

Arkansas Economic Development Institute 2019 period life table definitions

Both population and mortality data were obtained from the Arkansas Department of Health's Vital Statistics Query System.

Age group: the age grouping a person falls into.

x : the lowest age in an age group.

n_x : the number of years in the age group.

a_x : a fraction representing on average how long the people who died in the age group lived.

Population (P_x): the estimated amount of population in that age group for the given reference year.

Deaths (D_x): the recorded number of deaths in the age group for the given reference year.

M_x : the age-specific mortality rate for the age group.

$$M_x = \frac{D_x}{P_x}$$

q_x : the probability that an individual will die while within the age group.

$$q_x = \frac{n_x * M_x}{1 + (1 - a_x) * n_x * M_x}$$

l_x : using a hypothetical cohort of 100,000 people, how many of them will be alive at the start of the age group.

$$l_{x+n} = l_x - d_x, l_0 = 100,000$$

d_x : the estimated amount of people that will experience death throughout that age group.

$$d_x = l_x * q_x$$

L_x : the estimated number of person-years experienced by the cohort at a specific age group.

$$L_x = n_x * (l_x - d_x) + a_x * n_x * d_x$$

T_x : the estimated number of person-years expected to be lived by the cohort from that age group forward.

$$T_x = \sum_{x=0}^{x=\infty} L_x$$

e_x : the average number of years a person in the cohort is expected to live.

$$e_x = \frac{T_x}{l_x}$$

$var(q_x)$: the variance in the age specific probability of mortality.

$$\frac{n^2 * M_x * [1 - (a_x * n * M_x)]}{P_x * \{1 + [(1 - a_x) * n_x * M_x]\}^3}$$

$var(e_x)$: the variance in the life expectancy.

$$\frac{\sum\{l_x^2 * [(1 - a_x) * n_x + e_{x+1}]^2 * var(q_x)^2\}}{l_x^2}$$

SE: standard error of the variance in life expectancy.

$$SE = \sqrt{var(e_x)}$$