's incidence of low birthweight must include a commitment to enrolling all pregnant women in prenatal services early in pregnancy. Ironically, many of the women who now receive inadequate prenatal care are those who would benefit the most from such services—those at greater than average risk of a low birthweight delivery. In addition, recent evidence suggests that the trend throughout the 1970s toward improved use of prenatal services, particularly by high-risk women, may have come to a halt. National, state, and local data indicate that the proportion of mothers beginning prenatal care in the first trimester of pregnancy increased steadily from 1970 to 1980, but that this trend has levelled off or possibly reversed since 1981. The committee views with deep concern the possibility that the nation's progress in extending prenatal benefits to all women has been disrupted.

The committee believes that full access to prenatal care will require a fundamental assumption of responsibility by the public sector for making such services available. Federal leadership will be critical to achieving this policy goal, but states also must attach high priority to prenatal care. At both levels, full support of the private sector and a greater commitment of public funds will be required.

DEFINING THE PROBLEM

If prenatal care is to become available to all pregnant women, the population of women receiving inadequate or no prenatal care must be defined, circumstances analyzed to reveal why these women receive insufficient care, and then ways found to remove the barriers. After reviewing numerous studies, the committee concluded that the major barriers to early receipt of prenatal care fall into the following six categories:

- financial constraints such as inadequate insurance or lack of Medicaid funds to purchase care;
- limited availability of maternity care providers, particularly providers willing to serve socially disadvantaged or high-risk pregnant women;
- insufficient prenatal services in some sites routinely used by high-risk populations, such as Community Health Centers, hospital outpatient clinics, and health departments;
- experiences, attitudes, and beliefs among women that make them disinclined to seek prenatal care;
- poor or absent transportation and child care services; and
- inadequate systems to recruit hard-to-reach women into care.

FINANCIAL CONSTRAINTS

Numerous studies have shown that the availability of funds to cover the costs of prenatal care influences women's decisions about seeking such services. Efforts to eliminate financial barriers can take many forms, including making private health insurance more affordable for those without coverage who do not qualify for Medicaid, increasing support for public

agencies that serve socioeconomically disadvantaged groups, and improving Medicaid coverage of prenatal care. The committee chose to focus on the Medicaid program, the largest public program financing prenatal care.

Medicaid Coverage The Medicaid program is a crucial element in reducing the occurrence of low birthweight, partly because of its capacity to reduce financial barriers to care generally and thereby to increase the proportion of low-income women seeking prenatal care. The program is also of great significance because of the characteristics of Medicaid recipients themselves. Medicaid-eligible pregnant women are typically poor and single and often have other risk factors as well, such as low-weight for height and short intervals between pregnancies.

Medicaid prenatal benefits have also been shown in a few studies to be cost-effective. For example, in California, extending an improved set of Medicaid prenatal benefits to selected low-income women between 1979 and 1982 was found to be cost-effective because it was associated with savings in the costs of caring for low-weight infants.[16]

Support of the Medicaid program should be part of a comprehensive effort to reduce the nation's incidence of low birthweight. Changes in the program, a topic of considerable controversy in both Congress and state governments, should be dedicated to enrolling more eligible women in the program and to providing them with early and regular, high-quality prenatal care.

The Health Care Financing Administration (HCFA), in collaboration with the Division of Maternal and Child Health (DMCH), should establish a set of generous eligibility standards that maximize the possibility that poor women will qualify for Medicaid coverage and thus be able to obtain prenatal care. All Medicaid programs should be required to use such standards. In particular, eligibility standards should provide Medicaid coverage for pregnant, indigent women, regardless of their family composition or the employment status of the chief breadwinner in the family unit.

Further, Medicaid policies and reimbursement rates should reflect the high-risk nature of the Medicaid-eligible population. Program policies should not set a limit on the number of prenatal visits, because these women may require more frequent visits and more specialized care than low-risk women. DMCH should develop a model of prenatal care for use in publicly financed facilities; the model should be adopted by all Medicaid programs and be used to help structure reimubrsement policies. HCFA and appropriate state agencies should monitor adherence to this standard of care.

Maternity Care Providers.

Assessing whether there are enough prenatal care providers is a complicated task, in part because several different groups are involved. Although obstetrician/gynecologists perform the majority of deliveries, family physicians and general practitioners perform almost 20 percent, and about 2 percent are managed by certified nurse-midwives. Moreover, a substantial amount of prenatal care (as distinct from deliveries) is provided by nurse-midwives, nurse practitioners, and public health nurses. The committee limited its investigation to two provider groups: obstetrician/gynecologists, because they offer the majority of maternity services, and a combined group

consisting of certified nurse-midwives and obstetrical nurse practitioners, because they often care for socioeconomically disadvantaged women who are at elevated risk of low birthweight.

MARCH OF DIMES BIRTH DEFECTS FOUNDATION

Obstetrician/Gynecologists The number of private physicians providing prenatal care is inadequate in many parts of the country; of equal concern is the finding that the participation rate of obstetrician/gynecologists in Medicaid is relatively low and may be decreasing. This limits the number of private practitioners available to care for high-risk, low-income women.

To overcome this problem, the committee recommends that HCFA develop a series of demonstration/evaluation projects aimed at increasing the participation of obstetrician/gynecologists in Medicaid. Approaches should include reducing delays in reimbursement, increasing reimbursement rates, and increasing the number of prenatal visits reimbursed by Medicaid. The results of these projects should be vigorously disseminated to policy leaders.

To the extent that provider attitudes are found to impede Medicaid participation, local and national professional societies, including the American College of Obstetricians and Gynecologists, should undertake appropriate education to urge members to increase their Medicaid patient loads.

Nurse-Midwives and Obstetrical Nurse Practitioners Certified nurse-midwives and obstetrical nurse practitioners have been shown to be particularly effective in managing the care of pregnant women who are at highrisk of low birthweight because of social and economic factors. These health care providers tend to relate to their patients in a nonauthoritarian manner and to emphasize education, support, and patient satisfaction. For example, several studies have shown that women served by nurse-midwives are more likely to keep appointments for prenatal care and to follow specified treatment regimens.[17]

The committee recommends that more reliance be placed on nurse-midwives and nurse practitioners to increase access to prenatal care for hard-to-reach, often high-risk groups. Maternity programs designed to serve high-risk mothers should increase their use of these providers; and state laws should be supportive of nurse-midwifery practice and of collaborations between physicians and nurse-midwives/nurse practitioners.

Insufficient Prenatal Care Services

Closely related to the issue of financial barriers and poor provider availability is the evidence that in some communities there is an inadequate number of organized facilities, particularly publicly financed ones, providing prenatal care to pregnant women who are unable or unwilling to use the private care system. Often these are women who traditionally have relied for care on

facilities such as Community Health Centers, Maternity and Infant Care Projects, hospital outpatient departments, and health departments.

The importance of such facilities derives not only from their capacity to provide prenatal care to groups often outside of the private practice system, but also from the fact that there are populations that may be better served by public facilities offering a range of services than by physicians in private practice, who traditionally provide only medical care. The poor and the very young, as well as those not yet part of the mainstream culture, such as recent immigrants, may benefit especially from the outreach activities, social work, and nutritional counseling often provided in such settings.

The committee emphasizes the important function of these organized facilities, especially local health departments, in the effort to increase access to prenatal care. Health departments are singled out for detailed discussion in the main report because virtually every person in the United States lives in an area that is served by one, and because they are known to be active providers of prenatal care. In fact, national and state data indicate that reliance on health departments for maternity care has increased in the 1980s. To address the unmet needs for prenatal care, health departments should be given increased resources. Every community is different, however, and in some it may be more appropriate to provide additional support to Community Health Centers, Maternity and Infant Care Projects, hospital outpatient departments, or related settings.

Women's Experiences, Attitudes, and Beliefs

Access to prenatal care also is affected by a pregnant woman's perceptions of whether care is useful, supportive, and pleasant; by her general knowledge about prenatal care; and by her cultural values and beliefs. Some women may fail to seek prenatal care early because they lack information about the symptoms of pregnancy, the facilities that could assist them, or the importance of early care in averting the complications of pregnancy.

Other women may resist seeking prenatal care because of a language barrier, because of cultural beliefs that women should receive prenatal care only from other women, because of conflicts over the life-style changes required to maintain a healthy pregnancy (e.g., reducing smoking and heavy drinking), because of a desire to conceal the pregnancy, or because of previous unfortunate experiences with the health care system.

Two major strategies exist to overcome these barriers: general education about prenatal care and the development of a personal, caring environment in which to offer prenatal services, especially for socioeconomically disadvantaged women. The following attributes should be built into this environment: (1) respect for patients—their questions, problems, and time; (2) accessibility, including easy availability of telephone consultations; (3) continuity of care in the patient-provider relationship; (4) small size or decentralization to avoid the feeling of a large, impersonal bureaucracy; (5) responsiveness to the concerns that are most salient to women in early pregnancy, such as first trimester nausea and recognition of the need for emotional support and acceptance; (6) flexibility in the definition of services—encouraging providers to help women obtain nonmedical benefits; and (7) an understanding of cultural barriers.

Transportation and Child Care

Provision of transportation and child care services should be viewed as an integral part of prenatal care for low-income populations. Distance and difficulty in arranging babysitting for other children can lead women to put off seeking care unless an emergency occurs.

Increasing the Capacity for Outreach

Sometimes health care programs must do more than provide an open door. They must take the initiative to find and educate women about the importance of care. Two strategies employed to accomplish this task involve the use of outreach personnel and the forging of referral relationships with other service systems.

Outreach Personnel In the field of maternity services, outreach personnel generally perform one or more of the following tasks: identifying women requiring services and enrolling them in prenatal care, acting as an intermediary between these women and the provider system to ensure access to needed services, and establishing ties to other social services to address the nonmedical needs of pregnant women. The committee believes that the use of outreach workers is an effective way to improve access to care for difficult-to-reach populations. More research is needed, however, on the comparative advantages of different case-finding approaches, the costs of different outreach systems and their effectiveness, and the types of personnel best suited to various program goals and target groups.

Program Links Bringing hard-to-reach women into care also can be accomplished by forging strong referral relationships between prenatal services and other programs that are in touch with potential clients. The Special Supplemental Food Program for Women, Infants and Children (WIC) is a good example of a program that can lead to increased use of prenatal care. WIC prenatal participants must document their pregnancy status, which can lead to entry into a prenatal care network. Also, WIC sites are often located in neighborhood or county health centers, adjacent to prenatal care clinics, and WIC personnel actively encourage prenatal care during nutritional counseling.

A SYSTEM OF ACCOUNTABILITY

The committee believes that although many different factors contribute to the problem of inadequate access to prenatal care, an underlying cause is the nation's patchwork, nonsystematic approach to making prenatal services available. Although numerous programs have been developed in the past to extend prenatal care to more women, no institution bears responsibility for ensuring that such services are available to those who need them. Without a structure of accountability, gaps in care will remain and efforts to expand prenatal services will continue to face major organizational and administrative difficulties. The committee recommends that federal and state governments take specific actions to assume such responsibility.

Government Actions.

The federal government has long been on record as supporting prenatal care. For example, the 1980 Public Health Service report *Promoting Health/Preventing Disease: Objectives for the Nation* sets specific goals for reducing the number of women who receive inadequate prenatal care and for eliminating variations among groups in access to such services.[1] To meet or exceed these goals, the committee believes that the federal government should take the following specific actions:

- provide sufficient funds to state and local agencies to remove financial barriers to prenatal care (through channels such as the Maternal and Child Health Services Block Grants, Medicaid, health departments, Community Health Centers, and related systems);
- provide prompt, high-quality technical consultation to the states on clinical, administrative, and organizational problems that can impede the extension of prenatal services;
- define a model of prenatal services for use in public facilities providing maternity care; and
- fund demonstration and evaluation programs and support training and research in these areas.

States should take a complementary leadership role in extending prenatal services. This could be accomplished by designating one organization—probably the state health department—as responsible for ensuring that prenatal services are available and accessible in every community. Through such an organization, each state should:

- assess unmet needs for prenatal care;
- serve as a broker to contract with private providers to fill gaps in services; and
- where necessary or preferable, provide prenatal services directly through facilities such as Community Health Centers and health department clinics.

In addition, the state should designate a local organization in each community to be the "residual guarantor" of services—to arrange for care for pregnant women who still remain outside of the prenatal care system. In many areas, the local health department would logically fill this role.

System Development

To begin the development of a functioning system of responsibility and accountability, the committee recommends that the Secretary of the Department of Health and Human Services convene a task force charged with defining a system for making prenatal services available to all pregnant women. Such a group must include representatives from Congress, the Public Health Services, HCFA, state governments and health authorities, maternity care providers, and consumers.

This task force should focus on four specific issues: (1) how to bring together the knowledge and general goals of maternal and child health programs with the "financial power" of the Medicaid program; (2) what can

be learned from existing experience with the regionalization of perinatal services; (3) how to make state and national data systems more useful in assessing unmet need for prenatal services and, more generally, in monitoring the impact of various maternal and child health programs; and (4) how to ensure that prenatal care is financed adequately in times of cost containment, when preventive services often lose the competition for dollars.

Improving the Content of Prenatal Care

Participation in conventional prenatal care programs is associated with a reduced incidence of low birthweight. The committee believes, however, that enhancing the content of prenatal care could increase its contribution to the development of healthy infants. This section focuses on ways to strengthen prenatal care for all women, for women at elevated risk of preterm delivery, and for women at elevated risk of intrauterine growth retardation (IUGR). It also examines interventions closely associated with prenatal care that may help to reduce low birthweight, including smoking reduction programs, nutritional services, and stress alleviation approaches. Finally, recommendations are made for specific actions on content of care issues by the federal government and by professional societies representing the major maternity care providers.

REVISIONS IN CARE FOR ALL PREGNANT WOMEN

The committee has identified seven components of the prenatal care offered to all pregnant women that merit increased emphasis in the effort to improve pregnancy outcome generally and to prevent preterm delivery and IUGR in particular.

1. *Establishing Specific Goals* Greater efforts to organize prenatal care around explicit goals can help focus the attention of the patient on the purposes of the prenatal visits and engage her more in her own care. The process of establishing goals also can help the practitioner to structure appropriate interventions and to consider the combination of prenatal services that should be provided to each pregnant woman.

   Defining the prevention of low birthweight as a major goal of prenatal care may require adjustments in clinical practice. For example, reducing the risk of prematurity or IUGR may require more emphasis on screening and counseling early in pregnancy. At present, prenatal care seems particularly oriented toward the prevention, detection, and treatment of problems that are manifested in the third trimester, particularly preeclampsia—thus the emphasis on blood pressure monitoring, screening for proteinuria, attention to possible edema, and increased frequency of prenatal visits toward the end of pregnancy. By contrast, the goal of preventing low birthweight requires additional attention during the first and second trimesters especially, to screening, diagnosis, and treatment, as early as possible, of conditions that predispose to preterm labor or IUGR, such as smoking and poor nutritional status. Many of the other aspects of prenatal care outlined below also merit attention early in pregnancy, such as the education topics.

2. *Risk Assessment* Prenatal care should include formal identification and evaluation of risk. This should be a dynamic process that begins at the first visit and is attentive to developing problems throughout pregnancy. Risk assessment can help to increase the flexibility of prenatal care, which is especially important for women in socially disadvantaged, high-risk groups; set packages of prenatal care often do not address their multiple problems. It can also help ensure that certain problems and risk factors are both detected and managed properly.
3. *Pregnancy Dating* Accurate dating of pregnancy is a cornerstone of good prenatal care. Without it, a clinician is less able to detect intrauterine growth retardation, to determine if labor is premature and the extent of the prematurity, or to avoid accidental prematurity following labor induction or an elective cesarean section.

   The minimum data required to determine gestational age include the date of the last menstrual period, uterine size by pelvic exam during the first trimester, the time of quickening, the first time fetal heart tones are heard without amplification, and serial fundal height measurements after 20 weeks gestation.
4. *Ultrasound Imaging* A federal consensus development conference in 1984, sponsored jointly by the National Institutes of Health and the Food and Drug Administration, concluded that available data do not support routine ultrasound examination of all pregnancies, but identified almost 30 specific situations in which ultrasound is useful. [18] Among these are many indications relevant to the prevention of low birthweight. For example, when a uterine size/date discrepancy occurs, ultrasound can help establish gestational age.
5. *Detection and Management of Behavioral Risks* Prenatal care should include explicit attention to detecting and managing behavioral risks associated with low birthweight, especially smoking, nutritional inadequacies, and moderate-to-heavy alcohol use. In many settings, intervention options to overcome these problems are limited to physician or nurse counseling; in others, more formal programs are available on a referral basis.
6. *Prenatal Education* Health education for women who are pregnant or contemplating pregnancy should be expanded to include greater emphasis on behavioral risks in pregnancy, early signs and symptoms of pregnancy complications such as preterm labor, the role that prenatal care plays in improving the outcome of pregnancy, and related topics detailed in the main report.

   Unfortunately, prenatal care education and counseling services are often inadequate, particularly for high-risk groups. Problems that may interfere with effective education of pregnant women include the short time typically scheduled for each prenatal visit, third-party reimbursement policies that pay for diagnostic and therapeutic procedures but ignore provider costs related to patient education, and lack of patient-education interests and skills on the part of many physicians. In many settings, nurses and related personnel may be more appropriate than physicians as providers of prenatal education.

   Childbirth education classes have not been shown to have an impact on the incidence of low birthweight, probably because they usually begin in the third trimester of pregnancy and focus primarily on labor and delivery. To

increase their role in the prevention of low-weight births, these classes should begin earlier, place greater emphasis on the prenatal period and the risk factors described above, and make a greater effort to enroll women from lower socioeconomic groups.

7. *Health Care System Factors* Prenatal care providers should organize their programs to manage a wider variety of patient problems and risk factors than is usually possible in many prenatal care settings, particularly those in the private sector. Nutritional counseling, psychosocial counseling, strategies to modify smoking and other health-compromising behaviors, and related services should be provided directly or through a well-organized referral system. In addition, care should be provided in a comfortable atmosphere that underscores the importance of two-way communication—patients should receive full answers to questions about their pregnancies and should be encouraged to report relevant symptoms or problems.

PRENATAL CARE FOR WOMEN AT HIGH RISK OF PRETERM DELIVERY

Information on the causes of low birthweight and the risk factors associated with it has led to the development of several innovative programs designed to prevent preterm delivery. Those described in the committee's report include the March of Dimes Birth Defects Foundation's Multicenter Prevention of Preterm Delivery Program, which originated at the University of California at San Francisco; the Los Angeles Prematurity Prevention Program, implemented in selected health centers that provide prenatal care for the Harbor-UCLA Medical Center; and the French Prematurity Prevention Program, which started in the early 1970s in Haguenau, France.

Preliminary data from these and other programs suggest several enrichments to basic prenatal care that may increase the likelihood of full-term births to women at high-risk of preterm delivery:

- repeated risk assessments;
- expanded patient education; and
- increased provider education.

A woman who is at higher than average risk of preterm labor may benefit from repeated risk assessment as her pregnancy proceeds. In particular, women who have been defined as high-risk because of a previous preterm

birth or mid-pregnancy loss may require additional cervical assessments in the second half of pregnancy to check for early signs of dilatation or effacement. The committee is aware that the value and risks of repeated pelvic examinations in later pregnancy have not been clearly assessed.

Women at elevated risk of preterm delivery should also be offered special education about the factors associated with prematurity; the importance of early detection of the symptoms of preterm labor, such as bleeding and periodic contractions; how to detect mild uterine contractions and how to differentiate normal contractions that often occur throughout pregnancy from those signaling early labor; and what to do when the signs and symptoms of preterm labor appear, including how to contact an obstetric care provider for consultation and help. Efforts to arrest preterm labor (such as use of tocolytic drugs, described below) hinge on its early detection and prompt management.

High-risk women also should be taught to identify and lessen events in their daily lives, such as physical stress and strenuous exercise, that can trigger uterine contractions, which in turn might lead to preterm labor. The research data supporting such advice are still tentative, but common sense and clinical judgment support such caution.

To complement patient education, provider education should include increased emphasis on the importance of being receptive to patients' complaints, some of which may indicate early signs of preterm labor; the uses of hospitalization for women with suspected preterm labor; and the various approaches available for arresting true preterm labor, such as tocolysis.

Tocolysis involves the use of specific drugs to inhibit preterm labor. The one such agent licensed for use in the United States is ritodrine hydrochloride. Widespread experience with tocolysis indicates that it can be beneficial in some individual cases of threatened preterm labor, but that the current generation of tocolytic drugs does not offer a long-term solution to the problem of prematurity. Some patients with preterm labor have medical or obstetric complications that caution against the use of tocolytic drugs, and in some situations delivery may be in the best interests of the mother or fetus. Important side effects can follow the use of tocolytic agents; rarely, complications may be life-threatening or even fatal.

The number of cases in which tocolytic intervention is successful would probably increase if patients and providers were better informed about the early signs and symptoms of preterm labor, the vital importance of early diagnosis, and the appropriate use of tocolytic drugs. Currently, only about one-third of pregnant patients who arrive at the hospital in preterm labor are suitable candidates for this form of therapy.

PRENATAL CARE FOR WOMEN AT HIGH RISK OF INTRAUTERINE GROWTH RETARDATION

Many of the risk factors linked to preterm labor also are associated with IUGR; thus, some aspects of prenatal care that help to avoid one type of low birthweight also may help prevent the other. For example, careful risk assessment is as important for IUGR detection and treatment as it is for prevention of prematurity.

Unfortunately, the data available to suggest new clinical directions for

IUGR reduction are more limited than those for preterm delivery. The literature suggests simply that clinicians caring for pregnant women at elevated risk of IUGR should place extra emphasis on:

- reduction of behavioral risks such as smoking and alcohol use;
- nutritional surveillance and counseling—maternal preconception weight and weight gain during pregnancy, especially during the third trimester, are important determinants of birthweight; and
- early diagnosis and effective management of IUGR through accurate assessment of gestational age and fetal growth and maturity; ultrasonography can help in meeting such goals.

PROGRAMS COMPLEMENTARY TO PRENATAL CARE.

Because many of the risks associated with low birthweight have a behavioral basis, the committee examined selected interventions designed to reduce these risks, including smoking reduction strategies and nutritional intervention programs such as the Special Supplemental Food Program for Women, Infants and Children (WIC). The committee also evaluated stress and fatigue abatement approaches, although the evidence that these factors contribute to low birthweight is controversial. The interventions reviewed are not, strictly speaking, components of prenatal care, but they should be adjuncts to more routine prenatal services.

Smoking Reduction

The committee urges that efforts to help women stop or reduce smoking in pregnancy become a major concern of obstetric care providers. About 20 to 25 percent of women who smoke at the beginning of pregnancy quit on their own at some time during the 9 months. Controlled studies suggest that aggressive intervention programs can encourage up to 30 percent more to stop.[19]

Several themes derived from the literature on smoking intervention programs can aid practitioners in establishing effective strategies:

- counseling by a woman's physician or other primary clinician appears to be among the most effective intervention strategies for the pregnant smoker—group counseling appears to be less effective;
- social support appears to be a critical factor in changing smoking behavior—spouses or partners and other family members should be involved in intervention efforts;
- smoking reduction deserves high priority, but prenatal care providers should be reasonable in their expectations of the pregnant woman—she is probably being asked to make many changes in her life at a time when she may be unusually tired and anxious about a range of sexual and social changes associated with pregnancy and planning for a new baby;
- the mass media can play a motivating and reinforcing role in encouraging changes in smoking habits, but are probably insufficient as the sole approach. Cigarette labels that explicitly warn of the dangers of smoking during pregnancy should supplement other public information strategies; and

- research on smoking and pregnancy should receive high priority—important topics include how to structure interventions to reach specific high-risk groups, the motivations of women who do stop successfully during pregnancy, the role of social supports such as the spouse, and how to encourage continuation of nonsmoking behavior after delivery.

Nutritional Intervention: WIC

The data on nutrition and pregnancy outcome support the view that nutritional assessment and services should be major components of high-quality prenatal care, especially for women at elevated risk of IUGR. Accordingly, the committee examined the value of the Special Supplemental Food Program for Women, Infants and Children (WIC), which provides one of the principal data sets demonstrating the importance of nutrition to birthweight and represents a major public investment in the nutritional well-being of women and children. WIC is a three-part intervention program involving supplemental food, nutritional counseling, and close ties to prenatal services for nutritionally and financially high-risk women. Evaluation studies have shown that WIC participation is associated with improved pregnancy outcome, including increased birthweight among babies of participating women.[20, 21] The results also seem to indicate that longer periods of participation in the program during pregnancy (i.e., more than 6 months) are associated with greater weight gains.[21]

Based on such studies and others reviewed in the main report, the committee recommends that nutritional supplementation programs such as WIC be part of a comprehensive strategy to reduce the incidence of low birthweight among high-risk women and that such programs be closely linked to prenatal care.

Stress and Fatigue Reduction

A variety of approaches have been organized to reduce the amount of stress experienced by pregnant women. Some are concerned primarily with physical stress and fatigue, others more with psychosocial and emotional stress.

The prematurity prevention program in France, mentioned earlier, emphasizes reduction in physical stress for women with several risk factors (especially a history of preterm delivery, incompetent cervix, or a particularly strenuous life-style). These women may be advised to take a leave of absence from their jobs or get additional help at home.

The prematurity prevention program at the University of California at San Francisco addresses psychosocial and physical stresses simultaneously. Through a continuing education program, nurses are taught to recognize excessive fatigue or anxiety in their maternity patients and to help the women find solutions to their problems. High-risk patients also receive psychological support during pregnancy from a member of the "Preterm Labor Support Group," which consists of other women who have experienced preterm labor.

Another potentially important stress reducing intervention is maternity leave. The patchwork arrangement in this country of sick leave, disability

leave, leave without pay, and other leave categories is not adequate to provide job security for pregnant women and new mothers who participate in the labor force. The committee recognizes that revision of maternity policies is a complicated issue, but suggests that more adequate maternity leave, particularly for certain high-risk women, could contribute to a reduction in low birthweight, among other benefits. At a minimum, labor unions, women's groups, and health professionals should explore this issue.

ENCOURAGING CHANGE IN PRENATAL CARE

To encourage the provision of improved, more flexible prenatal services, particularly for women at high-risk of low birthweight, the committee recommends four specific strategies:

- The professional societies that represent the principal maternity care providers should carefully review the suggestions made by the committee regarding prenatal care to determine whether their general guidelines for clinical practice should be revised and enriched accordingly.
- The Division of Maternal and Child Health (DMCH), in concert with both consumer and professional groups concerned with prenatal care, should define a model of services to be used in publicly financed facilities that provide care to pregnant women. This model should be updated and revised frequently to incorporate new knowledge and experience, and should not be used in a way that discourages research on improved approaches to prenatal care.
- The professional societies of the major maternity care providers should undertake programs to educate their members about the prenatal care issues highlighted by the committee. Suggestions for continuing education strategies are outlined in the complete report.
- Third-party reimbursement policies should reflect the common need of high-risk women for more intensive prenatal services, the importance of prenatal care being tailored to the needs of individual women and thus variable in its content, the value of counseling and education to reduce behavioral risks such as smoking, and the importance of ancillary services such as transportation to health care facilities. The federal model of prenatal care should emphasize these themes; and labor unions, businesses, and other organizations should incorporate them into negotiations over health insurance benefits.

RESEARCH NEEDS

Major progress in reducing low birthweight will require a far more sophisticated understanding of prenatal care content than now exists. Research on the content of prenatal care should be a high funding priority for foundations, public agencies, and institutions concerned with improving maternal and child health. This research should focus on three major areas: (1) description and analysis of the current composition of prenatal care, (2) assessment of the efficacy and safety of numerous individual components of prenatal care, and (3) evaluation of certain well-defined combinations of prenatal care interventions designed to meet the widely varied needs and risks among pregnant women.

MARCH OF DIMES BIRTH DEFECTS FOUNDATION

Current Prenatal Care.

The Assistant Secretary for Health should take the lead in organizing activities to increase our knowledge of current prenatal care practices. Existing surveys conducted by the National Center for Health Statistics could include a special emphasis on prenatal care content. Consumer experience with prenatal care should be analyzed and the professional societies of the major maternity care providers should be consulted about ways to survey their members regarding various content issues. In some instances, direct studies of provider practices may be necessary.

Individual Components of Care

During its study, the committee compiled a long list of research topics involving specific interventions in prenatal care. They are listed in the full report and span both clinical topics and environmental/behavioral topics.

Combinations of Interventions

Both public and private institutions should support studies to assess the effectiveness of well-defined combinations of prenatal interventions in reducing low birthweight and improving infant health generally. In particular, these studies should assess the merits of different prenatal care strategies for women at elevated risk of prematurity or IUGR.

Too often, research on prenatal care has been oriented toward the broad question of whether it improves pregnancy outcome. The appropriate goal now is to identify the components and combinations of prenatal services that are effective in reducing specific risks for well-defined groups of women.

A Public Information Program

The committee believes that a carefully designed, long-term public information program could contribute to the prevention of low birthweight. Such a program could help create a climate in which change and progress are possible and also convey specific types of information. Following a review of the basic elements that constitute a successful health information campaign, the committee sketched the broad outlines of a program directed at preventing low birthweight.

The plan incorporates two major objectives. The first is to call the problem of low birthweight to the public's attention and to reinforce its importance with the nation's leaders. The second is to help reduce low birthweight by conveying a set of ideas to the public about avoidance of important risk factors.

PUBLIC AWARENESS

Public awareness of the low birthweight problem is heightened by the release periodically of major reports by a variety of public and private organizations interested in maternal and child health. These reports, aimed at the nation's opinion leaders, are major resource documents for administrators, planners, legislators, and the news media.

Because reports compiled and disseminated by the federal government often receive particularly widespread attention, the committee recommends that the office of the Assistant Secretary for Health develop and publicize a report every 3 years on the nation's progress in reducing low birthweight. This report should explore trends in low birthweight and present new information on causes and risks for both prematurity and intrauterine growth retardation (IUGR). Successful programs to combat low birthweight should be described and research priorities outlined. The development, presentation, and dissemination of the report should be managed to reach as many concerned groups and individuals as possible. Additionally, the annual statistical profile of the nation's health developed by the National Center for Health Statistics, *Health: United States,* periodically should include a special supplement or profile on low birthweight and its prevention.

AN INFORMATION CAMPAIGN

Defining the audience is a crucial step in any public information program. The committee considered carefully whether such a program on preventing low birthweight should focus on only a few target groups or on the population generally and again reviewed the literature on risk factors and causes of preterm labor and IUGR. Because many of the risk factors for low birthweight are widely distributed throughout the population, and because a substantial amount of low birthweight occurs among women judged to be at low risk, the committee concluded that the program should embrace a broad audience. Within this program, however, a special subset of messages should also be developed to reach three high-risk target groups: pregnant smokers, young teenagers, and socioeconomically disadvantaged women.

Overall, the public information initiative should have two themes: (1) planning for pregnancy and (2) adopting good health practices in the

childbearing years, especially during pregnancy; in the full report, several more specific topics are suggested. Messages based on these themes should be developed and market tested to ensure their acceptability to a wide variety of audiences. Television, radio, and the print media should be used extensively, as should educational materials prepared for use in health care settings and schools. The committee urges that particular attention be given to the possibility of integrating health-related messages into the story lines of television shows; many high-risk women are members of groups that are known to watch daytime television, especially soap operas.

This public information program clearly needs an organizational home and strong leadership. The committee urges that the leadership responsibility be assumed by the Healthy Mothers, Healthy Babies Coalition, a 4-year-old consortium of voluntary, professional, and governmental groups. The coalition should establish a formal executive secretariat to provide stability and permanence. Both public and private funds should be provided to the coalition in amounts adequate to the task of leading a major public information campaign. Activities should include the production and distribution of high-quality, well-tested public information materials.

The committee emphasizes that this public information initiative should be only one element in a more comprehensive program to reduce low birthweight. Public messages stressing the importance of prenatal care must coincide with a commitment to making prenatal care more accessible, just as messages to decrease smoking in pregnancy must be reinforced and elaborated in individual office and clinic settings. To be successful, the information campaign must carry scientifically accurate messages and receive full social and political support.

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