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Measures of Mortality

Indicators of child mortality

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Death rates, whether crude or standardized, are measures of overall mortality. But there are rates for specific groups as well. Besides the age-specific death rate, there are many other indicators that measure mortality in specific groups.

Fetal Deaths

Almost all fetal and child deaths are preventable. Such mortality is considered a definite indication of lack of health. Several indicators with a focus on different age groups are calculated. Beginning with conception, the age groups considered important for mortality studies are shown in Fig. 1.

The rates are generally computed on annual basis and can be enumerated as follows. The numerator and the denominator are numbers related to the same time period, although this is not explicitly stated in the following expressions.

$$\text{Abortion rate} = \frac{\text{abortions}}{\text{females of reproductive age group}} * 1000\,. \qquad (1)$$

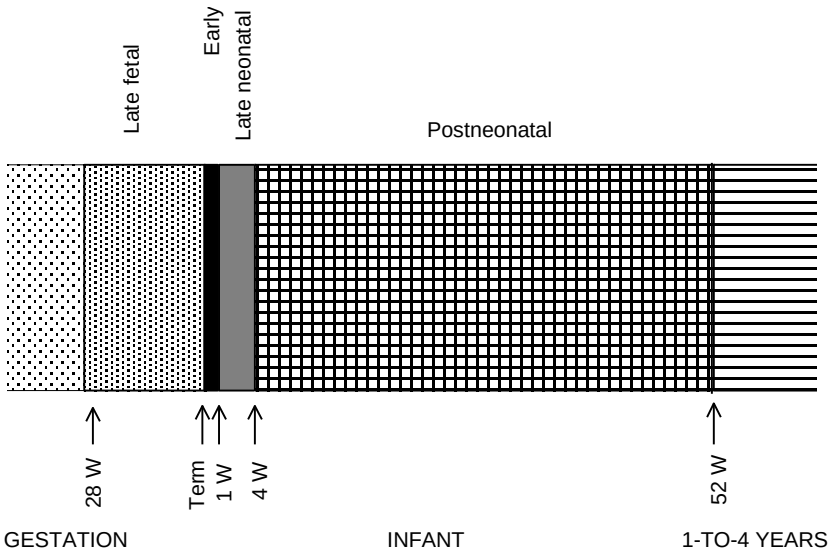

Figure 1 Childhood age groups important for study of mortality in a community

The reproductive age group for females is conventionally 15 to 44 years but is now extended to 49 years. The fertility in women 45-49 years of age has not been found negligible and thus the definition has been revised.

$$\text{Abortion ratio} = \frac{\text{abortions}}{\text{live births}} * 1000\,, \tag{2}$$

and $$\text{Stillbirth ratio} = \frac{\text{stillbirths}}{\text{live births}} * 1000\,. \tag{3}$$

Generally, pregnancy terminations are considered stillbirths when the fetus or the infant is born dead and weighs at least 1000 g or has body length (crown-heel) at least 25 cm. When these measurements are unavailable, the gestational age should be at least 28 weeks. Such deaths are also called late fetal deaths. The one based on gestational age is the WHO definition, and the former definition is used mostly in industrially developed nations. This can make international comparison difficult. Exercise caution while making such a comparison.

Other rates incorporating fetal life are as follows. These rates are particularly important for developing countries where mortality in early life is high.

$$\text{Stillbirth rate (SBR)} = \frac{\text{stillbirths}}{\text{still + live births}} * 1000\,,$$

Perinatal mortality rate (PMR)

$$= \frac{\text{(late fetal + early neonatal) deaths}}{\text{late fetal deaths + live births}} * 1000,$$

and Perinatal mortality ratio (PM ratio)

$$= \frac{\text{(late fetal + early neonatal) deaths}}{\text{live births}} * 1000.$$

Early neonatal deaths are those occurring during first week of life (<7 days). A more precise

definition for perinatal mortality is

$$\text{PM ratio} = \frac{\text{late fetal + early neonatal deaths weighing } \geq 1000\text{ g}}{\text{live births weighing } \geq 1000\text{ g}} * 1000$$

Even though frequency of occurrence is the essential feature of a rate but note that the preceding text uses the term *rate* when the numerator is part of the denominator, otherwise calling it a *ratio*. But this is not true for some 'rates.'

Mortality in Children

The measures of mortality after a live birth has taken place are the following.

$$\text{Neonatal mortality rate (NMR)} = \frac{\text{neonatal deaths}}{\text{live births}} * 1000\,, \qquad (4)$$

and $$\text{Postneonatal mortality rate} = \frac{\text{postneonatal deaths}}{\text{live births}} * 1000\,. \qquad (5)$$

The neonatal period is the first 27 days of life and the postneonatal period is 28 to 364 days. In this case of 'rate' in the above formula, the postneonatal deaths are actually out of those who survive neonatal period. Thus, it is not a 'rate' in the strict sense. Yet, the convention is to call it a rate.

Neonatal mortality is generally determined by the health of the mother and the adequacy of services available at the time of birth. Main causes are prematurity and birth asphyxia. Postneonatal mortality is mostly due to infections and undernourishment since birth. International efforts have succeeded in controlling much of the postneonatal mortality but the neonatal mortality is yet to respond to these efforts. Emphasis is now given to maternal nutrition and skilled attendance at birth in developing countries to control neonatal mortality.

Neonatal and postneonatal together form the infantile period. Note that an infant is a child *less* than 1 year of age and a neonate is *less* than 4 weeks, which is the same in completed days as just stated. The sum of the neonatal and postneonatal mortality is the infant mortality when their denominator is the same live births.

$$\text{Infant mortality rate (IMR)} = \frac{\text{deaths of infants}}{\text{live births}} * 1000\,. \qquad (6)$$

Moving beyond the infant period, the next is

Under-5 mortality rate (U5MR)

$$= \frac{\text{deaths of children} < 5\text{ years}}{\text{live births}} * 1000\,. \qquad (7)$$

The U5MR is also called the child mortality rate, although this term is sometimes used for mortality in (1-4) years age group. These rates are different from the respective ASDRs because the denominator is the number of live births and not the population of that age group. It is customary to use the term 'mortality rate' when the denominator is live births and the term 'death rate' when the denominator is population.

The mortality count used in the numerator in formula (6) and (7) is not necessarily out of the live births in the denominator. A child born in the month of October may die in the month

of January in the next calendar year. The birth and the death of the same child, thus, would be counted in different years. Despite this anomaly, these are called rates and are retained as such because of simplicity in counting. The births are not required to be followed up to find out about the death for these rates. The effect of this anomaly on the rate is minimal because of the averaging-out phenomenon.

Some professionals use modified denominators in the calculation of some of these rates. For example, for postneonatal mortality rate, they use (live births – neonatal deaths) as the denominator. Although there is a justification, such modification introduces complexity and compromises the nice feature of additivity of some of these rates. For this reason, this text uses and advocates simple denominators as stated.

All these mortality rates in childhood are considered very sensitive indicators in a global context. Attention is particularly paid to IMR because this is relatively easily understood and now almost universally available. A large number of background and proximate factors such as education, affluence, nutrition, availability and utilization of health care facilities, and cultural practices affect IMR. This rate is affected rather quickly by health programs in developing countries, and so is also used to measure the effectiveness of such programs.

Wide differentials exist in these rates from country to country and from one segment of population to another segment within the same country. For example, IMR was 2 per 1000 live births in Singapore in the year 2004 while it was 165 in Sierra Leone. U5MR was 101 per 1000 live births in Pakistan and only 6 in New Zealand in the year 2004.