

2002 Supplemental Analyses of Recent Trends in Infant Mortality

by Kenneth D. Kochanek, M.A., and Joyce A. Martin, M.P.H.

Overview

Preliminary data for 2002 indicate an increase in the infant mortality rate (IMR) to 7.0 deaths per 1,000 live births from 6.8 in 2001 (1). To better understand the increase in the IMR for 2002, the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) reviewed additional partially edited mortality records processed after the close of the preliminary data file as well as partially edited fetal death data for 2002 (processed as of January 2004). These data indicate that the increase in the 2002 IMR observed for preliminary data will be confirmed by final data, and that while the IMR increased, the perinatal mortality rate (late fetal deaths plus early neonatal deaths per 1,000 live births plus fetal deaths) remained stable. (Final statistics will be available later this year.)

The rise in the IMR is concentrated in the neonatal period (0-27 days), particularly in the early neonatal period (0-6 days) (tables 1 and 2). The rate of late fetal mortality (fetal deaths of 28 or more weeks of gestation per 1,000 live births plus fetal deaths) shows a 3 percent decline for 2002 (slightly greater than the average annual decline for 1990-2001). As a result, the perinatal mortality rate, which more fully describes the risk of death at late stages of pregnancy and shortly after birth, appears unchanged for 2002 (table 2 and figure 1). The perinatal mortality rate had declined fairly consistently for more than half of a century.

Cause of death

One way to better understand the increase in the IMR is to examine changes by cause using final 2001 and preliminary 2002 data. When examined by cause of infant death, 3 causes among the 10 leading causes of infant death appear to account for most of the current year increase: Congenital malformations, deformations and chromosomal abnormalities; Disorders related to short gestation and low birth weight, not elsewhere classified; and Newborn affected by maternal complications of pregnancy (table 3). Historically, the majority of these deaths have been among infants born low birthweight (weight at delivery of less than 2,500 grams or 5 and one-half pounds). Despite steady increases in preterm and low birthweight rates between 1990 and 2002, trends over this time period for these three causes do not indicate a consistent pattern of increase or decrease (2-14). However, the interpretation of the cause of death trends is complicated by the change in the ICD revision in 1999 that created breaks in the comparability of cause of death statistics (5).

Historical trends in infant mortality

The death registration area was completed in 1933 when all States were included in the collection of death statistics (15). Since then, with the exception of 1957-58, when a significant increase in the IMR was observed, the historical trend of the IMR has been one of steady, sometimes rapid decline. Through the 1930s and 1940s, the IMR declined by an average of 4 percent per year. The rate of decline slowed markedly to 1 percent per year for 1950 to 1964. Thereafter, until the early 1980s, infant mortality declined rapidly, by an average of almost 5 percent per year (16). From 1981 to 1989 the rate of decline again slowed to an average of 2 percent per year (3).

Recent trends in fetal and infant mortality

Over the more recent period, 1990 to 2001, the IMR declined 26 percent (from 9.2 to 6.8 per 1,000) for an average decrease of 3 percent per year (3). Between 1990 and 2001 the neonatal mortality rate declined from 5.8 to 4.5 per 1,000 (down 22 percent) and the postneonatal mortality rate from 3.4 to 2.3 (down 32 percent) (3). Between 1990 and 2001, the late fetal mortality rate declined fairly steadily, by 23 percent, from 4.3 to 3.3 per 1,000 (17). The perinatal mortality rate also declined steadily between 1990 and 2001, from 9.1 to 6.9 for a total of 24 percent. Although the pace of decline has slowed somewhat since the mid-1990s, significant declines in late fetal mortality and infant mortality have been observed through 2001 despite substantial increases in preterm and low birthweight risk, two important predictors of perinatal health.

As discussed above, preliminary data for 2002 indicate a 3 percent rise in the IMR from 2001. The increase was observed for neonatal deaths only; a 4-percent increase in the neonatal mortality rate was reported, whereas the postneonatal rate remained constant. The increase in neonatal mortality was accompanied by a 3-percent decline in the late fetal mortality rate and, as a result, the perinatal mortality rate was unchanged for 2002.

In addition to releasing preliminary and final mortality and natality statistics, NCHS also releases monthly provisional counts of vital events (as differentiated from records of vital events) and corresponding rates along with cumulative provisional information for the past 12 months and for all months to date in the calendar year. The provisional series is subject to reporting inconsistencies with considerable variation in the resulting estimates (18). However, the provisional series can be used to get early information on more recent trends with the understanding that the findings may change when more complete data are available. NCHS currently has provisional counts of infant deaths for the first 9 months of 2003. These counts suggest an improvement in the IMR between 2002 and 2003; however, the provisional data are not stable enough to determine if the magnitude of that improvement is large enough to bring the rate down to or below the historically low level reached in 2001.

Potential explanatory factors for the changes in the infant mortality rate

Changes in the characteristics of births and changes in birthweight and gestation-specific infant mortality rates (i.e., the death rate for infants at a given weight or gestational age) may be related to changes in the IMR. Final birth data for 2002 indicate that the two key predictors of infant health, the percent of births born preterm (less than 37 completed weeks of gestation) and low birthweight (LBW), continued to climb, rising 1 to 2 percent for 2002 (2). Increases in preterm and LBW rates of 3 and 1 percent respectively, were also noted between 2000 and 2001. Since 1990 preterm and LBW rates have risen fairly steadily, preterm by 14 percent (from 10.6 to 12.1 percent) and LBW by 11 percent (from 7.0 to 7.8 percent).

The bulk of the increase has been among moderately preterm (32-36 weeks of gestation) and moderately low birthweight (1,500-2,499 grams) infants. Between 1990 and 2002, the moderately preterm rate rose from 8.7 to 10.1 percent and the moderately low birthweight (MLBW) rate from 5.7 to 6.4 percent, whereas the very preterm rate (less than 32 weeks of gestation) rose from 1.92 to 1.96 percent and the very low birthweight rate (VLBW) (less than 1,500 grams) from 1.27 to 1.46 percent.

Although still at increased risk compared with term or normal birthweight infants, infants born moderately preterm and MLBW, are at substantially lower risk than their very preterm and VLBW counterparts for early death. For 2001, 18 percent of infants born very preterm did not survive the first year of life compared with less than 1 percent of infants born moderately preterm (19).

Multiple births, more than half of which are born preterm and/or low birth weight, have contributed importantly to recent increases in preterm and LBW rates. Between 1990 and 2002 the multiple birth rate climbed 42 percent (a 3-percent rise was reported between 2001 and 2002) (2, 20); in 2002 nearly one-fourth of all LBW infants were born in a multiple delivery (2). Multiple births do not account for all of the preterm/LBW rise; however, the preterm rate for singletons alone increased 7 percent over this period (2). (While the rate of moderately preterm singleton births rose from 8.01 to 8.87 percent between 1990 and 2002, the very preterm rate for singletons declined slightly, from 1.69 to 1.57 percent.)

The increased use of assisted reproductive therapies (ART) such as in-vitro fertilization has been strongly associated with the growth in multiple gestation pregnancies (21) and may also be associated with an increased risk of LBW among singletons (22,23). One percent of all 2001 births were the result of ART procedures (24).

Changes in the management of labor and delivery influenced at least in part by the increased use of medical technologies (e.g., ultrasound) (25), and more aggressive management of premature rupture of the membranes (PROM) (26,27) may also be related to the trends in preterm/LBW births as induction of labor and cesarean delivery occur more often at earlier gestational ages; the use of

induction of labor and of cesarean delivery among births delivered preterm has risen substantially in recent years (28-30).

Recent declines in infant mortality have been attributed to improvement in birth weight and gestation-specific infant mortality rates, not to the prevention of preterm or LBW births (31). The decline in birth weight and gestation-specific mortality has been attributed primarily to improvements in obstetric and neonatal care such as pulmonary surfactants for preterm infants. Data from the 2002 linked birth and infant death file, to be available in the summer of 2004, will allow us to assess whether changes in birth weight and gestation-specific mortality rates have contributed to the current year rise in the IMR.

Summary

Preliminary data for 2002 show a significant increase in the IMR to 7.0 infant deaths per 1,000 live births, the first rise in the U.S. IMR since 1958 (1,15). Review of additional partially edited 2002 mortality data indicate that the increase in the IMR will be confirmed by final data. The 2002 increase in infant mortality was concentrated in the neonatal period, particularly in deaths occurring within 7 days of birth. Partially edited fetal death data suggest that the increase in neonatal mortality was accompanied by a decline in the late fetal mortality rate for 2002, and thus it appears that the 2002 perinatal mortality rate will remain level.

Data from the 2002 linked birth and infant death file, which are expected to be available by the summer of 2004, will allow us to assess the contribution of maternal and infant factors such as multiple births and management of labor and delivery. With this file, it will also be possible to investigate whether changes in birthweight and gestation-specific neonatal mortality rates relate to the increase in infant mortality.

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Definition of terms

Infant mortality rate – Deaths of infants aged under 1 year per 1,000 or 100,000 live births. The infant mortality rate is the sum of the neonatal and postneonatal mortality rates.

Neonatal mortality rate – Deaths of infants aged 0-27 days per 1,000 live births. The neonatal mortality rate is the sum of the early neonatal and late neonatal mortality rates.

Early neonatal mortality rate – Deaths of infants aged 0-6 days per 1,000 live births.

Late neonatal mortality rate – Deaths of infants aged 7-27 days per 1,000 live births.

Postneonatal mortality rate – Deaths to infants aged 28 days-1 year per 1,000 live births.

Late fetal mortality rate – Fetal deaths of 28 or more weeks of gestation per 1,000 live births plus fetal deaths.

Perinatal mortality rate – Late fetal deaths plus early neonatal deaths per 1,000 live births plus fetal deaths.

Low birthweight rate – Births with weight at delivery of less than 2,500 grams per 100 live births. The low birthweight rate is the sum of the moderately low and very low birthweight rates.

Moderately low birthweight rate – Births with weight at delivery of 1,500-2,499 grams per 100 live births.

Very low birthweight rate – Births with weight at delivery of less than 1,500 grams per 100 live births.

Term – Births at 37-41 weeks of gestation.

Preterm rate – Births at less than 37 completed weeks of gestation per 100 live births. The preterm rate is the sum of the moderately and very preterm rates.

Moderately preterm rate – Births at 32-36 weeks of gestation per 100 live births.

Very preterm rate – Births at less than 32 weeks of gestation per 100 live births.