INTERNATIONAL PERINATAL MORTALITY: COMPARABILITY OF DATA

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Accurate and comprehensive annual infant mortality rates are computed for only a minority of the world's population, comprised of most of the countries of Europe and North America, several countries in Latin America, Africa, and Asia, and Australia and New Zealand in Oceania. Infant mortality measures of varying degrees of unreliability exist for many other countries, and for the rest of the world such data are nonexistent. Similarly, perinatal mortality a measure resulting from the combination of appropriate subsets of both fetal and infant mortality, is available for study on a reliable basis for only a relatively few countries and for a small proportion of the world population. Nevertheless, in many of the more developed countries, perinatal deaths now exceed in number the deaths in the next 30 to 40 years of life, while in less developed countries the toll of such early mortality is usually significantly greater. However, even for those countries where perinatal mortality data are available, questions arise concerning terminology and definition, quality and completeness of data, and analytical techniques and methodology, all of which affect to a greater or lesser degree the value of the information for use within countries, for international comparisons, or for analysis of trends through time. Nonetheless, the continuing efforts of the United Nations and the World Health Organization to encourage nations to improve their vital statistics, and the growing interest of the nations themselves in developing statistics for national planning, have resulted in an increase in countries producing fetal death statistics, neonatal statistics, and subsequently, perinatal statistics for health status analysis.

Another reason for the recent surge of interest in perinatal statistics is the significant decline in the perinatal mortality rates during the last decade in a number of countries, particularly in Scandinavia. This represents a change from the previous decade in which a decrease in the rate of decline over previous periods had been observed. In the period 1955-64, for example, the decrease in the perinatal mortality rate for the United States was 5.7 percent, while in the decade 1965-74 the rate dropped by 31.1 percent. Similar declines were noted for Canada and the countries of Northwestern Europe. Of interest by way of contrast, the perinatal mortality rate in Hungary, which showed a similar pattern to that of the United States of a slowdown in the rate of decrease during the period 1955-1964, has not experienced a resumption of the accelerated decline. These same trends noted in perinatal mortality were first noted in the patterns of infant mortality for these countries during the same period, after leveling off in the 1950's and 1960's, the U.S. infant mortality rates unexpectedly fell from 24.7 in 1965 to 16.7 in 1974, a decline of some 32 percent. 1/

It may be said that while for most of the world the general infant mortality rate remains a primary social indicator, in developed countries the perinatal mortality rate is replacing it. A number of countries which hitherto have been unable to produce adequate data to calculate perinatal mortality rates are now attempting to do so and the development of perinatal mortality statistics is recognized as a goal for many of them. That the perinatal period is a highly significant time in the study of early mortality is demonstrated by the fact that in Norway, for example, where both civil and medical registration of births and deaths is quite complete and uniform throughout the country "more than 80 percent of deaths before and after birth and up to one year of life, compiled in official statistics now occur in the perinatal period."2/

The purpose of this paper is to examine the trends in perinatal mortality statistics in selected countries, to review the problems of measurement and comparability, and to suggest further areas for research and analysis.

Components of Perinatal Mortality

The components of perinatal mortality as used in this paper are late fetal deaths (deaths of 28 weeks or more gestation) and semanatal deaths (deaths occurring in the first six days of life). In recognition of the fact that mortality during late gestation periods is closely allied to mortality in the early neonatal period, especially as regards cause of death, the WHO in 1954 supported the establishment of a perinatal mortality rate. Since that time WHO expert groups have been at work developing standards and assessing progress in international perinatal mortality measurement. There are two kinds of perinatal mortality measures in use: perinatal mortality rates and perinatal mortality ratios. The perinatal mortality rate is defined as the number of deaths under one week of age plus late fetal deaths (perinatal deaths) per 1,000 live births and late fetal deaths. The perinatal death ratio is the number of perinatal deaths per 1,000 live births. In other words, the rate includes late fetal deaths in both numerator and denominator. The inclusion of counts of both live births and late fetal deaths in the denominator serves to more closely approximate the population at risk of dying. The most appropriate denominator, were such a statistic available, would be a count of

*Paper contributed at the annual meeting of the American Statistical Association of America, Boston, Massachusetts, August 24, 1976. Mr.Israel is Deputy Director, National Center for Health Statistics, and Dr. Lunde is Director, Office of International Statistics, NCHS. The opinions expressed are those of the authors and do not necessarily reflect the views of the National Center for Health Statistics and the Department of Health, Education, and Welfare.

total pregnancies. The actual numerical difference between rates and ratios in this case is slight, at least among countries where registration is fairly well complete. For example, in 1974 the U.S. perinatal rate was 18.9 and the ratio was 19.1, a difference of 0.2 points or 1 percent. The measure referred to most frequently in this paper will be the perinatal mortality rate on the basis that the denominator comes closer to estimating the true population at risk. The UN Demographic Yearbook publishes international perinatal mortality data in terms of ratios; it is considered that having only births in the denominator lends a certain amount of stability to the measure.

Trends of the Perinatal Mortality Rate

Perinatal mortality declined in the countries of low infant mortality throughout the last 50 years. Chase noted that the rate of decline in 1950-65 had been slower than in previous periods.3/ Between 1955 and 1964, of these countries, Denmark showed a rapid decline of 31 percent and England and Wales, Finland, and Sweden declined by around 20 percent. In Hungary the decline was only 12 percent and in the United States it was practically stationary during that period.

In the next decade, 1965-1974, a significant change was noticeable. There was an increase in the rate of decline and Denmark's perinatal mortality rate fell by almost 40 percent and Finland's by 37 percent. In Sweden, the Netherlands, and the United States the rates dropped about a third. The region of Northwest Europe was not entirely consistent, as Norway declined by 29 percent and England and Wales by around 22 percent. However, the rate for Hungary during this period was almost stationary. When one examines the component rates of fetal mortality and semanatal mortality, one can see that these rates declined accordingly. Lower late fetal deaths had a greater impact than semanatal mortality levels in Sweden and England and Wales, while semanatal declines had the greatest impact in Canada, Finland, the Netherlands, and Norway.

Problems of Measurement

Difficulties in comparing statistics from one country to another or even within countries often stem from differences in definitions in terminology, and in the practice of applying the definitions and terms to specific cases. In recognition of this problem WHO has promulgated standard definitions of live birth and fetal death.4/ However, even with internationally recommended definitions for the most important terms, considerable international variations still exist. These variations, along with a discussion of the problems of application of national definitions within a country, are presented in the Handbook of Vital Statistics Methods.5/ But even when definitions appear to be the same or essentially similar, interpretation and practice in their application may affect the data to an unknown degree. Despite their socio-cultural similarities, the Scandinavian countries have shown variation in various mortality rates and have questioned the degree to which such differentials may be affected by differences in definitions and procedures. Bolander and Lettenstrom indicate that through joint efforts promulgated by the Nordic Medico-Statistics Committee (NORMESCO) in Norway, Sweden, Denmark, and Finland, adherence to common standards is being achieved and a better basis for comparability is being established.6/

In the measurement of perinatal mortality, all the limitations of fetal death statistics, infant death statistics, and live birth statistics must be considered in evaluating international comparability. One major problem, related to the imperfect registration of live-born infants, is eliminated in perinatal statistics: the question of whether the product is a live birth or a fetal death. Still, exclusion from live birth statistics in some countries of those live born who die shortly after birth and are registered as stillbirths can have the effect of increasing the ratios by decreasing the number of live births in the denominator. Unreliable birth figures in some countries have inflated the ratio. Live births tabulated by date of registration rather than date of occurrence can have a similar effect. In some parts of Africa, Asia, and Latin America live birth statistics by date of registration (usually extensively delayed) produce birth rates of great magnitude. Incompleteness of current registration is hidden by the inclusion of events that occurred in prior years.7/

Fetal death statistics are probably the most unreliable of all vital statistics; because of the impossibility of determining the completeness of early fetal deaths (less than 20 weeks gestation), and uncertainties with intermediate fetal death (20 but less than 28 weeks gestation) only data on late fetal deaths are available for many reporting countries. In the UN Demographic Yearbook for 1974 data were available from only 45 countries or areas and the quality of much of the data may be questioned. There are also many differences in interpreting fetal death which make comparison difficult, despite WHO efforts to promote a standard definition based on evidence of life. Viability, for example, is defined in some countries in terms of length of gestation period ranging from 3 months to 7 months. Some countries have an additional requirement that fetuses be of a minimum length, from 30 to 35 centimeters. Others specify that the product show "definite" signs of life or some other non-specific term.

Furthermore, there is now a growing dissatisfaction with the currently recommended definitions. For example, there is concern that the signs of life listed in the WHO definition of live births call for the inclusion as live births of very early, and patently non-viable fetuses, who may show one or more of the definite signs of life after such procedures as therapeutic termination of pregnancy in the early weeks of gestation. In addition, the criteria themselves are clearly subjective and open to various interpretations. Objections have also been voiced regard-

ing the definition of fetal death which is supposed to be the converse of the definition of live birth and therefore should include all terminations of pregnancy other than the delivery of a live born infant. However, the current definition refers to the absence of signs of life in a fetus at the time of its separation from the mother. In many cases, the fetus is not available for examination at that time, if at all; and again, the criteria are subjective.

Another problem is related to differences in the registration requirements for fetal death. All of the States of the United States require registration of all other fetal deaths, or those of 20 weeks or more gestation. Most countries confine registration to fetuses of 28 weeks or more gestation. The general effect of this latter practice would be to record fewer fetal deaths because of the tendency to underestimate gestational age slightly over 28 weeks to avoid registration of fetal deaths. When, in the United States, registration requirements were lowered from 28 to 20 weeks and, later, in some ten states lowered from 20 weeks to all fetal deaths regardless of gestational age, the reporting at 28 weeks and over improved.

Underregistration of fetal deaths is a significant problem, even in developed countries. Registration completeness may account for the principal differences among the comparatively low perinatal rates in advanced countries.

Another problem in most countries is determination of gestational age. Where fetal deaths are reported there is frequently a large proportion of unknown gestation. Where these should be allocated is a question; usually these are allocated in statistical tables under later fetal deaths, which have an effect on the fetal death rates and ratios.

As regards semanatal deaths, in some countries death statistics are not available in terms of the first week of life; mortality is classified in terms of under 10 days or under 14 days of life. In some countries infants dying in the first week of life are excluded if they have not been registered while alive.

Needed Research

While it is generally true that the importance of measures of fetal, infant, and perinatal mortality is well recognized, the actual scope of these data vary considerably from country to country. When available at all, they range from the most basic establishment of the fact of death to sophisticated data systems designed to elicit information on the biologic, socio-economic, cultural and geographic determinants of early mortality. The scope of the data may include only those deaths occurring after birth (i.e. infant and childhood mortality) or may include fetal losses as well. If fetal deaths are included in a data collection system, they may be limited to those events occurring at 28 or more weeks of gestation. In this connection, a joint United Nations/WHO meeting8/ noted that probably at least 15 percent of all human individuals die before they have reached the twenty-eighth week of prenatal life. It also noted that the study of spontaneous fetal death at ages earlier than 28 weeks would be valuable since appreciable numbers of such early fetuses, when delivered, are now surviving. Attention is also being focused on early fetal losses due to legal abortion. Some countries, Hungary, for example, have adopted very liberal abortion laws but little is yet known about the effects of these policies on such measures as maternal mortality, perinatal, infant and childhood mortality, and on the demographic characteristics of the surviving population.

Similar to variations in the scope of the collected data are variations in the objectives for their analysis and use. While the ultimate goal of a statistical system dealing with mortality in early life must be the reduction of this mortality to its minimum, the attainment of such a goal is inevitably dependent upon the accomplishment of numerous intermediate objectives. Where measures of perinatal mortality are unreliable or unavailable, the first objective must be the development of a basic series of reliable, internationally comparable statistics. A second level of priority should be the maintenance of such measures on a periodic basis in order to assess changes in the levels of the measurements. Further priorities should deal with the collection of important additional variables that would allow further analysis and interpretation of the data. The completeness, accuracy and availability of such information will greatly assist in the evaluation of existing programs and future projects which are designed to meet the ultimate objective.

The sources from which the necessary information is derived are also somewhat varied, but, for the most part, countries are dependent upon their vital statistics systems to provide mortality and natality data. The vital statistics are, in turn, almost invariably derived from a system of civil registration, although sample survey methods and sample registration areas are employed in some countries as a substitute for complete registration. Surveys are also used in some countries in order to obtain additional data not available through the registration system. In some cases, a population enumeration or census has been used to collect information on vital events, but this method has not been generally satisfactory, primarily because it is retrospective and relies on the recall of the respondent and because such censuses are rarely conducted more frequently than once every five or 10 years. A few countries have established continuous population registers for the purpose of recording many types of civil events occurring to individuals. Such a continuous population register can provide the same kind of data as are available in the more limited vital statistics registration system, but usually provides additional opportunities for compiling and analyzing data through the mechanism of record linkage. Record linkage is, of course, a possibility with other data collection systems, but is usually much more difficult and costly. Other sources of data include

hospital, health insurance, and physician records, but data obtained from studies based on these latter kinds of documents are usually too limited and atypical to be of general applicability. In reviewing the registration problem in Latin America and elsewhere, after noting the large proportion of deaths during the first day of life that were unregistered, Puffer and Serrano concluded that until hospital procedures are improved and standard definitions followed, comparability of perinatal death statistics will remain in doubt for most of the world.9/ Special studies, however, can provide data for perinatal mortality statistics when such data may be incomplete or lacking. For example, Laurenti was able to analyze perinatal mortality in Sao Paulo, Brazil, by combining all death certificates of late fetal deaths with a sample of infants under one year of age obtained from physician and hospital records. By far the most common sources of data on perinatal mortality are the officially registered documents of birth, death, and fetal death. However, most of the comments which follow regarding these documents are also applicable to other sources of data as well. One aspect that must be raised is that of the items or topics which are included on the records. In order to satisfy both national and international needs, efforts should be made in all countries to include certain basic topics irrespective of any additional items that may be desirable and practical in each country. Guidelines for these topics as well as a suggested tabulation program have recently been put forward.11/ Further consideration of the sources of data must include mention of the persons who supply the information for the Official Records. There are numerous possibilities depending on the practices, procedures and legal requirements of each country and the circumstances surrounding each specific case. The knowledge and qualifications of these informants have a pronounced effect on the final statistics to be derived from the system.

In addition to the kinds of data on early mortality that have been discussed, there is another area that remains almost completely uncovered by statistics, namely early fetal deaths or abortions. The problems of recognizing early pregnancy wastage and of encouraging reporting when such losses are recognized are so great that it is unlikely that adequate statistics can be obtained in any country in the foreseeable future. However, in some countries relaxation of the abortion laws makes the number of legally induced abortions a significant and measurable statistic. While this number has little value in assessing the total of all early pregnancy wastage, both induced and spontaneous, it is of value in the evaluation of the effects of medical intervention on the birth rate and on perinatal morbidity and mortality. Data for such statistics are likely to be the product of a specially designed reporting system. However, improved or new techniques 12/ in the survey field are now raising the possibility of collecting sensitive information about such topics as abortion as a part of population surveys.

The existence of a data collection system, however, does not, in itself, ensure accurate, reliable statistics. In order to understand and use data properly, there must be an appraisal of the quality of the collected information. Such an evaluation should cover a number of aspects such as:

1. What pertinent terms and definitions are in use?

2. Have these terms and definitions been uniformly applied throughout the time period for which the data have been collected?

3. Have these terms and definitions been uniformly understood and used in all geographic areas from which the data are collected?

4. How complete are the counts of the vital events of interest?

5. If the vital statistics system is not based on the registration of all events, but relies on sample surveys or other procedures to estimate the counts of vital events, how reliable are the estimates?

6. What are the sources and how accurate are the population bases used in the calculation of the mortality rates?

7. What is the proportion of completeness for each item or topic of interest on the data collection record?

8. What is the accuracy of each of these items or topics?

Answers to some of these questions are more readily ascertained than are others. For example, determination of the official definitions and whether they have been modified during a given period is an easier task by far than is the determination of how these terms and definitions are actually used in practice. The evaluation of the completeness of coverage of vital events is difficult at best, but might be done through routine independent sources, field investigations, or through various other demographic analytic techniques. Estimates of vital events should be accompanied by a measure of sampling error or by some other indicator of their accuracy. The accuracy of individual items or topics can be investigated by several techniques, including an analysis of the proportion of records where the response to a particular item is incomplete, inconsistent, or unknown. Independent estimates of certain items might be obtained through special surveys or from census data. Various consistency checks with these latter sources of data are sometimes possible and, if so, highly desirable. Often it is possible to assess the approximate degree of accuracy of an item merely on the basis of the magnitude of the statistic compared with level of the same statistic observed in

other countries with similar characteristics at approximately the same point in time. It should be noted that evaluation of data is of fundamental importance, but as yet it is frequently overlooked. On the other hand, data collection systems of the type we are concerned with usually have many shortcomings, which, if recognized, can be tolerated or compensated for. Perfect, or even near-perfect statistics constitute an ideal which will not be realized. In a similar connection, Greenwood remarked: "The scientific purist, who will wait for medical statistics until they are nosologically exact, is no wiser than Horace's rustic waiting for the river to flow away."13/

Concluding Statement

That perinatal mortality is an important index of not only early mortality but of general health and wellbeing is widely accepted. However, the measure suffers from limited availability and problems of comparability around the world.

This paper presented some illustrative perinatal mortality statistics from a few countries with traditionally low mortality rates and generally reliable statistics. Even among these countries, it is difficult to ascertain how much of the difference in rates is due to real differences and how much is due to comparability issues. However, through the efforts of WHO and civil registration authorities, the medical profession, and other concerned persons in many countries, more reliable fetal and infant mortality data are becoming available. As civil registration systems improve and more accurate and complete data are tabulated it will become possible to extend production of the details of peri perinatal mortality statistics. The task in developing countries will be to improve registration completeness including those variables essential to basic fetal death, live birth, and infant death analysis. The task for developed countries will be to standardize registration terminology and practices to improve cause of death statistics, and to link fetal, births, and semanatal records with other socio-economic data for more comprehensive analysis.

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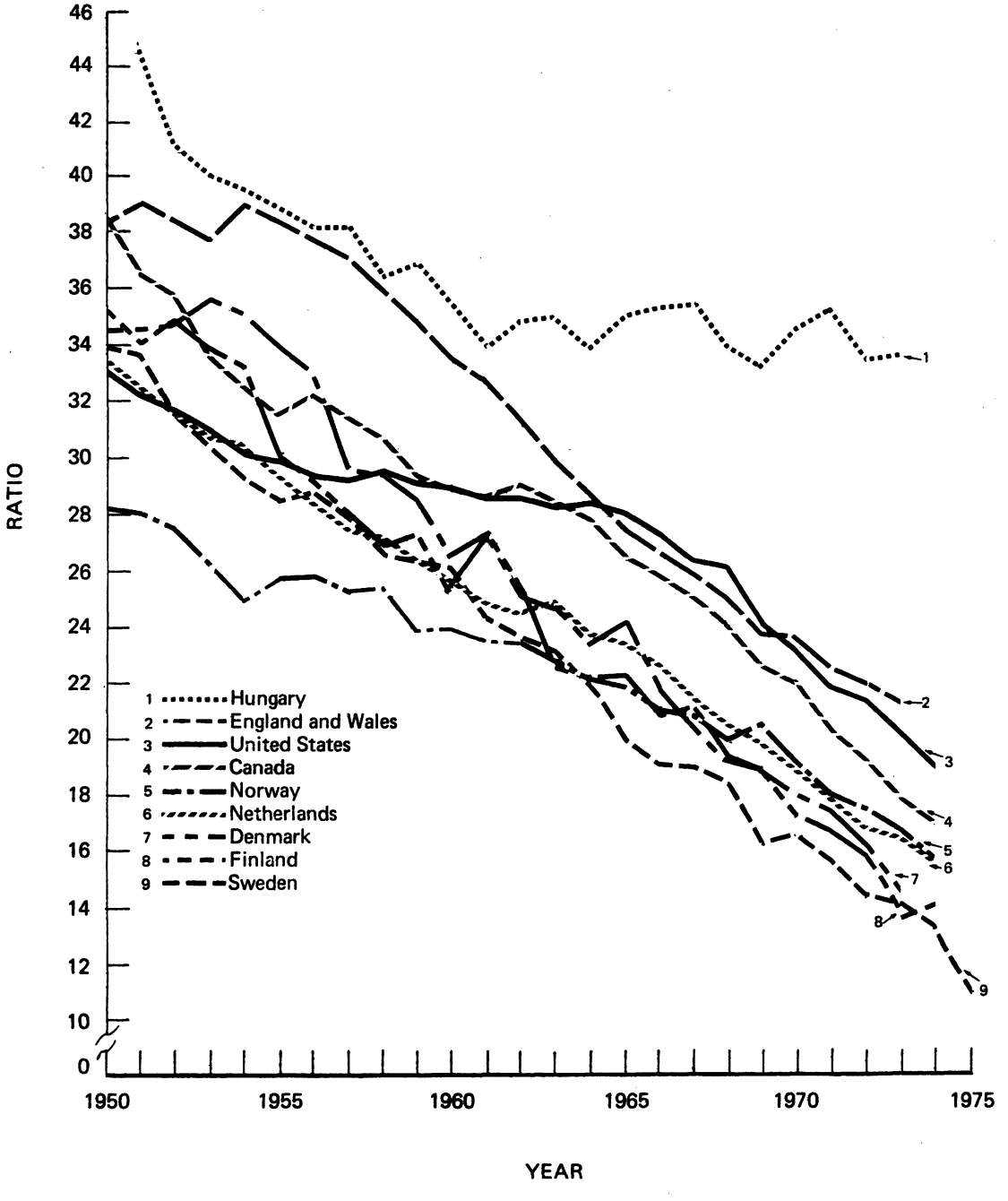
TABLE I. PERINATAL MORTALITY RATIOS, UNITED STATES AND SELECTED COUNTRIES, 1950-1975

Year	Country								
	USA	Canada	Denmark	England & Wales	Finland	Hungary	Nether-lands	Norway	Sweden
1975	-	-	-	-	-	-	-	-	11.1e
1974	19.1	16.9	-	-	14.0e	-	15.5	15.6	13.3
1973	20.2	17.7	14.6	21.3	13.7	33.6	16.4	16.7	14.1
1972	21.4	19.2	16.2	22.0	15.8	33.4	16.7	17.6	14.4
1971	21.9	20.3	17.5	22.5	16.7	35.2	17.8	17.9	15.7
1970	23.2	22.0	18.0	23.8	17.2	34.5	18.8	19.3	16.5
1969	24.2	22.5	18.9	23.7	18.9	33.2	19.8	20.5	16.3
1968	26.1	24.0	19.1	25.1	19.3	34.0	20.4	19.9	18.4
1967	26.5	25.0	-	25.8	21.1	35.4	21.4	20.8	18.9
1966	27.2	25.8	21.8	26.7	20.8	35.3	22.7	21.1	19.0
1965	28.0	26.3	24.2	27.3	22.3	35.0	23.4	21.9	19.9
1964	28.4	27.7	23.4	28.6	22.2	33.8	23.7	22.1	21.9
1963	28.2	28.4	24.6	29.8	22.5	35.0	24.9	22.8	23.1
1962	28.5	29.0	25.2	31.4	25.3	34.8	24.4	24.0	23.6
1961	28.6	28.5	27.3	32.7	27.1	34.0	24.8	23.5	24.2
1960	28.9	28.8	26.5	33.5	25.3	35.5	25.6	24.0	26.2
1959	29.1	29.3	28.6	34.8	27.3	37.0	26.3	23.9	26.3
1958	29.6	30.6	29.4	35.8	26.9	36.3	27.1	25.4	26.5
1957	29.2	31.4	29.5	37.0	27.8	38.2	27.4	25.1	27.8
1956	29.3	32.2	33.0	37.6	29.2	38.1	28.3	25.9	28.8
1955	30.0	31.5	33.9	38.3	30.0	38.7	29.3	25.9	28.4
1954	30.2	32.5	35.1	39.0	33.3	39.5	30.4	24.7	29.2
1953	31.0	33.6	35.6	37.7	33.8	40.0	30.6	26.2	30.3
1952	31.6	35.8	34.6	38.3	34.7	41.0	31.5	27.5	31.5
1951	32.2	36.4	34.5	39.0	34.0	44.3	32.4	28.1	33.6
1950	33.0	38.6	34.5	38.3	35.1	-	33.4	28.2	33.8

e Estimated
- Data not available

Sources: 1950-74 U.S.A.: Vital Statistics of the United States
1950-74 United Nations Demographic Yearbooks, 1957-74
1973-75 Central Statistical Offices of Canada, Denmark, Finland, Netherlands, Norway, Sweden and United Kingdom

PERINATAL MORTALITY RATIOS, UNITED STATES AND SELECTED COUNTRIES, 1950-75



Sources: 1950-74 U.S.: *Vital Statistics of the United States*
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