Population Projections

Demography Camp

Summer 2013

Steps for a 5 year projection

Given a closed female poulatio in 2010 by 5-year age groups: 0-4, 5-9, ..., 70-74, 75+

Project population to 2015, given ${}_5L_x$ values from an appropriate life table and rates of bearing daughters (${}_5m_x$)

Step 1: Survive the population alive in 2010 to 2015

$$ {}_5W_{x+5}^{(15)} =_5 W_x^{(10)} \times \frac{{}_5L_{x+5}}{{}_5L_x} $$

$$ {}_\infty W_{75}^{(15)} =_5 W_{75}^{(15)} +_\infty W_{80}^{15} $$

$$ {}_\infty W_{80}^{(15)} =_\infty W_{75}^{(10)} \times \frac{T_{80}}{T_{75}} $$

Questions:

- For the second equation, where do we find ${}_5W_{75}^{(15)}$?
- In the third line, what assumption does $\frac{T_{80}}{T_{75}}$ make about age composition in the observed population?

Step 2: Determine ${}_5W_0^{(15)}$

$$ {}_5\bar{W}_x = \frac{{}_5W_x^{(10)} +_5 W_x^{(15)}}{2} $$

for x = 15, 20, ...45

(Female) births in a 5 year period = B = $5 \cdot \sum_{x=15}^{45} {}_5\bar{W}_x \cdot_5 m_x$

$$ \therefore \ {}_5W_0^{(15)} = B \cdot \frac{{}_5L_0}{5 \cdot l_0} $$

Comments

1. For 2-sex population, repeat procedure for males
   - $B_m = B_f \cdot sex\ ratio\ at\ birth$
2. In practical situations, account must also be taken of immigrant arrivals and emigrant departures
3. With repeated application of constant fertility and mortality assumptions in a closed population, population acquires constant (intrinsic or stable) growth rate and constant (stable) proportionate age distribution
   - The stable growth rate and stable age distribution depend only on fertility and mortality assumptions and are independent of initial population size and structure