

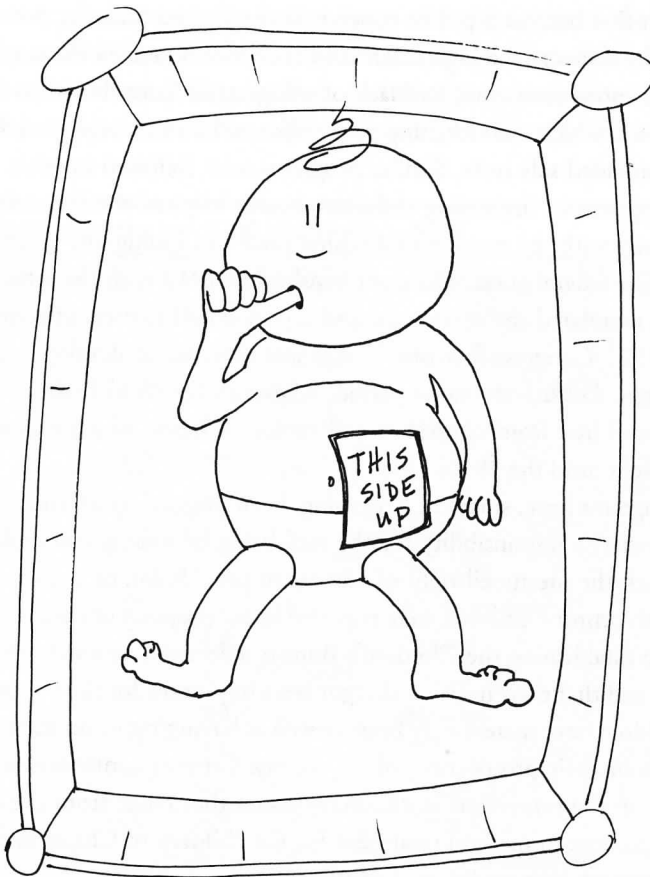
INTRODUCTION TO Public Health

Third Edition



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Maternal and Child Health as a Social Problem



The "Back to Sleep" Campaign

The health of pregnant women and children is traditionally one of the highest priorities of public health. In a society concerned with the welfare of its population, everyone should be guaranteed adequate conditions for the best possible start in life. The fetal and infant stages of development provide the foundations of good health throughout life. There is increasing evidence that conditions in utero and during early life play a powerful role in increasing individuals' susceptibility to the chronic diseases that plague American adults, including high blood pressure, obesity, cardiovascular disease, and diabetes.¹ Moreover, because children are the most vulnerable segment of the population, like canaries in the coal mine, they are the first to suffer from any adverse conditions that affect human health in general.

Children's health first became a public concern in the United States at the end of the 19th century, prompted by alarm at the high infant and child death rates in the summer from diarrheal diseases.² Heat, poor sanitation, and lack of refrigeration contributed to heavy microbial contamination of milk, which was sickening poor children. In 1893, New York City established milk stations that provided safe milk. Similar programs soon followed in other cities. The success of the milk programs in improving children's health inspired the formation of voluntary infant welfare societies with the mission of teaching poor and immigrant mothers about nutrition and hygiene. The federal government got involved in 1912 with the establishment of the Children's Bureau, mandated to "investigate and report on all matters affecting children and child life."^{2(p.8)} In 1921 Congress first provided grants to states to develop health services for mothers and children. During the same period, advocates for child health and welfare were fighting to protect children from oppressive and exploitive labor, which was not regulated by the federal government until the 1930s.

Child health programs have, since the beginning, been plagued by a basic philosophical and political conflict: society's responsibility for the well-being of infants and children was sometimes in conflict with the presumed right of parents to provide for, or neglect, their own children.³ Until the 20th century, children were regarded as the property of their parents. Passage of the 1912 legislation establishing the Children's Bureau reflected a new view that children were a national resource and that their health and vigor were important for the progress of society. In recent decades, children have increasingly been viewed as having rights on their own, independent of their parents or their prospective role in society. Current controversies concerning the role of government in the protection of children—issues that range from the removal of children from abusive parents to medical treatment for the children of Christian Scientists—are a continuation of a century-long tradition of conflict.

Maternal and Infant Mortality

The infant mortality rate (IMR) is a gauge of a society's attention to children's health and is, in fact, an indicator of the health status of a population as a whole. This rate is a particular concern for American public health professionals because the infant mortality rate in this country is very high compared with that of other industrialized countries. As shown in Table 18-1, the United States ranks thirtieth after many Asian and European countries. Sweden and Japan, for example, both have infant mortality rates less than half of that in the United States.

The IMR, defined as the number of infant deaths within the first year of life for every 1000 live births, has been declining in the United States over the course of the century, as seen in Figure 18-1. The rate fell from 100 in 1915 to 6.9 in 2005. Reasons for the decline include improved socioeconomic status (SES), housing, and nutrition; immunization; clean water and pasteurized milk; antibiotics; and better prenatal care and delivery. The availability of family

Table 18.1 IMRs (Deaths per 1000 Live Births), 2005

Singapore	2.1	Italy	4.7
Hong Kong	2.4	Netherlands	4.9
Sweden	2.4	Australia	5.0
Japan	2.8	England and Wales	5.0
Finland	3.0	New Zealand	5.1
Norway	3.1	Scotland	5.2
Czech Republic	3.4	Canada	5.4
Portugal	3.5	Cuba	6.2
France	3.6	Hungary	6.2
Belgium	3.7	Northern Ireland	6.3
Greece	3.8	Poland	6.4
Germany	3.9	United States	6.9
Ireland	4.0	Slovakia	7.2
Spain	4.1	Chile	7.9
Austria	4.2	Puerto Rico	9.3
Switzerland	4.2	Costa Rica	9.8
Denmark	4.4	Russian Federation	11.0
Israel	4.6	Romania	15.0

Source: Data from National Center for Health Statistics, *Health, United States*, 2008. Table 24.

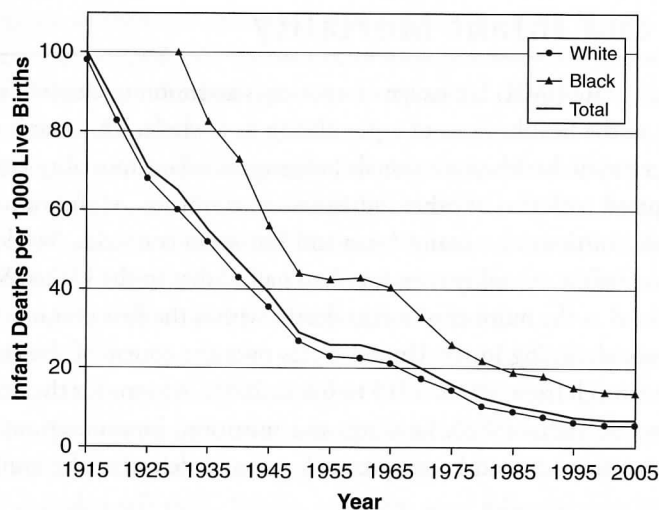


FIGURE 18-1 U.S. Infant Mortality Rates Between 1915 and 2005. *Source:* Data from U.S. Bureau of the Census and Centers for Disease Control and Prevention, *Health, United States, 2008*, Table 18.

planning services and legalized abortion in the United States contributed to the lowering of IMR during the 1970s because wanted babies are more likely to thrive than unwanted ones.⁴ Progress in recent years is largely credited to technological advances in caring for premature infants and infants with low birth weight.

A very disturbing feature of the trends in infant mortality in the United States is the disparity according to race. The IMR for black Americans is more than double that for white Americans.⁵(Table 18) In fact, the mortality rate for black infants has declined more slowly than that for white infants, so that racial disparity has increased since 1950.⁶ While the high infant mortality among blacks accounts in part for this country's dismal showing on an international scale, the rate for white Americans is worse than that of ten other countries.

Maternal mortality rates also declined dramatically in the United States during the 20th century, so that today the death of a woman in childbirth is a very rare event. Since 1991, an average of twelve women have died each year from causes related to childbirth for every 100,000 live births, as compared with 850 in 1900. Like IMRs, maternal mortality rates are significantly higher for black women than for white women—three to four times higher.⁷

Infant Mortality—Health Problem or Social Problem?

“Infant mortality is not a health problem; it is a social problem with health consequences.”^{8(p.473)} In seeking reasons to explain the high IMR in the United States, epidemiologists find that the number one risk factor for infant mortality is poverty. The generally lower SES of African Americans in the United States accounts in large part, but not entirely, for their higher IMR. There are a variety of reasons—environmental, nutritional, behavioral, medical, and social—that poverty leads to high infant mortality. These same factors that raise the risk of infant death also have a more general harmful impact on the health of the children that survive, leading to increased rates of chronic illness and disability, both physical and mental.

An extreme example of an environmental cause of infant mortality is the epidemic of birth defects in Minamata, Japan, caused by mercury contamination of the bay from an industrial source (see Chapter 12). Poor families are more likely to live in such industrial areas, exposing pregnant women and their fetuses to the harmful effects of polluted air and water. Lead, which is highly toxic to the developing nervous system, is a common contaminant in the American inner city, both from deteriorating paint and old plumbing. Other environmental chemicals known to harm the developing fetus are pesticides and organic solvents. More generally, to the extent that air or water pollution or substandard housing harm a mother's health, they harm her ability to give birth to a healthy infant. They may then cause further harm to a sickly infant who is brought home to an unhealthy environment.

Poverty may interfere with a prospective mother's ability to consume an adequate diet for nourishing her fetus. Poor women may lack the knowledge, time, or energy to prepare nutritious meals for themselves and their children. They may live in rural or inner-city areas where fresh fruits and vegetables are not readily available or are too expensive. Ignorance or lack of financial resources may carry over to how a baby is fed. Breastfeeding, which provides the best nutrition for an infant [unless the mother is infected with human immunodeficiency virus (HIV)], is less commonly practiced among poorly educated women than it is among those of higher SES.

Maternal behaviors that can harm the health of an infant include smoking, drinking alcohol, and the use of legal and illegal drugs. Women who smoke during pregnancy substantially increase their risk of giving birth to an infant of low birth weight. Moreover, infants are more likely to develop respiratory infections or die of SIDS when family members smoke in the home. Alcohol is a teratogen, and fetal alcohol syndrome is a risk for children of mothers who are problem drinkers. The use by inner-city pregnant women of illegal drugs, especially crack cocaine, became a major concern in the late 1980s and early 1990s. So-called “crack babies” were born addicted to the drug, suffered withdrawal symptoms after birth, and some sustained

permanent neurological impairment. Unhealthy behaviors are not limited to poor women, of course: affluent women may smoke, drink alcohol, use drugs, and eat unhealthy diets while pregnant. However, these behaviors are more common among poor women, probably for the reasons discussed in Chapter 14.

Social factors that contribute to high-risk pregnancies are those common in poor neighborhoods: young maternal age and low maternal education, out-of-wedlock birth, and violence. Teenage mothers are more likely to deliver premature infants than older women of the same SES, apparently for biological reasons.⁹ Poor women are more likely to be single mothers, thus lacking social support. Infants and children of poor families are at greater risk from violence, both the impersonal violence of the neighborhood and child abuse by family members. Poor children are also more likely to die from unintentional injuries, including fires and falls.

The lack of prenatal care has been linked with high risk of infant mortality. Poor women, who are more likely to lack access to medical care for financial and other reasons (see Chapter 26), are less likely to get prenatal care. However, it is not clear to what extent the lack of medical attention in itself contributes to the risk for poor women, since women who do not receive adequate prenatal care are likely to have other risk factors for infant mortality.¹⁰

Underlying and bound up with these factors that link poverty to infant mortality is the fact that poor women suffer higher levels of stress and lower levels of social support than most women of higher SES. According to one definition, stress is "a state that occurs when persons perceive that demands exceed their ability to cope."^{11(p.19)} Poor women may find that even such modest demands as paying the rent and the food bill, getting to work, or finding daycare are too much. Poor housing increases stress when leaky plumbing, malfunctioning appliances, and infestations of vermin must be dealt with. A mother's ability to cope with the needs of a sick child is limited when she has no health insurance, no transportation to a doctor's office, and no one to help her care for other children in the family. A poor, young, single mother may not have the coping skills that might come from experience, education, and the support of the child's father. To make matters worse, this mother is likely to seek stress relief through maladaptive behavior such as smoking, drug use, or entering into abusive relationships.

Preventing Infant Mortality

The United States has been successful in substantially reducing IMRs over the past three decades, as seen in Figure 18-1. However, much of this success is due to improved medical treatments for highly vulnerable infants after they are born.¹² The disadvantages of the technological approach are obvious: it disrupts normal bonding between parents and infants; it leaves

a significant number of the survivors with long-term developmental disabilities, even severe handicaps; and it is very expensive. The countries that have better IMRs than the United States are generally much less dependent on neonatal intensive care for achieving their successes.

The public health approach to the prevention of infant mortality focuses on two groups: pregnant women in general, most of whom are highly motivated to bear a healthy child and are receptive to information on how to avoid risks; and high-risk women—the poor, young, minority, unmarried women whose infants are most likely to suffer from their socioeconomic disadvantages. Prenatal care provides women with information on how to have a healthy pregnancy and bear a healthy child. Thus prenatal care is the most public-health-oriented kind of care the medical profession provides. Prenatal visits also provide the opportunity to diagnose problems that need medical intervention. For example, bacterial infections of the genital tract increase a mother's risk of giving birth prematurely, and treatment with antibiotics can reduce that risk. The Centers for Disease Control and Prevention (CDC) recommends that all pregnant women should be screened for common infections and treated if infected.¹³ Beginning prenatal care as early as possible—preferably even before a woman conceives—greatly enhances a woman's prospects of bearing a healthy infant.

Prenatal care is especially important for the women with the lowest SES. Visits to a health care provider may be the only source of the education, services, and social support these women need. Most states recognize the importance of prenatal care and have tried to remove financial barriers by providing insurance or other sources of payment and by establishing prenatal clinics at health departments, hospital outpatient departments, and community health centers. In 2003–2005, more than 84 percent of pregnant women received prenatal care in the first trimester of pregnancy.⁵(Table 8)

However, a number of barriers remain that discourage the women at highest risk from seeking prenatal care, including lack of information about available services, inconvenient hours of service, rudeness and long waits at the clinics, inadequate transportation, and lack of child care for older children. The percentage of black and Hispanic women who receive prenatal care in the first trimester is significantly lower than that for white women (76.3 percent for blacks and 77.8 percent for Hispanics in 2003–2005, compared with 88.9 percent for whites).⁵(Table 8) Reaching women who do not seek early prenatal care requires active outreach programs including hotlines, community canvassing, and the provision of incentives to the expectant mother.¹² A new barrier arose in the wave of anti-immigrant sentiment and policies included in the 1996 federal welfare reform bill, which resulted in denial of prenatal care for immigrants in some states. From a public health perspective, this is a foolish and expensive policy, since the infants—U.S. citizens—born to these women will be more likely to be premature, unhealthy, and in need of neonatal intensive care.¹⁴

To be effective in reducing infant mortality, prenatal care for high-risk women should include a broad array of medical, educational, social, and nutritional services. However, political realities too often mean that, although major efforts are made to increase the number of women who receive prenatal care, the clinics that provide it are understaffed, rushed, and not financed adequately to provide the services that could really make a difference in the health of the mother and infant.

Congenital Malformations

The leading specific causes of infant mortality, according to the listings on death certificates, are the following: congenital malformations, disorders related to short gestation and low birth-weight, and sudden infant death syndrome (SIDS). Congenital anomalies, which account for more than 20 percent of infant deaths, are preventable in many cases. Some disorders, such as Tay-Sachs disease, hemophilia, and Down syndrome have a well-known genetic basis and can be prevented by genetic screening and/or prenatal diagnosis, as described in Chapter 12. Newborn screening programs are designed to identify infants born with defects in body chemistry such as phenylketonuria and hypothyroidism that can be remedied by early diagnosis and treatment. Other congenital anomalies may be caused by known environmental exposures, such as tobacco smoke, viruses, heavy metals, or the use of legal or illegal drugs. Public health intervention includes Food and Drug Administration (FDA) regulation of teratogenic drugs such as thalidomide (see Chapter 12) or warnings to pregnant women such as those required on alcoholic beverage containers and on the packaging of legal teratogenic drugs such as the acne drug Accutane or the epilepsy drug Dilantin. Infection with the rubella virus—German measles—once a common cause of deafness and mental retardation, is prevented by immunization. However, the causes of more than 70 percent of birth defects are unknown. It is believed that many defects are caused by a combination of genetic and environmental factors.

In an attempt to identify causes, the CDC is coordinating the ongoing National Birth Defects Prevention Study, a case-control study involving eight states. Mothers of infants with birth defects are interviewed about their own health, pregnancy history, diet and substance use, work history, drinking water sources, and other questions thought to be relevant. They are also asked to provide DNA samples, which can help identify the role of genetics. Infants in the control group for the study are chosen at random from birth certificates of live-born infants with no major birth defects, and their mothers are similarly interviewed and asked for DNA samples.¹⁵ Among the study's findings to date are that women with diabetes are at increased risk for bearing a child with a broad range of birth defects, and that children conceived by artificial reproductive technology have double the risk of cleft lip, with or without cleft palate, and more than double the risk of some kinds of heart defects.^{16,17}

Nutritional factors are known to contribute to the risk of some defects. Two of the most severe—anencephaly (a lethal condition in which all or most of an infant's brain is missing) and spina bifida (protrusion of the spinal cord from the spinal column accompanied by paralysis of the lower body) are caused in part by a deficiency in folic acid, a B vitamin present in green leafy vegetables, dried beans, liver, orange juice, and grapefruit juice. The damage occurs early in the pregnancy, when the developing spinal column is being formed. Dietary supplementation with folic acid has been shown to reduce the incidence of these neural tube defects by 50 percent or more, but the supplementation must happen during the first month of pregnancy, even before the woman may recognize she is pregnant.¹⁸ Public health campaigns to encourage all women of childbearing age to take folic acid supplements have had only modest success, and poor, high-risk women are probably the least likely to comply with the recommendation. In order to remedy the problem, the FDA decided to require that foods such as flour, corn meal, pasta, and rice be fortified with folic acid, effective January 1, 1998. As a result of the fortification, the number of affected pregnancies in the United States declined by 26 percent by 2000 and has continued to decline.¹⁹ The amount of folic acid used for fortification is not sufficient to provide a maximum protective effect, however, and young women are still advised to take supplements.

Preterm Birth

An analysis by CDC scientists, published in 2006, proposed that preterm birth is responsible for many more infant deaths than are indicated on the death certificates. The scientists noted that six of the eleven leading causes listed on the death certificates, including three separate diagnoses involving respiratory distress, are entirely attributable to preterm birth. When this information is taken into account, prematurity—disorders of short gestation and low birth weight—becomes the leading cause of infant death, causing over one third of these deaths. Thus reducing infant mortality rates in the United States will require “a comprehensive agenda to identify, to test, and to implement effective strategies for the prevention of premature births.”^{20(p.1573)} The percentage of infants born prematurely has been growing, amounting to 12.5 percent of all births in 2004.²¹ This indicates a public health failure and an increasing reliance on high-technology medical care to maintain the continued decline in IMRs. Black infants are almost twice as likely to be born too small as are white infants. This disparity has decreased slightly in recent years, not because African-American mothers are having healthier pregnancies, but because many white women are postponing conception until they are older, when they are more likely to have difficult pregnancies or need assisted reproduction technology, increasing the risk of multiple births.

While the causes of premature labor and delivery are not well understood, many of the environmental, behavioral, nutritional, and social factors previously discussed can contribute. In trying to understand how to reduce the mortality and disability caused by preterm births, scientists classify preventive measures as primary, secondary, or tertiary.²¹ In the United States, most of the efforts have been focused on tertiary prevention, aimed at improving the outcomes for infants born prematurely, and requiring expensive use of neonatal intensive care. Secondary prevention is aimed at identifying women at risk of giving birth too early and reducing their risk. For example, maternal smoking causes a 25 percent increased risk of preterm birth; the CDC monitors the prevalence of smoking among pregnant women, which has declined significantly since 1990 but is still over 10 percent.^{5(Table11)} Other risk factors include previous preterm births, carrying more than one fetus, obesity, diabetes, and bacterial infections of the genital tract. Recent evidence suggests that gum disease is associated with preterm births, and that periodontal treatment may reduce the risk.²² Some of these factors can be helped by timely prenatal care. However, as many as half of preterm infants in the United States are born to women considered to be low risk.

Primary prevention of preterm birth is, from a public health perspective, the most desirable strategy. Many European countries accomplish this by providing social and financial support for low-risk pregnant women, but this might be politically difficult to implement in the United States.²¹ Preterm birth, of the various causes of infant mortality, is clearly a social problem rather than a health problem, as discussed earlier in this chapter. The reason the United States has such a poor record in preventing infant mortality is that we have tried to approach it as a medical problem.

Sudden Infant Death Syndrome

Sudden Infant Death Syndrome (SIDS), the third leading cause of infant death overall, is also not well understood. Almost always the death is unexpected; usually the infant appeared to be healthy before he or she died, and an autopsy fails to establish the cause of death. While SIDS is more common in infants of low birth weight and in infants of smokers or drug users, it is not limited to infants with these risk factors.²³ Until recently, because of the lack of understanding about the causes of SIDS, there was not much parents could do to reduce the risk. Then, in the early 1990s, studies done in New Zealand, Australia, and the United Kingdom reported that SIDS occurred more frequently in infants that were sleeping on their stomachs. The American Academy of Pediatrics and the National Institute of Child Health and Human Development began a "Back to Sleep" campaign to educate maternity wards, doctors and nurses, and parents that infants should be put to sleep on their backs. Since the campaign was launched, the number of deaths from SIDS has declined dramatically: by 2005, the SIDS death rate had fallen by over 50 percent.²⁴ There is still room for improvement: surveys of infant sleeping positions have

found that almost 15 percent of American infants continue to sleep on their stomachs, and black infants are almost three times as likely to be placed on their stomachs as white infants.²⁵ The SIDS death rate for black and American Indian infants is two to three times the rate for white infants.²³ Public health agencies and medical care providers are working with communities of minority groups to educate them about the importance of putting infants to sleep on their backs.

SIDS is a diagnosis of exclusion, meaning that any unexplained death is thoroughly investigated and SIDS is listed as the cause of death only if no other explanation is found. Law enforcement officials participate in the investigation, which includes an autopsy as well as interviews with family members and other caregivers. The CDC publishes guidelines recommending how these investigations should be done, with the aim of better understanding causes and risk factors for SIDS.²³

Family Planning and Prevention of Adolescent Pregnancy

Because pregnancy is not good for the health of either a teenager or her infant, preventing adolescent pregnancy is a high public-health priority. In addition to the health risks, pregnancy during the teen years has many harmful consequences, including interference with the young mother's education and career prospects, economic hardship, and interference with the formation of a strong family unit. Thus adolescent pregnancy, and all the accompanying socioeconomic consequences, increases the health risks to the child for all the reasons previously described as causes of infant mortality. Teenage mothers are less likely to seek prenatal care than older women and are more likely to have no care at all. They are more likely to smoke and less likely to gain adequate weight during pregnancy. Infants of teenage mothers are at greatly increased risk of low birth weight, serious and long-term disability, and dying during the first year of life.²⁶

Rates of adolescent pregnancy in the United States have declined since the 1950s, but in those days, social pressure forced marriage on many girls who became pregnant, producing a more stable economic and family environment for the young child. Today, most teenage mothers are unmarried, and a large increase in adolescent births in the late 1980s alarmed public health advocates and policy makers.²⁶ However, after peaking in 1991, rates declined steadily through 2005, but increased slightly in 2006 and again in 2007.²⁷ Birth rates have consistently been higher among African-American and Hispanic teenagers than among white teenagers, and rates have been lowest among Asian Americans and Pacific Islanders. U.S. adolescent pregnancy rates are the highest in the industrialized world.²⁷

Unintended pregnancy in older women is also a matter of concern to public health because it is more likely to lead to poorer health outcomes for mother and child. Some unintended pregnancies are merely mistimed, but many are unwanted, leading to some of the same risks as occur in teenage pregnancies. Surveys have shown that only about half of the pregnancies among American women are planned. A frequent consequence of unintended pregnancy is induced abortion. In the United States, there is approximately one abortion for every four live births.²⁸ This is a decrease from the ratio of more than one in three live births in the 1980s. From a public health perspective, every pregnancy should be an intended pregnancy.

Adequate access to contraception could go a long way toward reducing rates of unintended pregnancy and abortion. Americans' ambivalent feelings about sex probably contribute to the fact that many women lack access to comprehensive family planning services. Even private health insurance plans often do not provide coverage for contraception. Unmarried women, poor women, adolescents, and African-American women are especially likely to encounter difficulty in obtaining and paying for services. A number of federal programs provide financing for family planning services, as do many state programs. However, availability of services varies widely from one state to another and, in many areas, well under half of those in need of subsidized services receive them.²⁹

Female sterilization and vasectomy for men are the most effective methods of contraception and are commonly used in the United States, but they are permanent and thus inappropriate for young people. Other highly effective methods—for women—are intrauterine devices (IUD) and some hormonal implants. These methods have a failure rate of less than one pregnancy per hundred women per year. Equally effective when used correctly are combination oral contraceptives—"the pill"—and other hormonal contraceptives, such as Depo-Provera shots and the hormone-laden vaginal ring. Pills must be taken every day, however, and the other hormonal methods must be renewed at regular intervals.

All of these methods have drawbacks, although the health risks tend to be overestimated by the general public. Barrier methods, including the male and female condoms and the female diaphragm and cervical cap, can be fairly effective if used correctly (failure rates of 2 to 6 pregnancies per 100 women per year) and condoms have the added advantage of reducing the risk of sexually transmitted diseases. However, barrier methods are often used inconsistently and incorrectly. Spermicides used alone (foams, creams, and jellies) have failure rates of 15 pregnancies per 100 women per year for perfect use and much worse for typical use.³⁰

The "morning after pill,"—also known as "Plan B"—is a mixture of estrogen and progestin to be used within 72 hours of unprotected intercourse—the sooner, the better. It is an effective backup method, reducing the risk of pregnancy by up to 94 percent, although the mechanism is not well understood.³¹ This emergency method has not been widely used, apparently because many women and even some medical providers are not aware of its potential. In 2003, the

drug's manufacturer requested the FDA to approve the sale of emergency contraceptives without a prescription, which would make the medication more easily and rapidly available to women who need it. An FDA advisory committee, after reviewing the evidence for safety, recommended that the request be approved. However, in an unusual move widely interpreted as being motivated by political pressure by the Bush administration, the FDA rejected the committee's recommendation. Availability of emergency contraception would be expected to significantly reduce the number of unwanted pregnancies, including the 25,000 that result from rape, and the rate of abortions in the United States. After three years of pressure from Congress, including a threat to hold up confirmation of the next FDA commissioner, the FDA finally approved Plan B sale without a prescription to women 18 and older. In 2009, a judge ordered the FDA to allow sale of the pill to 17-year-olds, and the FDA complied.³²

Public health programs specifically aimed at preventing teenage pregnancy include comprehensive sex education in the schools, which has been found to be effective in delaying young people's initiation of intercourse and increasing their use of contraception when they do have sex.³³ As discussed in Chapter 13, there is considerable controversy about the exact message that should be conveyed in pregnancy prevention programs. The federal welfare reform bill that was implemented in 1998 included funding for programs that teach sexual abstinence only. Many states were reluctant to apply for the money because they believe such programs are much less effective than those that include education on contraception as well. A 2004 congressional review found that commonly used abstinence-only curricula contained "multiple scientific and medical inaccuracies."^{33(p.2014)} For example, they teach that condoms are ineffective. Some programs encourage teenagers to sign virginity pledges; studies have shown that those who do sign may delay sex, but when they do initiate intercourse they are less likely to use protection.³⁴

Abstinence-only advocates took credit for the significant decline in adolescent pregnancy rates between 1991 and 2005 described previously (although the rates increased slightly in 2006 and 2007, for unknown reasons). However, despite hundreds of millions of dollars of federal funds spent on abstinence-only programs each year, studies have found no measurable impact on teen sexual behavior. An analysis of data from national surveys of young women ages 15 to 19 found that only 14 percent of the decline in pregnancy could be attributed to delayed initiation of sexual activity, while 86 percent of the decline was due to increased use of contraceptives.³⁵ The authors concluded that "abstinence promotion is a worthwhile goal, particularly among younger teenagers."^{35(p.155)} However, it is insufficient to help adolescents prevent unintended pregnancies and sexually transmitted diseases. "Public policies and programs... should vigorously promote provision of accurate information on contraception and on sexual behavior and relationships, support increased availability and accessibility of contraceptive services and supplies for adolescents, and promote the value of responsible and protective behaviors, including condom and contraceptive use and pregnancy planning."^{35(p.155)}

Nutrition of Women and Children

Since the establishment of milk stations in the 1890s, nutrition has been an important component of maternal and child health programs. At first, the emphasis was on breastfeeding and the safety of milk and baby foods. Public health is still concerned with promoting breastfeeding, which offers most infants the healthiest start in life, reducing risks of infectious diseases, ear infections, respiratory infections, obesity, and chronic diseases such as asthma and allergies. Medical and public health organizations recommend that infants be exclusively breastfed for the first six months of their lives and then breastfed with supplemental baby food at least until their first birthday. The CDC tracks rates of breastfeeding at discharge from the hospital, but data at six months is sparse. Rates of initiation of breastfeeding have increased, but they vary depending on age and income of the mothers, with rates of only 57 percent among poor women and 43 percent among mothers less than 20 years old.³⁶

During the Great Depression of the 1930s, the federal government established several food assistance programs to ensure adequate nutrition for poor families. They formed the basis of current federal programs, run by the Department of Agriculture, which originated in the 1960s.³⁷ The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), provides vouchers for milk, fruit juice, eggs, cereals, and other nutritious foods for pregnant women, lactating mothers, infants, and children up to 5 years old. Nutrition education is also provided, and WIC centers often become a source of many support services for poor, young families. The Department of Agriculture has evaluated the WIC program and found it to be effective in saving medical costs for the women and infants who participated.

The nutritional needs of older children are addressed through the School Meals Program. School lunches, provided at most schools, must meet certain nutritional standards, including offering a meat or meat alternative, fruit and/or vegetables, bread, and milk. Children from households with incomes at or below 185 percent of the poverty level receive the lunches free or at reduced prices. Children from families with higher incomes pay more. A more limited number of children receive free or reduced price school breakfasts, and some schools offer after-school snacks. There is also a Summer Food Service Program, which provides meals during school vacation periods.

A third federal program designed to help low-income families afford adequate food is the Supplemental Nutrition Assistance Program (SNAP), formerly the Food Stamp Program. Based on the household's size and income, families are issued an electronic benefits transfer card that can be used like a credit card to buy nutritious foods at grocery stores. The Food Stamp Program, which cannot be used for alcohol, tobacco, or nonfood items, has come under fire, in

part because of some well-publicized abuses. There are some limitations on immigrant families' eligibility to receive SNAP benefits. The American Recovery and Reinvestment Act of 2009, designed to stimulate the flagging economy, provided increased funding for several of the Department of Agriculture's nutrition assistance programs.³⁸

Despite food assistance programs, children are at risk of going hungry in the United States. Department of Agriculture surveys have found that 11 percent of households are food insecure, meaning that they have limited or uncertain access to nutritionally adequate foods. Families headed by single women with children and black and Hispanic households are the most likely to experience food insecurity. Poor nutrition increases children's risks of stunting, inadequate cognitive stimulation, iodine deficiency, and iron deficiency anemia. It also increases the risk of overweight and obesity, in that high-calorie processed foods are often less expensive than fresh, perishable foods such as fruits, vegetables, and low-fat dairy products.^{39,40}

As discussed in Chapter 16, while undernutrition is a real concern for the poorest American families, overeating is a more widespread problem.

Children's Health and Safety

Deaths in childhood from infectious diseases have been vastly reduced because of widespread immunization programs, as discussed in Chapter 9. Virtually all children are vaccinated against diphtheria, tetanus, pertussis (whooping cough), polio, measles, rubella (German measles), mumps, and hepatitis B before they enter school, because most of these immunizations are required by law. However, many preschool children are at risk because they do not receive immunizations at the recommended ages. Well-baby care is almost as important as prenatal care for child health, but children of poor families often miss out on these visits to the doctor for the same reasons that their mothers missed prenatal visits, including lack of affordable health care.

In 1993, the federal government launched a childhood immunization initiative aimed at increasing vaccination coverage among children ages 19 months to 35 months. The federal government began to provide free vaccines for children who were uninsured or whose insurance did not cover vaccines. Public and private sector organizations and healthcare providers at the national, state, and local levels were enlisted to implement the goals of the initiative, in the hope of virtually eliminating many of the traditional childhood diseases. In addition to the eight diseases listed above, four more recent vaccines are covered by the Vaccines for Children Program: *Haemophilus influenzae* type b (spinal meningitis), varicella (chicken pox), pneumococcal disease, and hepatitis A.⁴¹

In 2008, the FDA approved a vaccine that has proven uniquely controversial. Human papilloma virus (HPV) is a group of sexually transmitted viruses that will, at some time in their lives, infect about half of all people who have ever had sex. Although some infections do not

cause symptoms and are cleared by the immune system, others may lead to genital warts in men and women or cause cancers of the cervix or other genital organs. The new vaccine prevents infection with the types of the virus that cause most cervical cancers and genital warts. It is ineffective, however, in people who are already infected. Thus vaccination is recommended for 11- and 12-year-old girls, to reach them before they become sexually active, but they are approved for women up to age 26. The vaccine is expensive, with a cost of \$125 for each dose, and it is designed to be given as three doses within six months. The Vaccines for Children Program will pay for poor and uninsured young people to be vaccinated. Many states have considered making the vaccine mandatory.⁴²

The controversy about the HPV vaccine stems from several factors.⁴³ There is the question of whether the expense is justified to prevent a disease, cervical cancer, which is relatively rare in the United States. Because the vaccine prevents only 70 percent of cancer cases, women will continue to need regular Pap smears to screen for the disease. Moreover, it is unclear how long immunity persists, so there may be a need for booster shots. Some parents are reluctant for their daughters to be vaccinated because they fear it may encourage promiscuity. There is also concern about side effects of the vaccine. The greatest value of the vaccine would be in developing countries, where screening is rare and the death rate from cervical cancer is high, but the vaccine is too expensive to be used in third-world countries.

Immunization rates are tracked by the CDC. In 2007, 77 percent of children aged 19 months to 35 months had received the recommended doses of the most highly recommended six vaccines.⁴¹ Coverage rates for some of the individual vaccines reached over 90 percent. In recent years, there have been shortages of some vaccines. Manufacturers have left the market or produced insufficient supplies because they conclude that profits are not high enough, and they fear lawsuits over possible side effects. How to respond to these shortages is a challenge to the public health system.

Other preventive services of concern to public health because they may be missed by children of low SES who do not get regular well-baby care include screening for tuberculosis, problems with vision and hearing, and scoliosis, or curvature of the spine. Because recognizing these problems as early as possible is important for ensuring a child's future health and ability to learn, these services are usually provided in schools. Diagnosing a problem in a school screening program does not guarantee that the problem will be corrected, however. As Chapter 25 discusses, children who are uninsured or underinsured may be unable to obtain treatment even after the problem is identified repeatedly.

Childhood asthma is a significant public health concern, affecting 8.5 percent of children. Prevalence is higher among blacks (9.2 percent) than whites (6.9 percent), and is even higher among children of Puerto Rican descent (14.5 percent).⁴⁴ Asthma prevalence grew dramatically between 1980 and 1996 for reasons that are not well understood. Since then, rates appear to

have reached a plateau. Deaths from asthma are rare among children, but African-American children have a risk four times higher than white children of dying from the disease. Environmental factors in the inner city are believed to be responsible, at least in part, for the increase in asthma prevalence. Because asthma can generally be controlled by medication when patients and their parents are educated about self-management techniques, hospitalizations, and deaths are thought to be due to lack of access to regular, appropriate medical care.

Although fluoridation of community water supplies and other sources of fluoride have reduced tooth decay among children by more than 50 percent since the 1960s, some children still suffer from painful and debilitating tooth decay. Poor children are especially likely to suffer from dental decay when the water is not fluoridated, and communities vary in the extent to which they provide dental services through clinics or local health departments. The CDC has identified fluoridation of drinking water as one of the ten great public health achievements of the 20th century. In 2006, about 69 percent of the population served by public water systems received fluoridated water.⁴⁵

The fact that most mothers now work outside the home, a major change from the norm in previous decades, means that young children are increasingly being cared for in day care centers. Suddenly, the need for safe and affordable day care has become a public health issue. Infectious diseases spread rapidly among young children, and adequate hygiene when changing diapers is especially important. There are also risks of injury because of an unsafe physical plant or play equipment, inadequate staffing, or unqualified caregivers. These risks can be reduced by state licensing of day care centers, requiring them to meet basic health and safety standards.

Injuries constitute the main risk to the life and health of children once they pass their first year. Public health efforts to prevent childhood injury include education and regulations that encourage use of seat belts, child safety seats, and bicycle helmets. The U.S. Consumer Products Safety Commission monitors toys and children's furniture for safety hazards, issuing warnings and ordering recalls of products that are found to be dangerous to children. Public health efforts directed toward preventing childhood injuries are described in Chapter 17.

While maternal and child health services, like public health in general, focus on prevention of death and disability, there is a long tradition of public concern about the care of children with handicaps. Beginning in 1935, the federal government funded state "crippled children's programs" that provide diagnosis, treatment, and rehabilitative services for children with special needs, many of whom are also eligible for support through Social Security.² While in the past many of these children might have been institutionalized, current programs try as much as possible to keep them at home, supporting families and preparing disabled young people to live independent lives.

In order to better understand factors that influence children's health and development, the federal government and many partners are launching the largest long-term study on children ever to be conducted in the United States.⁴⁶ The National Children's Study is a longitudinal cohort study, comparable to the Framingham Heart Study and the Nurses' Health Study, described in Chapters 4 and 5. The National Children's Study will follow 100,000 children, from before birth to age 21, to better understand the link between children's genes, the physical, chemical, and psychosocial environments in which they are raised, and their physical and mental health and development. They hope to answer questions such as the following:

- Is preterm birth caused by inflammation and infection?
- Does repeated head trauma adversely affect neurodevelopment?
- Is early-life infection associated with asthma risk?
- Does impaired maternal glucose metabolism (diabetes) during pregnancy cause children to be overweight?
- Does breastfeeding reduce the risk of obesity?
- How does routine low-level pesticide exposure interact with genes to affect neurobehavior and cognitive development?
- Does household mold exposure in the first year of life lead to asthma?
- Does prenatal infection and inflammation increase the risk of cerebral palsy and autism spectrum disorders?⁴⁶

The National Institutes of Health announced in January 2009 that the first phase of the Children's Health Study was about to begin by recruiting volunteers in two communities: Duplin County, North Carolina, and Queens, New York.⁴⁷ In April, five additional sites were added, in California, Pennsylvania, South Dakota, Utah, and Wisconsin.⁴⁸

Conclusion

Maternal and child health is one of the highest priorities for public health. In the United States, city, state, and local governments have for over a century conducted programs and enforced legislation aimed at protecting children and promoting their health.

Infant mortality is a gauge of society's attention to children's health and is often used as an indicator of the health status of a population as a whole. The United States compares poorly with other countries on infant mortality, ranking thirtieth overall. IMRs, along with other public health improvements, have greatly improved since the beginning of the 20th century. Like other indicators of health, infant mortality is higher among African Americans than among whites and declines with increasing SES.

The three leading causes of infant mortality overall are congenital anomalies, low birth weight, and SIDS. Public health programs to prevent infant mortality because of congenital anomalies, or birth defects, include pre- and postnatal screening and diagnostic programs, as described in Chapter 12. They also include protection of pregnant women from exposure to environmental teratogens. Dietary supplementation with folic acid has been found to prevent some birth defects.

Low birth weight, caused by preterm birth, the leading cause of infant death overall, is closely linked to SES. Because pregnant adolescents are especially likely to give birth to infants of low birth weight, prevention of pregnancy in teenagers is a high priority for public health.

SIDS deaths declined dramatically during the 1990s after it was found that babies who were put to sleep on their stomachs were at increased risk of sudden death. An educational campaign about infant sleeping positions cut SIDS deaths by over 50 percent.

Adequate family planning services are important for public health. Pregnancy in adolescence is risky for both mothers and infants. Comprehensive sex education is effective in preventing teen pregnancy. Political conservatives promote abstinence-only programs, which are less effective than programs that include information on contraception. Unintended pregnancy also increases health risks in older women and their infants. While a variety of effective contraceptive methods are available, many women do not have access to affordable family planning services. Nutrition is an important component of maternal and child health programs. The federal government has, since the 1930s, supported a number of programs that provide supplemental foods for pregnant women, infants, and children.

Other public health initiatives that have a significant impact on children's health include immunization requirements, fluoridation of community water supplies, and injury-prevention measures. Regular access to medical care is important for the health of children, but many poor and minority children do not have this access, as discussed in Chapter 25.

The National Children's Study, a cohort study linking genes and the physical, chemical, and psychosocial environment of children to their physical and mental health and development, is just getting started in 2009. It will track 100,000 American children from birth to age 21.

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