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On the Measurement of Post Neonatal Mortality: A Technical Note

IN the recent years, much attention has been given to the study of infant mortality as it has a direct bearing on child survival. The conventional methods to measure infant mortality and its components, neonatal and post neonatal mortality, for a given year are as follows:

Infant Mortality Rate (IMR)

$$= \frac{\text{Number of infant deaths}}{\text{Number of live births}} \times 1000, \qquad (1)$$

Neonatal Mortality Rate (NMR)

$$= \frac{\text{Number of infant deaths in neonatal period}}{\text{Number of live births}} \times 1000, \qquad (2)$$

Post Neonatal Mortality Rate (PNMR)

$$= \frac{\text{Number of infant deaths in post neonatal period}}{\text{Number of live births}} \times 1000 \qquad (3)$$

It may be noted that the above measurements have a common denominator, that is, the number of live births during the year. Of late, a few scholars have suggested an alternative measure of PNMR. The measure suggested by Chiang [1984: 83] is given by;

$$\text{PNMR} = \frac{\text{Number of deaths between 28 days and one year of life}}{\text{Number of live births -- neonatal deaths}} \times 1000 \quad (4)$$

The author cautions that in the estimation of PNMR "one must subtract neonatal deaths from live births in the denominator to render the rate a meaningful measure of risk" (Chiang 1984:84). The suggestion appears to be logical as those infants who died in neonatal period are not exposed again to the risk of death in post neonatal period and hence one should make necessary correction in the denominator. Many researchers, therefore, consider the correc-

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tion as an improvement over the earlier measure, that is, the measurement given in (3). The question arises whether the proposed correction is really an improvement? This note intends to clarify the concept of the two measurements of PNMR given in (3) and (4). Let us consider the following probabilities:

$$d(x)/l(G) \quad \text{and} \quad d(x)/l(x)$$

where, $d(x)$ and $l(x)$ are functions of conventional life table.

According to the definition, the ratio $d(x)/l(0)$ *is* the probability that a newborn will survive for x years and die in the $(x + 1)$th year. In other words, the ratio $d(x)/l(0)$ is the probability that a newborn will die between ages x and $x + l$. These probabilities are additive in the sense that the sum of $d(x)/l(0)$ and $d(x + 1)/1(0)$ will give the probability that a new-born will die between ages x and $x + 2$. The sum of all such probabilities over age is equal to 1.0.

The ratio $d(x) / 1 (x)$, on the other hand, is the probability that a life aged x years will die within one year or before reaching age $x + l$. These probabilities, as they are, cannot be directly combined rather their complementaries can be combined by multiplication and the complementary of the product will give the probability of death in wider age range. As for instance, if we wish to estimate from single year probabilities of death, the probability that a life aged x years will die before reaching age $x + 2$, is given by

$$[d(x) + d(x+l)]/l(x)$$
$$= l - [\{ l - d(x)/l(x) \} * \{ l - d(x + l)/l(z+1)\}].$$

Further, when the ratio $d(x) / I (x)$ is multiplied by the probability of survival from birth to exact age x, $I (x) /1 (0)$, the product gives an estimate of the probability that a newborn will die between ages x and $x + I$.

Similarly, the measurement of PNMR given in (3) is the probability that a newborn will die in post neonatal period, while the measurement given in (4) is the probability that a neonate, who has survived the neonatal period, will die in the post neonatal period. Thus, the two measurements of PNMR given in (3) and (4) have different concepts and cannot be considered as an improvement over the other. On the contrary, the advantage of measuring the PNMR through (3) is that when it is added to the estimate of NMR given in (2), the sum gives an estimate of IMR. The estimate of IMR can also be obtained from the NMR obtained in (2) and that of PNMR obtained through (4) by first estimating the probabilities of survival of a newborn in neonatal period and in post neonatal period separately. The complementary of the product of the two survival probabilities will give an estimate of IMR. However, if a life table is constructed showing the neonatal and post neonatal periods separately, the estimate of post neonatal mortality obtained through (4) will be useful and not that obtained through (3), otherwise it will overestimate the expectation of life at birth.

Reference

Chiang, C. L. ,1984, *The i-ife Table and its Application,* Robert E. Krieger Publishing Company, Malabar, Florida.