SOLUTIONS CHAP 4 no 8

8.a) The TFR is defined as the number of children that a girl would have if she lived past the age of procreation. Since by age 60 women have 4 children, then the TFR is 4.

The NRR is defined as the number of girls that a newborn girl is expected to have taking into account both the mortality an fertility rates. One thirds of girls are expected to have 0 child, one third will have 2, and one third will have 4. Half of those children are girls. We thus have:

$$NRR = \frac{1}{2}\left(\frac{1}{3} \times 0 + \frac{1}{3} \times 2 + \frac{1}{3} \times 4\right) = 1.0$$

This implies zero population growth.

8.b) 30 y/o women have 2 children and 60 y/o women have 4. Hence:

$$NRR = \frac{1}{2}\left(\frac{1}{2} \times 2 + \frac{1}{2} \times 4\right) = 1.5$$

The drop in the mortality rate has caused the population size to increase by 50% at each new generation.

8.c) Since 60y/o women now have 2 children on average, the TFR is now 2. The TFR has been cut in half.

30 y/o women now have 1 child on average and 60 y/o women have 2. Hence:

$$NRR = \frac{1}{2}\left(\frac{1}{2} \times 1 + \frac{1}{2} \times 2\right) = 0.75$$

The drop in the fertility rate causes the population size to now decline by 25% at each new generation.

The above example illustrate the effect of the timing differential between the mortality and the fertility transitions. Typically, the drop in mortality rates precedes the drop in the fertility rate such that the population growth rate begins by increasing but is eventually followed by a drop.