

## Capstone Milestone Report – World Population Projections

Population projections are routinely used by private, public and non-profit organizations for policy development. For example, projections are used in:

- Estimating central and local finance allocation
- Planning housing and land use
- Health care planning - for modelling and projecting health care indicators
- Weighting national and regional surveys
- Creating teacher workforce models at a national and local level
- Assessing ageing population and understanding its implications

Therefore, accurate and high-quality population projections are imperative for good policy-making. For my Capstone Project, I will be estimating aggregate, age-specific, and sex-specific population projections until 2100 for 200+ countries using United Nations 2012 Population Division Database since 1950.

Population projections are estimated using the demographic balancing equation

$$P_{c,t} = P_{c,t-1} + B_{c,t} - D_{c,t} + M_{c,t} \text{ ----- (i)}$$

where  $P_{c,t}$  is the population prediction in country  $c$  at time  $t$ ,  
 $P_{c,t-1}$  is the population prediction in country  $c$  at time  $t-1$ ,  
 $B_{c,t}$  is the number of births in country  $c$  at time  $t$ ,  
 $D_{c,t}$  the number of deaths in country  $c$  at time  $t$ ,  
 $M_{c,t}$  net migration in country  $c$  at time  $t$ .

Methodology uses the cohort component method to decompose the equation into age-specific and sex-specific components for population projections.

Analysis is divided into three steps

- Step 1 – Simulating a large set of trajectories for future values of total fertility rates using Bayesian hierarchical estimates
  - ◆ Done via BayesTFR package in R software
- Step 2 – Simulating a large and equal set of trajectories for future values of life expectancies using Bayesian hierarchical estimates
  - ◆ Done via BayesLife package in R software
- Step 3 – Converting trajectories from previous models to age-specific and sex-specific population projections using cohort component method
  - ◆ Done via BayesPop package in R software