A NOTE ON COHORT INFANT MORTALITY RATES

Lillian Guralnick and Edward D. Winter

THE INFANT mortality rate is probably the best known and most quoted vital statistic. In its commonly used form, it is the number of deaths of infants under 1 year of age in a given period divided by the number of live births in the same period, per 1,000 or per 100,000 live births. As a rate, this definition obviously violates the requirement that the numerator of a rate should arise from the population described in the denominator. Some deaths of infants under 1 year of age in any interval are of babies born in an earlier period who are not represented in the denominator, which is the number of live births in the same interval as the deaths. Conversely, some deaths of infants under 1 year of age relating to the live births in the year will occur in the following year. While the infant mortality rate is thus not technically perfect, generally no great difficulty has been experienced in using it. With little change in the numbers of births from one period to the next, no great inaccuracy could possibly occur in the denominator.

Exceptions to the usual stability in numbers of births have occurred, however, during the years for which infant mortality has been recorded for the United States. In 1946 and 1947 a sudden shift in the numbers of annual births was large enough to make the infant mortality rate as defined here unsatisfactory. To provide a better measure of the risk of death of infants under 1 year of age during a calendar period when changes in the number of births occur, a number of adjustments have been devised. These adjustments allocate either the deaths of infants under 1 year of age or the births in any given period so that the numerator and the denominator of the rate refer as closely as possible to events in the same period. The many ways in which this allocation can be done have been described in detail in a publication of the World Health Organization (*1*). A modification of the numerator adjustment method has been used in the United States (*2*). It provides an adequate approximation in most instances of the risk in a given calendar period of an infant dying at under 1 year of age.

An accurate measure of the true risk of an infant dying in the first year of life can also be readily computed. For any given cohort of births, for example, births in a stated month or year, the deaths occurring in this group can be cumulated until all infants in the cohort have reached 1 year of age. Division of the cumulated deaths by the number of live births in the cohort gives the probability of a live-born child in this group dying before his first birthday. This type of rate has been used in special studies and in life tables, but it has not been shown routinely in tables of vital statistics. For one thing, an annual cohort rate cannot be computed for births in a calendar year until the end of the following calendar year. And allocation of each death to the correct cohort of births requires knowledge of the month of birth for each child. This information has not generally been tabulated for the United States. Thus, while the concept of the cohort rate is straightforward, the cohort infant mortality rate that can be computed with the information for the United States existing at present—age at death and month of death—is an approximation to the extent that the deaths are allocated to a month of birth based on these two known factors.

Rates for the cohort of births in the United States for each month from 1940 through 1961 have been computed and are shown in table 1. Since these figures measure the risk for infants born in a stated month of dying during the first year of life, rather than the risk of infants

Miss Guralnick and Mr. Winter are statisticians, National Center for Health Statistics, Public Health Service.

Table 1. Infant mortality rates for birth cohorts, by month and year of birth, United States, 1940–61

Year of birth	Month of birth (deaths under 1 year per 1,000 live births)												
	Total	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1961	25.2	25.0	23.0	23.6	24.8	25.7	26.2	26.2	26.3	25.6	25.6	25.4	25.2
1960	25.9	25.5	24.4	24.1	25.4	27.3	27.6	26.6	25.9	25.6	26.9	26.2	25.6
1959	26.3	26.2	24.6	24.5	25.6	27.3	27.3	27.2	27.4	26.3	26.3	26.3	26.1
1958	27.0	26.2	24.5	25.4	26.2	27.1	27.9	28.3	28.4	27.2	27.8	27.9	27.0
1957	26.5	25.5	24.8	25.0	25.9	27.2	27.7	27.6	27.5	26.6	26.8	26.6	26.0
1956	26.2	24.9	24.1	24.3	26.4	27.7	27.6	27.4	27.2	25.5	26.6	26.5	26.2
1955	26.4	25.5	24.6	25.0	26.4	27.3	27.9	27.4	27.1	26.7	26.2	26.4	25.8
1954	26.5	25.6	24.9	25.4	26.8	27.3	28.1	27.3	27.6	26.6	26.9	25.9	25.7
1953	27.5	27.3	25.6	26.1	27.7	29.1	29.2	28.3	28.0	27.4	27.7	26.9	26.0
1952	28.4	28.3	26.9	26.6	28.5	29.6	30.5	29.6	28.7	28.3	28.4	27.7	27.9
1951	28.5	28.7	27.3	27.4	28.3	28.5	29.2	29.4	28.9	28.3	28.9	29.0	28.4
1950	29.3	28.4	27.6	28.5	30.3	30.6	29.7	29.5	29.6	29.4	29.0	29.5	29.5
1949	30.8	31.6	29.5	29.2	31.6	32.4	32.2	31.6	31.6	30.2	30.0	29.8	29.8
1948	31.9	32.6	30.2	29.4	31.2	33.1	34.5	32.3	32.2	31.1	32.0	32.2	32.4
1947	32.0	31.9	30.2	30.4	31.5	31.6	31.2	31.5	33.5	32.4	32.8	33.7	33.3
1946	34.6	36.2	34.5	34.0	35.5	37.1	36.9	34.8	34.8	33.5	33.8	33.4	33.1
1945	37.0	38.7	36.7	35.8	36.9	37.8	37.8	36.1	37.4	36.7	37.0	36.5	37.0
1944	39.0	39.7	37.3	39.1	39.3	40.0	40.0	38.4	38.7	39.1	39.3	38.7	39.0
1943	39.7	40.1	38.3	38.4	38.5	39.7	39.9	39.8	40.3	39.4	39.9	41.3	41.4
1942	41.3	44.6	40.9	39.6	41.6	41.7	41.3	41.4	42.0	41.2	39.6	40.9	41.3
1941	44.5	49.4	45.7	44.4	44.6	45.5	44.6	42.0	42.1	42.3	44.2	45.3	45.0
1940	47.7	49.7	47.7	46.2	46.4	46.4	46.7	45.8	46.3	46.9	48.6	50.4	51.5

SOURCE: Computed from data in reference 4.

Table 2. Infant mortality rates adjusted for changing numbers of births, by month and year of death, United States, 1940–61

Year of death	Month of death (deaths under 1 year per 1,000 live births)												
	Total	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1961	25.3	28.5	25.9	24.9	24.9	25.0	24.6	23.9	23.5	23.7	25.0	25.7	27.1
1960	26.0	27.9	26.8	26.2	25.9	26.6	26.2	24.6	23.1	23.3	26.0	26.6	28.7
1959	26.4	29.4	27.1	26.1	25.7	26.9	25.9	24.8	24.7	24.9	25.2	27.0	27.4
1958	27.0	29.1	28.0	27.1	26.8	26.8	26.4	26.3	25.1	24.4	26.3	27.4	29.6
1957	26.4	29.0	26.5	26.3	25.8	26.0	26.0	25.1	24.3	24.4	26.4	27.1	27.7
1956	26.1	27.7	25.3	25.3	26.7	27.9	26.5	25.3	24.9	22.7	25.6	26.5	28.3
1955	26.4	28.8	27.3	25.6	25.8	25.8	26.1	25.7	24.9	24.8	25.5	27.2	28.7
1954	26.7	28.4	26.6	26.2	27.3	27.0	27.4	25.8	24.8	24.5	26.0	26.6	28.3
1953	27.8	30.9	28.7	27.4	27.7	28.0	27.7	26.0	26.1	26.5	27.7	27.8	28.5
1952	28.5	29.8	28.8	28.9	28.8	27.9	30.7	27.9	26.0	26.3	28.3	28.6	29.5
1951	28.6	31.5	31.0	29.3	28.4	27.7	28.1	27.1	26.5	25.9	28.1	29.2	29.7
1950	29.2	30.1	29.6	31.1	30.9	29.8	29.1	27.0	26.8	27.1	27.7	29.6	31.2
1949	31.4	34.8	33.7	32.1	30.6	30.7	30.1	30.9	30.9	29.3	29.8	30.7	31.7
1948	31.8	36.2	34.8	32.2	31.7	32.7	32.2	29.7	30.2	28.7	31.0	31.1	32.7
1947	32.8	36.7	35.1	34.7	32.8	31.3	29.9	29.1	29.9	29.3	29.6	31.4	34.3
1946	34.6	39.7	39.5	36.7	37.0	38.1	36.5	33.5	32.4	31.2	32.1	32.7	35.4
1945	38.1	41.3	43.1	39.8	36.9	36.2	36.5	34.4	37.1	37.2	35.9	36.4	41.1
1944	39.4	43.7	40.3	41.8	40.9	39.1	39.3	37.3	37.1	38.1	39.7	37.8	39.4
1943	40.7	44.5	43.8	44.0	39.4	38.1	38.7	38.1	37.8	36.2	37.3	39.8	44.3
1942	41.2	47.4	47.4	45.3	42.1	40.6	39.9	40.4	37.8	38.3	38.1	38.4	42.2
1941	45.9	57.4	52.4	50.3	45.2	43.6	43.3	43.8	42.1	41.7	44.3	44.0	43.2
1940	47.4	56.1	52.1	49.5	46.8	45.5	44.0	44.4	41.7	41.7	44.4	49.1	53.1

SOURCE: Reference 4.

under 1 year of age of dying in the stated month, the seasonal pattern is not at all like the familiar swing of mortality. Adjusted death rates for infants under 1 year of age, shown in table 2, have been high in winter months and low in the summer, the peak being reached each year in December or January and the low point in July, August, or September. Cohort death rates since 1948 have shown a pattern of seasonality different from that for the adjusted rates. The cohort death rates were lowest in February or March and highest in May through August.

Most of the seasonality in infant mortality rates for each month is produced by the component of deaths between the ages of 28 days and the end of the first year of life (*3*). While these deaths are small in number, amounting in 1961 to only 27 percent of all deaths of infants under 1 year of age, they occur chiefly as a result of infectious diseases and show a large amplitude of seasonal variation throughout the year. This group of deaths determines the pattern of seasonality for deaths of infants under 1 year, since there is little monthly change in the neonatal death rate under 28 days. The postneonatal (28 days–11 months) deaths also determine the pattern of the monthly cohort rates. Roughly one-third of the postneonatal deaths result from the respiratory diseases, which are more frequent in the winter (*4*). Thus infants born during that season will have reached the postneonatal age group during the summer, when the incidence of respiratory diseases is low. The child born in May, June, or July will be exposed to greater risk of respiratory disease during the following winter.

The high proportion of infant deaths at ages under 28 days serves to explain the close similarity between the annual cohort rates and adjusted rates. In the period 1940–61, these rates never differed by more than 3 percent (tables 1 and 2). The cohort rates do not replace the calendar infant mortality rates; they serve rather as an additional method of analyzing infant mortality.

REFERENCES

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(*3*) National Vital Statistics Division: Annual summary for 1961—Pt. 2. Monthly Vital Statistics Report. U.S. Government Printing Office, Washington, D.C., vol. 10, No. 13, July 31, 1962, pp. 10–11.

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Proposed New Tolerances for Two Pesticides

The Food and Drug Administration, Department of Health, Education, and Welfare has proposed a regulation to reduce the residual amounts of aldrin and dieldrin permitted on 55 agricultural commodities from 0.25 ppm. to 0.0 ppm. Petitions are pending which, if approved, would establish tolerances of 0.1 ppm. for a number of these commodities.

The regulation would not affect 30 commodities already having an established 0.1 ppm. tolerance, and it would make no change in the authorized use of the 2 pesticides for 109 commodities registered by the Department of Agriculture on the basis that no residue is present on the crop as marketed.

The new tolerances would not go into effect until publication of a final order in the Federal Register. Raw agricultural products properly treated before that publication would be subject to the old rather than the new tolerances.