

Young, Minority and Disadvantaged Women Exhibit Least Favorable Pregnancy-Related Health Behavior

Virtually all U.S. women who had a live birth between 1984 and 1988 received prenatal care, but only about two-thirds began care during the first trimester. Black and Hispanic women, teenagers, never-married women, those whose pregnancy was unintended, and women with little education or low income were relatively unlikely to initiate care early; additionally, these women were among the least likely to obtain prenatal care from a private physician and the most likely to bear an underweight infant. These are among the principal findings of an analysis of data from the 1988 National Survey of Family Growth (NSFG) on pregnancy-related health measures.¹

The 1988 NSFG sample comprised 8,450 women aged 15–44 (of whom 63% were white, 33% black and 4% members of other racial groups). Interviews covered the women's fertility history and intentions, contraceptive use and prenatal care, as well as their socioeconomic and demographic characteristics.

Between January 1984 and the interview date, 16.2 million live births occurred among 1988 NSFG respondents. The investigators examined data on the timing and source of prenatal care these women received, their self-reported smoking and drinking habits during pregnancy, the incidence of low birth weight and how the women paid for delivery care.* They analyzed the data by pregnancy characteristics (mother's age at birth, birth order, cesarean vs. vaginal delivery, mother's marital status at birth and planning status of the pregnancy) and by maternal background characteristics (race and Hispanic origin, level of education, occupation, family income, Medicaid coverage for prenatal and delivery services, and area of residence). To examine trends in the measures they studied, the researchers also compared the 1988 data with similar information from the 1982 NSFG.

Timing of Prenatal Care

Overall, 98% of respondents who had a live birth between 1984 and 1988 obtained prenatal care, but only 65% initiated care

within the first trimester. Young women were significantly less likely than older women to receive early prenatal care: Only 39% of women who were teenagers at delivery and 60% of those who were aged 20–24 received early care, compared with 73% of those aged 25 and older. Teenagers were considerably more likely than older women to delay care until at least the fifth month of pregnancy or to receive no care at all (31% vs. 10–18%).

Smaller differences were apparent for most other pregnancy characteristics. Notably, never-married women were substantially less likely than their ever-married counterparts to begin prenatal care early (46% vs. 69%); this difference, the analysts suggest, may reflect that single mothers tend to be young, to have relatively little education and to have a low income. Additionally, women who had intended to become pregnant were more likely to seek care early than were those whose pregnancies were unwanted or mistimed (72% vs. 55–56%).

Among the maternal characteristics, education, income and occupation had particularly striking effects on the likelihood of obtaining early care.[†] The proportion of women beginning care during the first trimester was about one-half among those with less than 12 years of schooling, those whose family income was below 150% of the poverty level and those who had never worked; it was roughly four-fifths among women with more than a high school education, those with an income of at least 300% of the poverty level and those employed in professional or managerial positions.

Mothers whose prenatal or delivery care was covered by Medicaid were less likely than others to receive early care (49% vs. 68%), and residents of central cities or nonmetropolitan areas were less likely than suburban women to initiate care in the first trimester (59–61% vs. 70%).

Sizable racial and ethnic differences were apparent in the likelihood that women received early prenatal care. Early care was less common among black women than among white women (54% vs. 68%); this

racial differential was seen in most of the subgroups examined, although the magnitude and statistical significance of the differences varied. Similarly, Hispanic women and non-Hispanic blacks were significantly less likely to receive early care than were non-Hispanic whites (53% vs. 70%). Differences by race and ethnicity narrowed substantially among women who received care late or not at all.

The analysts found no statistically significant changes in the timing of prenatal care between the 1982 and 1988 surveys.

Main Source of Prenatal Care

Overall, 69% of respondents received most of their prenatal care from a private physician, 11% obtained care mainly from a hospital clinic and 20% went primarily to a nonhospital clinic.

Teenagers were far less likely than older women to see a private physician for most of their prenatal care (42%, compared with 65–77%). Large differences also were apparent by marital status (74% of ever-married women vs. 46% of never-married women), pregnancy planning status (74% of women whose pregnancies had been intended vs. 58–64% of those whose pregnancies had been unwanted or mistimed) and timing of prenatal care (73% of women who began care early vs. 58% of those receiving late or no care).

White women were more likely than black women to receive prenatal care primarily from a private physician (75% vs. 46%), and this pattern held regardless of pregnancy or maternal characteristics. Similar differences were apparent by Hispanic origin: Some 78% of non-Hispanic white women went to a private physician for most of their prenatal care, compared

*In examining prenatal care, low birth weight and how delivery was paid for, the investigators used the pregnancy or birth as the unit of analysis. For ease of presentation, however, "women" is used to describe the findings.

†For these characteristics, the calculations included only women aged 20–44 when they gave birth, since teenagers were likely still to be in high school, to have a low income or not know their family income, and to be unemployed or to have a low-paying job.

with only 45% of non-Hispanic blacks and 53% of Hispanics.

The likelihood that a private physician was the main source of prenatal care also was relatively low among women with characteristics that suggest socioeconomic disadvantage—such as low levels of education and income, employment in a low-paying job and receipt of Medicaid.

Commenting on their finding that women who delay prenatal care are relatively unlikely to get care primarily from a private physician, the researchers suggest that clinics might play a role in increasing the prevalence of early care by expanding outreach and assuring that services meet the needs of target populations.

Smoking and Drinking

Some 27% of respondents smoked cigarettes during their most recent pregnancy; nearly 17% smoked fewer than 15 cigarettes a day, and 11% smoked 15 or more. The proportion who smoked was higher among white women than among black women (29% vs. 23%), and the difference was attributable to higher rates of heavy smoking among whites than among blacks (12% vs. 6%).

A comparison of data from the 1982 and 1988 surveys revealed that the proportion of women smoking during pregnancy has been declining. Whereas 35% of women who gave birth in 1970 or earlier smoked while pregnant, the proportion was only 23% among those who delivered in 1985–1988. Overall patterns have remained the same, however: Substantial proportions of women who were younger than 25, were never-married, were socioeconomically disadvantaged, had an unintended pregnancy or had delayed prenatal care until after the first trimester smoked cigarettes while pregnant.

According to the 1988 data, 34% of respondents drank during their most recent pregnancy: Some 15% drank at least once a month, and 19% drank less frequently. Black women were less likely to drink during pregnancy than were white women (25% and 37%, respectively, did so); Hispanic women also were relatively unlikely to drink while pregnant (24%).

Older women, those with relatively high educational and income levels, and women working in well-paying occupations were the most likely to drink during pregnancy. The proportion of women who reported drinking while pregnant declined between the 1982 and 1988 surveys, but the change was not statistically significant.

In all, 51% of respondents neither smoked nor drank during their most

recent pregnancy, 15% smoked only, 21% drank only and 12% did both. The data suggest that women who smoke while pregnant are not the same ones who drink while pregnant; thus, the analysts comment, although smoking and drinking during pregnancy appear to be on the decline, health education efforts aimed at these two behaviors need to target different groups of women.

Low Birth Weight

Between 1984 and 1988, 7% of infants born to 1988 NSFG respondents were low-birth-weight (less than 2,500 g). Black women were twice as likely as white and Hispanic women to bear an underweight infant (14% and 6–7%, respectively). The proportion of infants who were low-birth-weight also was relatively large (roughly one in 10) among teenagers, never-married women, those who had not intended to become pregnant, women who smoked during pregnancy, and less educated and economically disadvantaged women. For all pregnancy and maternal characteristics, black women were more likely than whites to bear underweight infants.

The proportion of infants who were low-birth-weight has decreased markedly over time, from a level of 16% among those born in 1970 or earlier. This decline has occurred among both blacks and whites; the twofold racial differential, however, has remained essentially unchanged. At the same time, the gap between low-birth-weight rates among infants born to smokers and non-smokers has widened (from about two percentage points for those born in 1970 or earlier to about six percentage points for those born between 1985 and 1988). The researchers note that a multivariate analysis would be necessary to determine whether this change is “real” or whether it reflects changing characteristics of women who smoke.

Paying for Delivery Care

Women often rely on several sources, which they may use individually or in combination, to cover the costs of delivery. Between 1984 and 1988, 66% of respondents who had a live birth had private insurance coverage, 44% paid for at least some delivery expenses out of pocket, 11% were covered by Medicaid and 12% depended on other sources.

Whereas 71% of white women had some private insurance coverage for delivery care, only 40% of black women did; in part because private insurance does not cover all expenses related to delivery, white women were more likely than black

women to pay some portion of delivery costs out of pocket (47% vs. 27%). Black women, on the other hand, were considerably more likely than whites to rely on Medicaid (33% vs. 7%).

The proportion of women with private coverage was lowest (less than one-third) among teenagers, never-married women, those with little education or low income, and women who worked in a low-paying job. No significant changes occurred between the 1982 and 1988 surveys in the patterns of payment for delivery services.—*D. Hollander*

Reference

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Unwantedness at Birth May Induce Psychological, Social Problems for Adults

People born as a result of an unwanted pregnancy—especially women—appear to experience some negative effects on their social development and psychological health. According to an ongoing study comparing persons born in 1961–1963 to women who were twice denied an abortion (for the same pregnancy) with persons born from a wanted pregnancy,¹ those whose conception was unwanted differed significantly from their matched controls on six of 10 psychosocial adaptation measures. These differences were more pronounced among women than among men, a reversal of the findings from earlier phases of the study. Although some detrimental effects were shared with siblings, others were not, and thus could be related to the unwanted pregnancy per se.

To determine whether unwantedness predicts differences in social and psychological development, the children born to a cohort of Czech women who were twice denied abortion (after an initial request and a subsequent appeal) in 1961–1963 have been studied at several points in their lives—at ages nine, 14–16 and 21–23. In each study wave, the children from unwanted pregnancies were compared with a control sample from wanted pregnancies who were matched by gender, age, school class, birth order, number of siblings, mother’s age, parents’ education and father’s presence in the home. All of the children were born into intact families. Overall, data from the first three waves showed that differences by wantedness in psychosocial adaptation persisted over time, with children born from

unwanted pregnancies consistently being less well adapted than their counterparts.

The most recent study represents the fourth wave of data collection, conducted in 1992–1993, when those born from unwanted pregnancies were about 30 years old (mean age of 29.1 years). Researchers examined data provided by 190 members of the original cohort of children from unwanted pregnancies and 200 controls. To ascertain whether unwantedness effects might be shared within families, they also assessed 162 siblings of the original cohort, and almost the same number of siblings (160) of the matched controls. (Those who were only children were omitted from this portion of the analysis, as were any siblings younger than age 20.)

The researchers relied on four official registries to assess the incidence of criminal convictions, parenting problems, alcohol or drug abuse, and unemployment among the study participants. They also constructed indicators from the subjects' responses to a socialization scale, a mood frequency questionnaire (which measured anxiety and depression), a social development questionnaire and a social integration scale.* The researchers then performed multiple logistic regressions to determine whether wantedness status at birth predicted psychosocial health among young adults.

Examination of the official registries revealed some differences between the young adults born from wanted and unwanted pregnancies. The only statistically significant difference concerned women's unemployment status: Young women born from unwanted pregnancies were three times as likely as those from wanted pregnancies to be registered as unemployed in 1992–1993 (12% vs. 4%, $p < .05$). Although men from unwanted pregnancies appeared more likely than those whose conception had been wanted to be registered abusers of alcohol (12% vs. 7%), this difference was not statistically significant.

Further, there were statistically significant differences by whether the pregnancy was wanted or unwanted on six of the 10 indicators of social and psychological health: the socialization scale; the measure of self-discipline; having positive memories of home; depression; receipt of psychiatric care; and the social integration scale. For example, women had a mean

score of 34.1 on the socialization scale if their conception had been wanted, compared with a score of 31.9 if it had been unwanted; the mean scores among men were 31.4 and 30.0, respectively. The differences by wantedness were generally larger among women than among men.

Further analysis suggested that at least some of the late negative developmental effects were related to the unwantedness of the pregnancy per se, since the siblings of the study children did not share these effects. For example, women born following unwanted pregnancies were significantly more likely ($p < .001$) to suffer anxiety, depression and lack of self-confidence than were women whose conception was wanted, but there were no differences in the anxiety, depression and self-confidence scores among the sisters of either group. The researchers observed the same pattern when they examined other indicators, such as the social integration index: Women born from unwanted pregnancies were significantly less integrated into Czech society than were those whose birth was wanted, yet there were no differences among the sisters of these women. This finding suggests that, at least among females, children born from unwanted pregnancies tend to be emotionally unstable and poorly integrated socially, while such detrimental effects are not shared with siblings.

There were other areas, however, in which siblings shared the same developmental profiles regardless of the wantedness of the pregnancy: Among both men and women, children born from unwanted pregnancies and their siblings shared lower overall socialization scores and lower educational levels as adults than did children from wanted pregnancies; moreover, these shared differences within families were greater than the nonshared female-specific effects of unwantedness.

The investigators observe that some negative developmental effects of being born after an abortion was denied have persisted nearly 30 years later, although the strength of these effects appears to have lessened over the years. The researchers surmise that harmful developmental and social effects most likely stem from psychological deprivation suffered very early in childhood. An assessment of whether siblings display the same unfavorable developmental profiles revealed that they shared some, but not all, of the studied effects. This finding, according to the investigators, partially supports the hypothesis that the unwantedness of the pregnancy in itself is associated with at

least some harmful long-term developmental effects.

That some harmful nonshared effects were significant for women but not for men led the researchers to conclude that the long-term effects of unwanted pregnancies have gender-specific and time-specific components. The researchers hypothesize that at around age 30, women are especially vulnerable to partner and childbearing problems. They also suggest that a corresponding difficulty for men in this age-group could be occupational stress and heavy alcohol use. However, the survey did not collect sufficiently detailed data in these areas to adequately address this hypothesis.—*L. Remez*

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Special Screening Program In West Virginia Reduces Postneonatal Mortality

A risk-related screening and intervention program begun in West Virginia in 1985 appears to have reduced postneonatal mortality by about 20% statewide in only two years.¹ Nearly half (45%) of infants at the highest risk of mortality received monthly planned care; among these infants, mortality in the first year of life was 42% lower than that among similar infants who did not receive such care. Standardized ratios of postneonatal mortality went from 118.7 observed deaths per 100 expected deaths in the 15-year-period preceding the intervention to 96.1 observed per 100 expected in 1987–1988.

Researchers examined two approaches for reducing high levels of mortality in the first year of life in West Virginia. One used the Sheffield Birth Score, a multifactorial score administered at birth that assesses the newborn's health; newborns who scored above the 85th percentile were considered to be at high risk. The other approach relied on a clinical evaluation made by a physician, who registered infants in a protocol of specialized care if a sibling had died of sudden infant death syndrome (SIDS) or if they had had an apparent life-threatening event, had required a tracheostomy (insertion of a tube in the trachea to assist ventilation), had a high-risk cardiac condition or were born to a narcotic-addicted mother. The specialized care program (which included home treatment) was taught in a required physician education program.

*One point was earned for a study participant's absence from each registry and one point each was awarded for their success in social and personal endeavors (having completed secondary education, being married at the time of the survey, never having been divorced, never having seen a psychiatrist, and owning one's home or apartment). A high score thus signaled the highest level of social integration.

Of the 69,262 live births occurring in West Virginia in 1985 through 1987, approximately 45% were evaluated using the Sheffield Birth Score, and roughly 15% of these—4,570 newborns—had scores in the 85th percentile or higher. Among the high-scoring infants, 45% (2,079 infants) were linked to a primary care provider of the parents' choice who followed a consistent care schedule of monthly visits for six months.

In addition, 1,003 infants around the state were registered by physicians as being at risk on the basis of the clinical evaluation—765 because of a life-threatening event (375 preterm infants and 390 full-term infants), 94 because a sibling had died of SIDS, and 144 because of a tracheostomy, a cardiac condition, a narcotic-addicted mother or a combination of these risk factors. Among 618 of these infants who were also evaluated according to the Sheffield Birth Score, 324 had low scores and 294 had high scores. The physicians who clinically evaluated these infants provided home breathing or heart rate monitors for 52%, as part of the standard preventive protocol.

Researchers assessed the program's impact on total postneonatal mortality in the state by comparing trends in standardized mortality ratios (the ratio of the observed number of postneonatal deaths to the expected number of deaths, according to prevailing U.S. postneonatal mortality rates) for 1970 through 1988 in West Virginia and in two bordering states (Kentucky and Tennessee), as well as in the predominantly rural states of Idaho and Indiana. The data were adjusted for the higher rate of postneonatal mortality among blacks than among other racial groups.

The overall postneonatal mortality rate for the study period in West Virginia was 3.3 postneonatal deaths per 1,000 live births. Rates were significantly higher among the 4,507 infants who scored above the 85th percentile on the risk-assessment index than among those who scored lower (10.7 postneonatal deaths per 1,000 births vs. 1.7 per 1,000, $p < .0001$). However, postneonatal mortality rates among the high-scoring infants who were linked to a planned-care schedule were 42% lower than the rates among similar infants who did not receive planned care (77 postneonatal deaths per 1,000 births vs. 13.2 deaths per 1,000, $p = .046$).

There were a total of 95 postneonatal deaths among the infants who were assessed by the Sheffield Birth Score (49 deaths among the 4,570 who scored highest and 46 deaths among the 26,482 who had lower scores). Infants who were classified as high-risk were 6.3 times as likely to die

in the first year of life as newborns who scored below the 85th percentile. Furthermore, high-scoring infants were more than 11 times as likely as low-scoring infants to die of SIDS, and they were seven times as likely to die from either SIDS or a potentially preventable cause of death.

There were 22 postneonatal deaths among the protocol infants, for a rate of 21.9 per 1,000 births; in contrast, among all other births in West Virginia over the study period, the postneonatal mortality rate was 3.1 per 1,000—about one-seventh the rate for the protocol infants. Infants evaluated according to the protocol were about 10 times as likely as other infants to die of SIDS (9.0 per 1,000 vs. 0.9 per 1,000), and were about eight times as likely to die of SIDS or a potentially treatable health problem (15.0 per 1,000 vs. 1.9 per 1,000).

The standardized mortality ratio for West Virginia in the 15-year period before the intervention (1970–1984) was 118.7 observed deaths per 100 expected deaths; the ratio fell to 96.1 per 100 in 1987–1988. (The researchers included 1988 in the reference years because the infants were tracked for a full year of survival, and 40% of postneonatal deaths in a given year occur among infants born the previous year.) The rate for 1987–1988 represented a 19% decrease from that prevailing over the 15 years preceding the intervention. For 1970–1984, the ratios in the neighboring states of Kentucky (101.9) and Tennessee (110.7) were significantly lower than West Virginia's average, but by 1987, the ratios in West Virginia had fallen to levels close to those in the two neighboring states, and by 1988, when the full impact of the program began to be felt, West Virginia's ratio had fallen below them.

According to the researchers, the significant reduction in postneonatal mortality in West Virginia represents a saving of 33 lives by the end of 1987, and of 52 lives by the end of the following year. The cost of the program, on the other hand, totaled \$1.2 million by the end of 1987, or \$36,363 per life saved during the start-up period, the most costly part of the program.

The researchers conclude that the reduction in postneonatal mortality in West Virginia was a "direct result of the risk-related intervention program." Factors in the program's success included Medicaid's and third-party payers' assured funding of services for indigent families (which make up 50% of West Virginia's families); the fact that families were able to use a physician of their choice for the monthly planned visits; and the large number of physicians who participated in the risk-as-

essment and intervention program (849).

According to the investigators, another benefit of the screening and intervention program was the increased awareness and use of the preventive protocol among physicians in the state. They affirm that such a broad-based statewide system is essential for preventing the relatively small number of postneonatal deaths that are scattered throughout the state. —L. Remez

Reference

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Studies Suggest Inherent Risk of Poor Pregnancy Outcomes for Teenagers

Teenagers may be intrinsically more likely than older women to have adverse pregnancy outcomes, even if they receive adequate prenatal care, according to the results of research conducted in Utah.¹ In a population that reflected the characteristics of white, middle-class Americans, teenagers were significantly more likely than women in their early 20s to deliver an infant who was underweight, premature or small for gestational age. Additionally, a California study suggests that the risk of congenital malformations is elevated among infants born to teenagers.² The findings from both studies raise the question of whether young maternal age, irrespective of background or behavioral characteristics, increases the risk of poor pregnancy outcomes.

Pregnancy Outcomes

In the Utah study, the investigators examined vital statistics data for 134,088 white women aged 13–24 who delivered singleton, first-born infants between 1970 and 1990. Mothers in Utah generally are white and married, receive adequate prenatal care and tend not to smoke or use alcohol or illicit drugs; consequently, they tend to be at low risk for adverse pregnancy outcomes. Therefore, the researchers suggest, data on underweight, premature and undersized infants born to this population may provide insights into the biological risks associated with teenage pregnancy.

The investigators categorized infants as low-birth-weight if they weighed less than 2,500 g at delivery, as premature if their gestational age was less than 37 weeks and as undersized if their birth weight was below the 10th percentile for their gestational age and gender. They compared

data on infants born to women aged 13–17 and aged 18–19 with data on those born to women 20–24 years old.

To offset the potentially confounding effects of socioeconomic variables, the analysts classified the data according to the mother's marital status, educational level (defined as appropriate or inappropriate for her age) and adequacy of prenatal care (as determined by the trimester in which she first sought care and the number of visits she made for care). They assumed that women with the most favorable background (those who were married, had an age-appropriate level of education and received adequate prenatal care) would be the least likely to have adverse pregnancy outcomes; poor outcomes among this group, they suggest, could be attributable to underlying biological factors.

Within the study sample, 11% of births were to women aged 13–17, 21% were to older teenagers and 67% were to women aged 20–24. Young teenage mothers were the least likely to be married (62%, compared with 79% of older teenagers and 94% of those in their early 20s) and to have received adequate prenatal care (52%, as against 62% and 76% of those aged 18–19 and 20–24, respectively). Mothers aged 13–17 and those aged 20–24 were more likely than 18–19-year-olds to have obtained an age-appropriate level of education (95–96% vs. 85%).

Young teenagers had the highest incidence of poor outcomes: They were the most likely to have had a low-birth-weight baby (7%), a premature delivery (10%) or an undersized infant (14%). Women aged 20–24, on the other hand, were the least likely to have experienced these outcomes (4%, 5% and 10%, respectively). In each age-group, the frequency of these outcomes was highest among women who were unmarried, whose educational level was not age-appropriate and, particularly, who had received inadequate prenatal care: Those who had had inadequate care were at least twice as likely as those who had gotten adequate care to bear a low-birth-weight or premature infant.

The high risk for young teenagers was apparent even among those with the most favorable socioeconomic characteristics. In this group, mothers aged 13–17 had 1.7 times the risk of those aged 20–24 of bearing a low-birth-weight infant, 1.9 times the risk of delivering prematurely and 1.3 times the risk of having an undersized infant; for older teenagers, the relative risks were 1.2, 1.5 and 1.1, respectively. The researchers also found that women aged 13–15 were significantly more likely than those aged

16–17 to have adverse outcomes.

Analysis of data on smoking during pregnancy (which were available for women who gave birth in 1989 and 1990) showed that even among nonsmokers, teenagers had a higher risk of adverse outcomes than women aged 20–24; however, only young teenagers' risk of having a low-birth-weight infant was significantly elevated.

The researchers note that their data did not include information on psychosocial characteristics that may increase the risk of adverse pregnancy outcomes or on illicit drug use, but they add that in this sample, biases due to these data limitations are likely minimal.

In discussing their results, the analysts suggest that two "general features of biologic immaturity" may help explain the apparent elevated risk of adverse pregnancy outcomes among teenagers: Young gynecologic age may predispose a woman to infection, increased prostaglandin production and thus an elevated risk of premature delivery; also, a pregnancy that occurs while the mother is still growing may cause her to compete with the fetus for nutrients. Therefore, the investigators conclude, reducing the incidence of poor pregnancy outcomes among teenagers will require identifying the biological factors that contribute to these outcomes and taking steps to minimize their effects.

The authors of an editorial responding to the study raise a number of questions regarding its design and implications.³ They suggest that the population chosen for the analysis may have influenced the results, in that the same socioeconomic and behavioral characteristics that make teenage mothers unusual in Utah (for example, low income and a propensity for risk-taking behavior) may also be factors in poor pregnancy outcomes. Furthermore, they comment, the investigators' failure to provide frequency distributions for the outcomes studied or data on long-term outcomes may limit the clinical importance of the findings. The editorial's authors also note that prepregnancy weight is an established risk factor for the outcomes examined, and the study would have benefited from data on this characteristic.

Congenital Malformations

In the California study, researchers examined the prevalence of congenital malformations by mother's age. The data, covering more than one million infants born alive between 1983 and 1988, came from the California Birth Defects Monitoring Program, a population-based registry containing information on structural anom-

alies diagnosed before an infant's first birthday. The researchers calculated the overall prevalence of malformations across maternal ages 15–45. They also computed age-specific prevalences both including and excluding chromosomal anomalies.

Over the study period, 29,848 infants were born with malformations (29 per 1,000 live births); 6% of these had a chromosomal abnormality. A variety of malformations, affecting nearly every organ system, were more common among infants born to teenagers than among those born to women aged 25–29; these included defects of the central nervous system and upper limbs, but not major heart defects. Additionally, according to the analysis, the prevalence of nonchromosomal abnormalities was U-shaped; the risk among infants of teenage mothers was comparable to that among infants whose mothers were aged 40 and older.

Further research, the authors conclude, should focus on determining whether teenagers' risk of bearing infants with congenital malformations is due to behavioral or developmental factors, and on identifying the point, relative to conception, at which these factors have their greatest impact for the fetus.—*D. Hollander*

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Romanian Maternal Death Rate Fell by Two-Thirds After the 1989 Revolution

Fertility in Romania has fallen below replacement level, to an average of just 1.6 lifetime births per woman. After restrictive policies outlawing abortion and contraception were repealed in December 1989, contraceptive prevalence increased by 20%, total induced abortion rates doubled and the maternal mortality rate fell by nearly two-thirds. The increase in contraceptive prevalence, however, was primarily caused by an increase in reliance on traditional methods, which account for three-quarters of all contraceptive use. These are some of the highlights of a 1993 survey of reproductive health conducted in Romania.¹

The Romanian Reproductive Health Sur-

vey, a national household probability survey of 4,861 women aged 15–44, was fielded between July and December 1993. The survey questionnaire covered a wide range of topics, including a complete history of the respondent’s previous pregnancies, births and abortions; the women’s knowledge and use of family planning; attitudes toward modern contraception; measures of maternal and child health; and knowledge about human immunodeficiency virus (HIV) transmission.

A majority of the women surveyed were in a union (63% in a legal marriage and 4% in a consensual one), 5% were previously married and 28% had never been married. The sample was predominantly Eastern Orthodox (88%), and a similarly high proportion was ethnic Romanian (90%). Results indicated that first sexual intercourse often coincided with marriage, as the median age at first union was 20.4 years and the median age at first intercourse was 20.2 years. However, 22% of 15–24-year-olds reported premarital sexual experience.

From 1966 through 1989, Romanians lived under one of the most strictly enforced pronatalist regimes in Eastern Europe, with contraception, abortion and sex education virtually outlawed. These restrictive laws were repealed in December 1989 in the wake of the revolution against Communism. To examine the effects of these changes, the researchers reported survey findings on fertility and abortion for two consecutive 36-month periods preceding and following the revolution—June

1987–May 1990 and June 1990–May 1993.

Fertility and Abortion

According to the 1993 survey, the total fertility rate (TFR) in Romania dropped abruptly by one-third following the 1989 revolution, from 2.3 lifetime births per woman in 1987–1990 to 1.6 per woman in 1990–1993 (Table 1). The decline was sharpest (48%) for women aged 35–39, followed by a drop of 38% among women aged 30–34. Women aged 20–29, who accounted for the highest proportion of births (70%), had a 29–35% decline in fertility.

Over the period June 1990–May 1993, TFRs in Romania were extremely low among the most educated women (1.07 lifetime births per woman), among those of high or middle socioeconomic status (1.11 and 1.17 births per woman, respectively) and among urban women (1.21 per woman). Even the highest TFRs among Romanian women were only 2.26 lifetime births for those with a primary education (down from 3.47 in 1987–1990) and 2.15 births per woman among those of low socioeconomic status (down from 2.89 in 1987–1990).

One reason for these low fertility rates was the exceptionally high abortion rates that followed the legalization of abortion in 1989. The total induced abortion rate doubled over the study period, going from 1.7 lifetime abortions per woman in 1987–1990 to 3.4 per woman in 1990–1993. This rate was lowest among never-married women (1.0 abortions per woman), since abortions in Romania are obtained primarily by married women.

The overall doubling of the total abortion rate was accompanied by a one-third increase in the pregnancy rate over the period. One reason for this increase was that abortions return women to the risk of pregnancy sooner than when a pregnancy is carried to term, as the duration of pregnancy and postpartum infecundability are both shortened and the amount of time women are at risk of pregnancy increases.

The largest increase in abortion since legalization occurred among 15–19-year-olds, whose abortion rate tripled, from 10 abortions per 1,000 15–19-year-olds in 1987–1990 to 32 per 1,000 in 1990–1993. Abortion rates among women aged 20–34 (who are responsible for most childbearing) more than doubled in the period following legalization. For example, the abortion rate among 25–29-year-olds increased from 82 abortions per 1,000 to 209 per 1,000.

Over the period 1990–1993, total abortion rates were especially high among women who had completed only primary school

(4.7 lifetime abortions per woman), among those living in the capital, Bucharest (4.1 per woman), and among those of low socioeconomic status (3.7 per woman). The abortion ratio recorded in the survey was also extremely high: In 1992, 71% of known pregnancies in Romania were terminated by induced abortion. The reasons women gave for having an abortion indicate that the majority (67%) were performed to limit or space births, 20% were obtained for economic or social reasons, 4% were related to the woman’s relationship with her partner, 4% were for health reasons and 5% were for other reasons.

The health effects of the lifting of restrictions on abortion after 1989 were evident in the changes in abortion-related morbidity and mortality. Before 1989, more than two-thirds of abortions were illegally induced, and 21% of such procedures resulted in complications; in the period after liberalization, nearly all of the procedures were legal, and just 9% of women having a legal procedure reported developing complications. Similarly, the decline in the maternal mortality rate from 170 maternal deaths per 100,000 live births in 1989 to 60 per 100,000 in 1992 was largely attributable to the 60% drop in abortion-related mortality.

A sizable proportion of women in the sample—61%—said in 1993 that their most recent pregnancy was unintended; 51% were unwanted and 10% were mistimed. (In turn, 95% of unintended pregnancies among Romanian women end in induced abortion.) Between 1988–1990 and 1990–1993, the proportion who said they had an unintended pregnancy rose from 51% to nearly 68% (Table 1).

Fifty-nine percent of Romanian women in union said that they wanted no more children, including 72% or more of all women with two or more living children. By age, the subgroups in which the largest proportions want no more children are 30–34-year-olds (75%) and 35–39-year-olds (70%). In contrast, just 10% of respondents said they wanted another child within the next two years, including 42% of those with no children, 17% of those with one living child and 27–28% of 15–24-year-olds.

Contraceptive Use

Romania’s surge in abortion rates since 1989 appears to have been the primary determinant of the decline in fertility, as there was no important change in modern contraceptive use. Although the 1993 survey documented a 20% rise in contraceptive use from 1987–1990 to 1990–1993, fully 70% of that increase corresponded to greater reliance on traditional methods.

Table 1. Selected findings from the 1993 Romania Reproductive Health Survey

Measure	Rate or %
Total fertility rate	
1987–1990	2.3
1990–1993	1.6
Total abortion rate	
1987–1990	1.7
1990–1993	3.4
% with unintended pregnancy	
1987–1990	51.0
1990–1993	67.5
Fertility preferences	
% wanting no more children	58.5
% wanting a child within 2 yrs.	10.1
% wanting a child later	5.4
% wanting a child at some time, but unsure when	2.8
% undecided	3.7
% infecund or subfecund	19.5
% practicing contraception	57.3
Withdrawal	35.0
Rhythm	8.4
IUD	4.3
Condom	4.1
Pill	3.2
Female sterilization	1.4
Spermicides	0.8

In 1993, 57% of women in union were currently using a method; three-quarters of these users depended on traditional methods, with nearly two-thirds relying on withdrawal. Approximately 63% of users of traditional methods felt that their method was as effective as, or more effective than, the pill or IUD; this finding was not affected by women's level of education. Moreover, four-fifths of users of traditional methods did not want to switch from their current method, despite its high failure rate: According to life-table analyses of segments of new use since 1989, 30% of women in the sample relying on withdrawal or the calendar method had become pregnant within one year of initiating use.

Romanian women appeared to be uninformed about modern contraceptive methods. For example, roughly 20% of Romanian women in union had never heard of the pill or the IUD, 35% were unfamiliar with female sterilization and 88% had never heard of vasectomy. Further, responses to specific questions about the pill revealed that relatively few women believed that the pill is at least somewhat safe to take (19%); only about one-third (35%) were at least fairly sure that the pill prevents pregnancy when taken correctly.

The most widely used modern methods in Romania are the condom and the IUD (used by 4% each of women in union), followed by the pill (3%) and female sterilization (1%). The proportion of women in union who were using a modern method was highest among those of high socioeconomic status (28%), among the best educated (24%) and among those living in Bucharest (20%). In every subgroup, however, the prevalence of traditional methods was greater than that of modern methods.

Pharmacies and government contraceptive posts were important sources of modern contraceptives, providing contraceptive supplies for 38% and 31% of users, respectively. However, 17% of users of modern methods said that they resorted to the black market to obtain their method.

Forty-nine percent of Romanian women said they would use withdrawal in the future, while 46% said they would use a modern method. Among the reasons that current users of traditional methods gave for not wanting to use a modern method were fear of side effects (cited by 71% of such women), the partner's preference for a traditional method (67%), limited knowledge of other methods (61%) and difficulty in obtaining or paying for a modern method (38% and 34%, respectively). Only 12% attributed their reluctance to use a modern method to religious beliefs.

Women's stated ideal number of children—2.1—varied little by subgroup and indicated that at current rates, Romanian women are likely to bear fewer children than they consider to be ideal. Using the conventional definition of unmet need—the need for contraception among women who are fecund, sexually active, not currently pregnant and not practicing contraception, yet who do not want to become pregnant—yielded a relatively low level of unmet need (11%). However, a definition that includes women using less effective methods increased the proportion with an unmet need to 55% of women in union.

AIDS Knowledge

According to the survey module on AIDS, 96% of Romanian women had heard of AIDS, but fewer than one-half (47%) knew that infection with HIV can be asymptomatic; the latter proportion was especially low among rural women (37%), those with a primary schooling only (31%) and those currently in a consensual union (36%).

Responses to questions about modes of transmission provided further evidence that women's knowledge was fairly superficial: Nearly one-third (32–36%) of the sample believed that HIV can be passed by sharing objects with an infected person, by using public bathrooms or by kissing an infected person on the mouth. Further, 27% said that HIV can be transmitted by a mosquito; approximately the same percentage did not know that HIV can be spread through male homosexual sex. Again, these proportions were particularly high among rural and less-educated women.

Sixty-six percent of respondents believed that they were themselves at no risk of developing AIDS. Sixteen percent did not know if they were at risk, 12% considered themselves to be at low risk, 3% thought they were at high risk and another 3% could not specify their level of risk. The researchers found, though, that a history of condom use was not related to perceived risk: Women who said they were at high risk were no more likely to have used condoms than were women who saw themselves as being at no risk. Furthermore, women who classified themselves as high-risk were also no more likely to intend to use condoms than were those at no risk.

Conclusions

The investigators attribute the very high rates of unintended pregnancy in Romania to many factors, including "limited sex and contraceptive education, mistrust and misinformation about modern methods, lack of adequately trained providers [and the

shortage or uneven distribution of contraceptive supplies." To help remedy this situation and reduce abortion rates, the researchers urge that access among the public and medical establishment to modern methods and to accurate information about them be improved, and that permanent methods in particular be promoted, since the most commonly mentioned reason for having an abortion and for practicing contraception is to limit family size.—*L. Remez*

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Pill Use Before Age 35, Recent Injectable Use May Raise Breast Cancer Risk

Overall, oral contraceptive use is associated with only a modest increase in the risk of breast cancer, and use of the injectable contraceptive depot medroxyprogesterone acetate (DMPA) causes no increased risk; both methods, however, may substantially raise the likelihood of breast cancer among certain subgroups of users. The results of a multicenter U.S. study of the effects of pill use on breast cancer risk¹ indicate that women who have used this method for at least six months are 1.3 times as likely as others to develop breast cancer, but that the risk increases (to 1.7) among those younger than 35; young women are at even greater risk if they used oral contraceptives for 10 or more years, or if they have used the pill recently. In a study on DMPA that pooled data from four countries,² no overall association was apparent between use of the injectable and breast cancer, and the relative risk did not increase with prolonged use. However, first use of DMPA within the five years before diagnosis was associated with a doubling of the breast cancer risk. In addition, the risk among former users seems to disappear after five years following discontinuation, irrespective of duration of use.

Pill Use

Researchers examining the association between pill use and the risk of breast cancer conducted a population-based case-control study, using data on Seattle and central New Jersey women aged 20–44 and Atlanta women aged 20–54. A total

of 2,203 women with in situ or invasive breast cancer diagnosed between May 1990 and December 1992 participated in the study; these women were contrasted with 2,009 healthy women identified through random-digit dialing. The women participated in in-person interviews, completed questionnaires on diet and underwent a number of anthropometric measurements.

The researchers focused on women younger than 45 (the majority of the sample), because the pill has been available in the United States for most of their reproductive lives; 85% of breast cancer patients in this age-group and 82% of women in the control group had used the pill. The investigators used logistic regression analysis to calculate the risk of breast cancer among women who had used the pill for at least six months, relative to that among women who had never used oral contraceptives or had used the pill for less than six months. Estimated relative risks are adjusted for race, parity and age at first birth, factors that had small confounding effects on pill use.

Women aged 20–44 who had used the pill for six months or longer were 30% more likely than other women to have developed breast cancer (a relative risk of 1.3). The risk was higher, however, among those who were younger than 35 (1.7). By contrast, women aged 35–39 had a risk that was only slightly above average (1.4), and those aged 40–44 had no significantly increased risk.

The relative risk of breast cancer rose with duration of pill use among women aged 20–34, reaching 2.3 for those reporting 10 or more years of use; the effect of prolonged use was evident at each site, and among both white women and black women. Furthermore, for women aged 20–34, the risk increased from 1.6 to 2.0 as the interval between first use and breast cancer diagnosis lengthened from less than 15 years to 15–19 years; it decreased from 2.0 to 1.2, however, as the number of years since last use increased from less than five to 10 or more. Women who initiated pill use before age 18 had an elevated risk of breast cancer (2.2), but those who began using the pill at age 16 or younger were at no additional risk.

Neither duration of use, interval since first use nor age at first use was associated with breast cancer risk among women aged 35 or older. However, among all women younger than 45, recent users (those who had used the pill within the last five years) had an elevated relative risk of breast cancer (1.5), regardless of duration of use.

The researchers also examined the combined effects of various patterns of pill use

for women aged 20–34, 35–39 and 40–44. They found particularly high risks only among women younger than 35 who had used the pill for 10 or more years and either had begun using it before age 18 (3.1) or had first used it at least 15 years before diagnosis (3.2).

For all women younger than 45, breast cancer risk did not appear to be related either to duration of use before age 25 or, among parous women, to duration of use before a full-term birth. Women aged 20–34 who had used the pill for several years before giving birth had somewhat elevated risks, which the researchers attribute to these women's relatively long duration of pill use.

Information on the stage of the disease at diagnosis was available for 98% of breast cancer patients younger than 45. In 14% of these cases, the cancer had been diagnosed in situ; in 49%, it had advanced to a local stage; and in 37%, it was identified at a regional or distant stage. The investigators found that the relative risk associated with pill use rose from 0.9 to 1.4 as the stage of the disease advanced; the results were similar for prolonged use (the risk increased from 0.9 to 1.5) and for recent use (from 0.9 to 1.8). Among women younger than 35, as the disease progressed, the risk associated with prolonged pill use increased from 0.7 to 2.9, and the risk associated with recent use rose from 1.4 to 2.1.

No difference in relative risk associated with pill use was evident between black women, who accounted for 15% of the sample, and white women (1.3 vs. 1.2); this was also the case for most durations of use and for recent use. A different picture emerged among women younger than 35, however: Women of both races who had used the pill for five or more years had the same risk of breast cancer (2.1), but white recent users had a higher risk than comparable blacks (2.4 vs. 1.4).

The data on Atlanta women aged 45–49 and 50–54 revealed relative risks associated with pill use of 1.2 and 0.9, respectively. No clear trends emerged for these older women by duration of use, interval since first use or age at first use; too few breast cancer patients aged 45 or older had used the pill within the last five years to permit analysis of the effects of recent use.

The investigators examined factors that may have interacted with pill use to influence breast cancer risk. Although they found no significant interaction effects, they noted that among women younger than 35 who used the pill for five or more years, those with a family history of breast cancer had a higher risk than others (3.1 vs. 1.9). Assessments of screening histories and di-

agnostic methods revealed no biases that would have influenced the associations.

In discussing their results, the researchers note that since they found neither a decreased risk of breast cancer associated with pill use among older women nor evidence of detection or screening biases, other explanations for the elevated risk among younger women must be explored. Future investigations, they suggest, should focus on how the pill may influence tumor development and on the effects of various oral contraceptive preparations.

DMPA Use

For the analysis of the association between breast cancer risk and use of DMPA, investigators pooled the results of two case-control studies with similar designs and results. One study was carried out in New Zealand, and the other was conducted by the World Health Organization (WHO) in Kenya, Mexico and Thailand.

The New Zealand study involved 891 breast cancer patients aged 25–54 identified through a population-based cancer registry and a control group of 1,864 women randomly selected from electoral rolls. A questionnaire that was based partly on the one developed for the WHO study was administered through telephone interviews.

The WHO investigators identified breast cancer patients aged 15 and older by monitoring hospital admissions, visits to outpatient clinics and pathology records. The control group consisted of hospitalized women whose conditions were not obstetric or gynecologic in nature and would not affect contraceptive use. Interviews were conducted, generally in the hospital, with 877 breast cancer patients and 12,041 controls.

Both studies found evidence that women younger than 35 at diagnosis or hospitalization, recent users of DMPA and women who had used the injectable before age 25 were at increased risk of breast cancer. Neither sample was large enough, however, to permit conclusive estimates of the effects of these factors.

The pooled data set consisted of 1,768 breast cancer patients and 13,905 controls aged 15 and older (most younger than 55); about 12% of each group had used DMPA. The analysts used unconditional logistic regression to calculate relative risks of breast cancer, adjusted for age, study site and age at first live birth, which they had identified as potentially confounding factors.

For the sample as a whole, ever-users of DMPA were no more likely than never-users to have developed breast cancer (a nonsignificant relative risk of 1.1); dura-

tion of use did not appear to affect the risk. Women younger than 35 had the highest overall relative risk (1.5, compared with risks of about 1.0 for those aged 35–44 and those aged 45 or older) and the highest risk at any duration of use (2.0 at three or fewer months—i.e., after one injection).

Data on the interval since first use of DMPA revealed that among all women and among women younger than 35, those who had initiated use within the previous five years were the most likely to have developed breast cancer (a relative risk of 2.0 in both instances). For women of all ages, risk declined significantly as the interval since first use increased.

Similarly, the effect of current DMPA use was of borderline significance for women of all ages and was significant among women younger than 35 (relative risks of 1.5 and 2.1, respectively), but was not significant among older women. Although the trend according to the interval since last use was not significant, the

data suggest that former users may have a somewhat elevated risk within the first five years after discontinuation, but not after longer periods.

Duration of use was a statistically significant factor only for those who used DMPA before age 25. In addition, women who used the injectable before age 25 tended to be young at diagnosis; most were under age 35.

When the analysts examined the combined effects of various risk factors, they found that at all durations of use (from three months or less to five years or more), recent first use was associated with the highest breast cancer risk; the risk reached 3.1 among women who had begun use within five years before diagnosis and had had only one injection. Similarly, women who had recently discontinued the method generally had an increased risk of breast cancer; the exception was those who had used DMPA for more than two years and had discontinued it more than two years before diagnosis.

According to the investigators, the main contribution of the pooled analysis was to “untangle” the effects of the factors associated with DMPA use and breast cancer, and to demonstrate the key role of recent use. The explanation for this association, however, remains uncertain. In the analysts’ view, the most plausible explanation may be that DMPA accelerates the growth of existing tumors. It is also possible, they note, that women who discontinue DMPA use after one injection because of undesirable side effects already have an elevated risk of developing breast cancer in the near future.—*D. Hollander*

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Black-White Infant Mortality Differential Has Grown In Recent Decades and Will Persist into Next Century

Infant mortality in the United States has declined dramatically in the past four decades, but racial disparities in infant mortality levels have grown.¹ Black infants are currently more than twice as likely as white infants to die, and according to a recent analysis of vital statistics data, this differential is expected to persist into the 21st century.

The researchers used vital statistics data for 1950–1991 to estimate birth and infant mortality rates by age, race and ethnicity, and cause of death. National linked birth and infant death data sets for 1985, 1986 and 1987 provided more detailed information on racial and ethnic background, as well as information on mother’s education. To examine income differentials, the researchers used weighted birth and infant death data from the National Maternal and Infant Health Survey of 1988. Finally, historical data on education and income were taken from the National Natality Survey and the National Infant Mortality Survey for the years 1964–1966.

Overall, U.S. infant mortality rates declined steadily between 1950 and 1991, at an average annual rate of 3.1%. Infant mortality fell slowly between 1950 and 1965, at a rate of 1% per year, but began to decrease sharply thereafter, with an overall reduction of almost 50% between 1965 and 1981. After 1981, however, the rate declined less dramatically: Between 1982 and 1993, the

infant mortality rate fell from 11.5 infant deaths per 1,000 live births to 8.3 per 1,000, a yearly decline of 2.8%.

Mortality Differences by Race

While overall infant mortality rates were declining, however, racial disparities were increasing. The infant mortality rate for black infants was 43.9 infant deaths per 1,000 live births in 1950, 64% higher than the rate among white infants of 26.8 per 1,000. By 1991, the mortality rate for black infants had fallen to 16.5 per 1,000, but this was more than twice the rate among white infants—only 7.5 per 1,000. From 1950 to 1991, the infant mortality rate for white infants declined by 3.2% per year, on average, compared with a decline of 2.9% annually for black infants. Only in the late 1960s and early 1970s did these rates briefly converge.

Neonatal mortality (deaths during the first 27 days of life) declined by 3.4% annually between 1950 and 1991. However, postneonatal mortality (deaths between 28 days and one year) declined more slowly, at an annual rate of 2.5%. Among whites, the neonatal mortality rate declined much faster than the postneonatal rate, with the former decreasing by 3.7% annually and the latter by 2.3%. Among black infants, in contrast, the average annual decline in neonatal mortality was 2.8%, compared with a mean annual decrease of 3.1% for postneonatal mortality.

Over time, racial inequalities in neonatal mortality have grown. In 1950, black infants were 43% more likely to have died within one month of birth than were white infants, but by 1991 their risk of early death was 130% higher than that of whites. Black-white differentials in postneonatal mortality narrowed over the same period, however: In 1960, black infants were almost three times as likely as whites to have died during the postneonatal period, whereas in 1991 they were twice as likely to have died.

Maternal Education

Data for 1964–1966 and for 1987 show maternal education to have been inversely associated with infant mortality. In 1964–1966, the infant mortality rate among blacks fell steadily with increasing maternal education, from 45.9 per 1,000 among those with eight or fewer years of schooling to 32.1 per 1,000 among those with more than a high school education. Among whites, rates fell from 32.0 per 1,000 among the least-educated women to 18.0 per 1,000 among high school graduates, and then leveled off. Rates for 1987 showed the same pattern, but because white mothers tended to have more education, the variable had more of a positive effect on infant mortality among whites than it did among blacks.

The greatest percentage decline between the earlier and the later periods was among white infants born to mothers with more

than 16 years of education; the infant mortality rate in this group fell from 19.6 per 1,000 live births in 1964–1966 to 5.8 per 1,000 in 1987. Those who experienced the smallest decline were infants born to mothers with 9–11 years of education; their likelihood of surviving to one year of age increased by only one-half between 1966 and 1987. The racial disparity in infant mortality rates was greater at higher levels of education: In 1987, for example, the infant mortality rate for babies born to black women with more than a high school education was 2.3 times the rate for comparable white infants, while black infants born to women who had not completed high school were just 1.6–1.7 times as likely as similar white infants to have died in their first year.

Family Income

Like maternal education, income was inversely related to infant mortality, especially in 1988 and especially among white infants. For instance, the mortality rates for infants whose parents had a family income of less than \$10,000 in 1988 were 11.2 deaths per 1,000 live births among whites and 19.3 per 1,000 among blacks, somewhat higher than rates for infants whose parents had a family income of \$35,000 or more (7.2 per 1,000 and 16.6 per 1,000, respectively).

Racial disparities in infant mortality increased between 1964 and 1988 for middle-income and upper-income families; in the mid-1960s, the infant mortality rate was 20% higher for blacks than for whites in families earning \$5,000–6,999 and 60% greater among those earning \$10,000 or more; in 1988, black infant mortality rates were more than twice as great as for whites among families in comparable earnings brackets (\$18,000–24,999 and \$35,000 or more).

Cause of Death

The five most important causes of death in 1991 were congenital anomalies, sudden infant death syndrome, prematurity and low birth weight, respiratory distress syndrome and maternal complications of pregnancy. Although congenital anomalies were the leading killer of white infants in 1991 (184.7 deaths per 100,000 live births), prematurity and low birth weight was the major killer of black infants (210.2 per 100,000) and accounted for one of every six infant deaths in 1991. Sudden infant death syndrome was the second most important cause of death among both black and white infants.

Overall, the top five causes of death in 1981 were the same as in 1991, but sudden infant death syndrome was the leading cause of death among blacks (248.7 per 100,000), while congenital anomalies were

the leading cause among whites (248.4 per 100,000). Although declines in conditions such as respiratory distress syndrome and pneumonia were shared by black and white infants between 1981 and 1991, black infant mortality from prematurity and low birth weight increased by nearly 9% over that time. All in all, in 1991, black infants were four times as likely as white infants to have died from prematurity and low birth weight and three times as likely to have died from pneumonia or influenza.

Future Trends

The researchers used a log-linear regression model to project future levels of U.S. infant mortality, based on recent trends in rates. According to this model, the infant mortality rate for the U.S. population will be 70 deaths per 1,000 live births by the year 2000. The rate among black infants will remain much higher than that among whites, though: For example, neonatal mortality rates are projected to be nearly 2.3 times as high among blacks (8.6 per 1,000) than among whites (3.8 per 1,000), while postneonatal mortality is expected to be 1.8 times as high (4.1 per 1,000 vs. 2.2 per 1,000).—*R. Turner*

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