Generation time

In population biology and demography, generation time is the average time between two conseque consecutive generations in the lineages of a population. In human population, generation time typically ranges from 22 to 33 years.

    The definition of generation time fall into two categories

(1) The time taken by a population to renew.

(2) The distance between individuals of one generation and the next

    There are three general methods of defining it.

(1) Net reproductive rate → The net reproductive rate R_0 is the number of offspring an individual is expected to produce during its life time. This definition look at the time as a renewal time of the population justified by using the examples of microbiology (The time taken by a bacterial colony to double) Since one can consider that during the exponential phase of bacterial growth mortality is very low and as a result bacterium is expected to be replaced by two bacteria in the next generation (the mother cell and the daughter cell). If the population dynamic is exponential with a growth rate r (ie $n(t) \sim a \, e^{rt}$ where $n(t)$ is the size of the population at time t) then this measure of generation time is given by

$$T = \frac{\log R_0}{r}$$

Indeed T is such that $n(t+T) = R_0 n(t)$ i.e $e^{rT} = R_0$

Difference in age between Parent and offspring —

NET reproductive rate consists of a hypothetical cohort of women, their deaths and their female births during their child bearing Period ie 15 to 49 years.

2/ It is also a measure of the number of daughters that a cohort of new born girl babies will bear during their life time assuming a fixed Schedule of fertility rates and a fixed set of mortality rates.

3/ Net Reproductive Rate is a measure of the extent to which a cohort of newly born girls will replace themselves under given Schedule of age specific female of fertility and mortality.
                    The net Reproductive rate belongs to the Kind of indicators defined as classic measures" of Population renewal. It represents the average number of daughters a hypothetical cohort of women would have at the end of their reproductive period if they were subject during whole lives to the fertility Rates and the mortality rates of a given period. It is expressed as daughter per women. It is a measure that keeps fertility and mortality fixed at some level and sets age specific migration at Zero

NET REPRODUCTIVE VALUE —

Reproductive value is a measure of the relative reproductive potential of an individual at any age, is a useful concept that can be applied to diverse subjects such as optimization of life histories, colonization of islands, management of exploited populations. However complexity of the reproductive value often causes instructor to poorly handle the concept in introductory biology and ecology. The original equation for reproductive value (Fisher) applies to continuous breeders and attempts to convert Fisher's formula to a discrete form suitable for seasonal breeder led to commonly cited equation eq (Mac Arthur and Wilson 1967)

$$V_x = \dfrac{\displaystyle\sum_{y=x}^{\infty} e^{-ry} \ell_y m_y}{e^{-rx} \ell_x} \quad (1)$$

In this equation V_x is reproductive value of a female at age x

ℓ_x is the proportion of new born females that survive to age x

m_x is the average number of daughters born to a female at age x and r is a per capita rate of increase called intrinsic rate of natural increase. The Parameter ℓ_x is found by dividing the number of females that survive to age x, S_x by the number alive at age 0, So. The parameter m_x is found by dividing the total number of daughters born to all females at age x symbolized B_x thereby S_x.