

Measuring Mortality & Fertility in a Population

McFalls pp. 3-12 (*March 2007 version*)

Terms/Concepts to Know

Fertility
Fecundity
Intermediate variables
Proximate determinants of fertility
Crude death rate (CDR)
Crude birth rate (CBR)
Age-specific mortality and fertility rates
Total fertility rate (TFR)
Replacement level fertility
General fertility rate
Net reproduction ratio (NRR)
Completed fertility rate
Life expectancy (at birth)
Life span
Infant mortality rate (IMR)
Cohort measure
Period measure

Crude Death Rate (CDR)

The crude death rate is a measure of the intensity of mortality in a population in a given year (or over a period of several (t) years). For a period of 1 year (as it is usually calculated):

$$\text{CDR} = \frac{\# \text{ deaths occurring during the year}}{\text{mid-year population}}$$

Crude Birth Rate (CBR)

The crude birth rate is a measure of the intensity of fertility in a population in a given year (or over a period of several (t) years). For a period of 1 year (as it is usually calculated):

$$\text{CBR} = \frac{\# \text{ births occurring during the year}}{\text{mid-year population}}$$

Age specific mortality and fertility rates

Demographers use *age-specific* death and birth rates to get around the problems of age structure that are associated with crude rates. Age-specific rates are calculated exactly

like crude rates (see above), except that the calculations are made for each separate age-group.

$$\text{Age-specific death rate in year } t = \frac{\text{\# deaths in a given age group during year } t}{\text{mid-year population in the given age group}}$$

$$\text{Age-specific birth rate in year } t = \frac{\text{\# births from women in given age group during year } t}{\text{mid-year population of women in the given age group}}$$

An example of the calculations of age-specific fertility rates is given in McFalls, p. 6. An example of the graphical display of age-specific fertility rates can be found in McFalls, p. 9, Fig.2.

Total Fertility Rate (TFR)

The total fertility rate (TFR) in a given year is the number of children a woman would have on average if she experienced at every age the fertility rates measured in the given year.

An example of the calculations of the TFR is given in McFalls, p. 6, Box 2.

Net Reproduction Ratio (NRR)

The net reproduction ratio (NRR) is a measure of generational growth. Specifically, it is the expected number of daughters per woman (based on current birth rates), accounting for her odds of surviving until the end of her childbearing years. Very generally speaking, and if the time period is sufficiently long, if this number is 1, the population is not growing. If it is less than one, the population is shrinking, and if it is greater than one, the population is growing.

Life expectancy at birth (e_0)

The period life expectancy at birth is also calculated from period age-specific death rates, in a manner too complicated to explore here. The life expectancy at birth in a given year is the average number of years a fictional person can assume to live were he / she born in the given year, and were he / she to experience at every age the mortality rates measured in that given year.

The following table compares life expectancy at birth with the CDR:

Age structure, CDR and e_0 in Mexico and the United States, 2000

| | % population < 15 years | % population > 65 years | CDR (per thousand) | e_0 |
|---------------|----------------------------|----------------------------|--------------------|-------|
| United States | 21 | 13 | 9 | 77 |
| Mexico | 34 | 4 | 5 | 72 |

Source: US Census Bureau, International Data Base.