Regional workshop on the Production of Population Estimates
and Demographic Indicators
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Overview of the work of the United Nations Population Division

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Work of the Population Division

- (a) Providing substantive support to United Nations bodies, especially to the Commission on Population and Development, and assessing progress made in the implementation of the Programme of Action of the International Conference on Population and Development;
- (b) Facilitating the discussion of key or emerging population issues by experts or Government representatives;
- (c) Preparing comprehensive and sex-disaggregated studies on population issues and population trends relating to fertility, mortality, international migration, HIV/AIDS, urbanization, population growth, population ageing, population prospects, population policy and population in relation to development;
- (d) Disseminating population information and policy-relevant findings in the area of population;
- (e) Supporting capacity development to address population issues through workshops or the dissemination of technical material.

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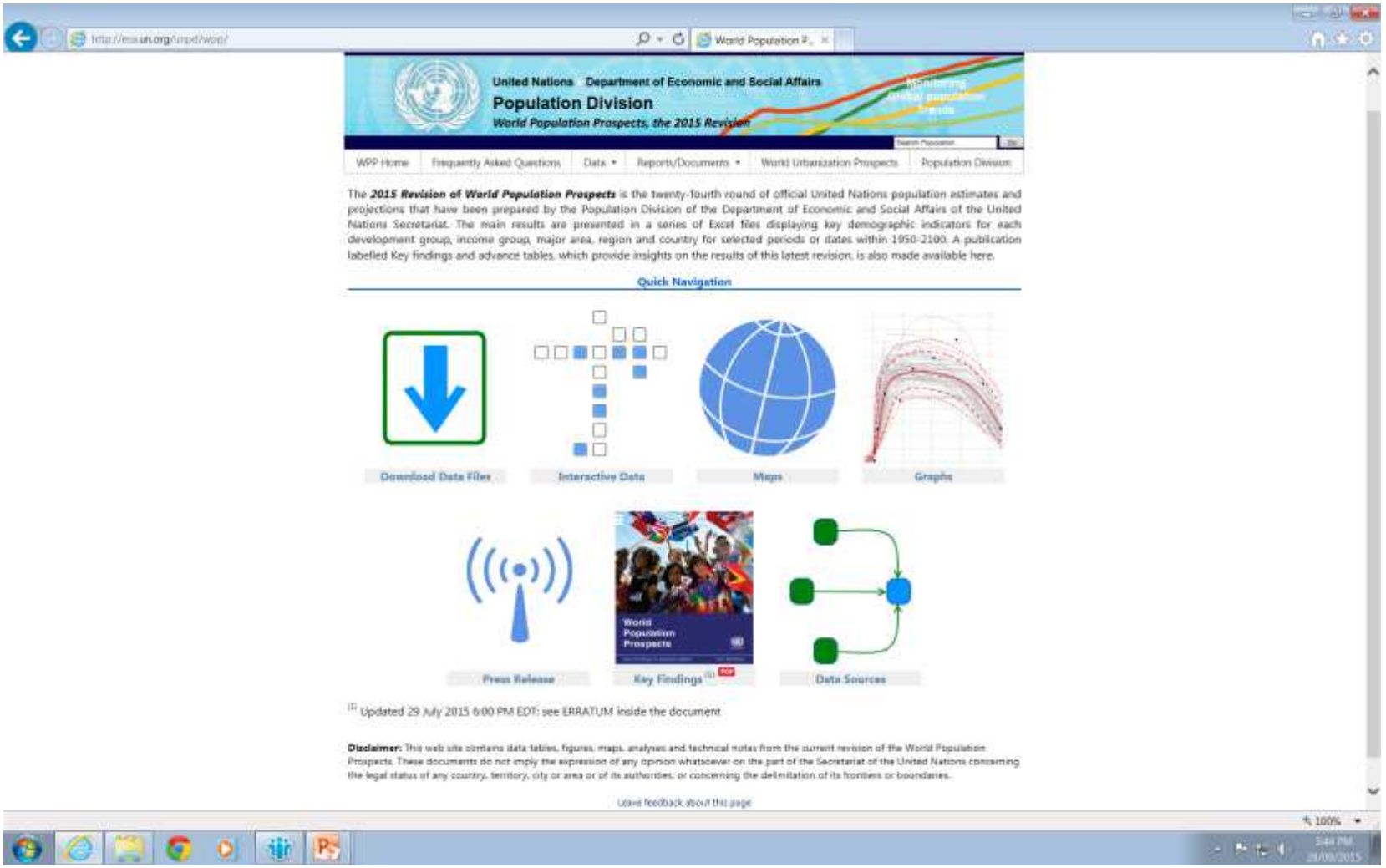


Population Estimates and Projections

1. Overview of the UN Methodology

2. Cohort-component method and data required

3. Some brief examples on data quality

Overview of the UN methodology

World Population Prospects

(the 2015 Revision was released in July 2015)

- Estimates and projections of population and demographic components for all countries of the world, 1950-2100
- Estimates vs. Projections (focus will be on estimates)
- Demographic components: Fertility, mortality, migration
- De facto concept

Population estimates by age and sex

- We do not “copy” the estimated population from a given country within a time-series

- We basically start our estimation process in 1950 and generate populations by age and sex using the cohort-component method and information on the different components of the population (e.g. fertility, mortality and migration) while checking for consistency with population counts that are made available overtime.

- This process enables us to maintain some consistency between the different components and the overall population. On the basis of the observed data, adjustments are sometimes required.

Accounting framework and interpolation issues

- It should be stressed that the Population Division, as part of its official population estimates and projections, produces populations by age and sex by five year age groups (e.g. 0-4, 5-9, ...80+ or 100+) and every 5 years (e.g. for 2005, 2010, 2015 etc.) using the cohort-component method. Values between the 5 year intervals are interpolated; this can make it difficult to accurately reproduce data for intermediary years, especially when the trends fluctuate.

- Though we strive to use or approximate national data, it is sometimes difficult for us to reconcile official national estimates over time. In some cases it is because the estimates have been revised and/or are not consistent over time, or because fluctuating trends are occurring between 5 years intervals (e.g. between 2010 and 2015).

Cohort-component method

- Most commonly used method that accounts for age distribution

a) Population accounting concept

b) Data required

c) Model implementation for closed and open populations

What is population accounting?

$$P_{t+n} = P_t + B_{t,t+n} – D_{t,t+n} + I_{t,t+n} – E_{t,t+n}$$

$$P_{t+n} – P_t = B_{t,t+n} – D_{t,t+n} + I_{t,t+n} – E_{t,t+n}$$

P_t is the population at time t

$B_{t,t+n}$ and **$D_{t,t+n}$** are number of births and deaths occurring between t and t + n.

$I_{t,t+n}$ and $E_{t,t+n}$ are number of immigrants and emigrants from the country during the same period

Data Required

- Base year **population** by age and sex
- Age-specific **fertility** rates
- Sex-specific life tables (**mortality**)
- Age and sex specific net **migration** rates for the period (*absolute numbers / open populations*)

Computation-closed population

Three important steps to follow!

STEP 1.

Project forward the population in each subgroup at the **beginning of the time interval** (single/abridged) in order to estimate the **number still alive** at the beginning of the next interval accounting for those who survive each specific age interval

$$S_{x,x+n} = {}_nL_{x+n}(t) / {}_nL_x(t)$$

$$P_{x+n}(t+n) = P_x(t) \times S_{x,x+n}$$

where $S_{x,x+n}$ is the period-cohort **survivorship ratios** of persons aged x to x + n

Computation-closed population

STEP 2.

Compute the **number of births** for each subgroup over the time interval and add them across groups

$$B(t,t+n)=\sum_{x=\alpha}^{\beta} f_x(t,t+n)\times\frac{n}{2}[P_x^{\,f}(t)+P_x^{\,f}(t+n)]$$

ASFR

- $f_x(t, t+n)$ is the age specific fertility rate in the age interval x to x + n
- n is the width of the age interval
- α and β are the lower and upper bounds of the childbearing ages

Computation-closed population

STEP 3

Compute the **number of those births** who **survive** to the beginning of the next interval (consider sex ratio assumptions)

$$P^f_0(t+n) = B^f(t, t+n) \times S_{b,0}(t, t+n)$$

Where $S_{b,0}$ is the survivorship ratios at birth

The survival ratio from birth to the first age group is:

$$S(b,0) = {}_nL_0(t) / n^*l_0$$

IMPORTANT

- The age groups should be of the same width except for the *last* one
- The projections period is divided into time intervals of the same length as the age intervals (e.g. 5X5)
- Sex ratio assumption (e.g. 105 males per 100 females)

Open Populations

- Dealing with emigration is relatively easy

  => two-exits: two-decrement life table combining the risks of death and emigration

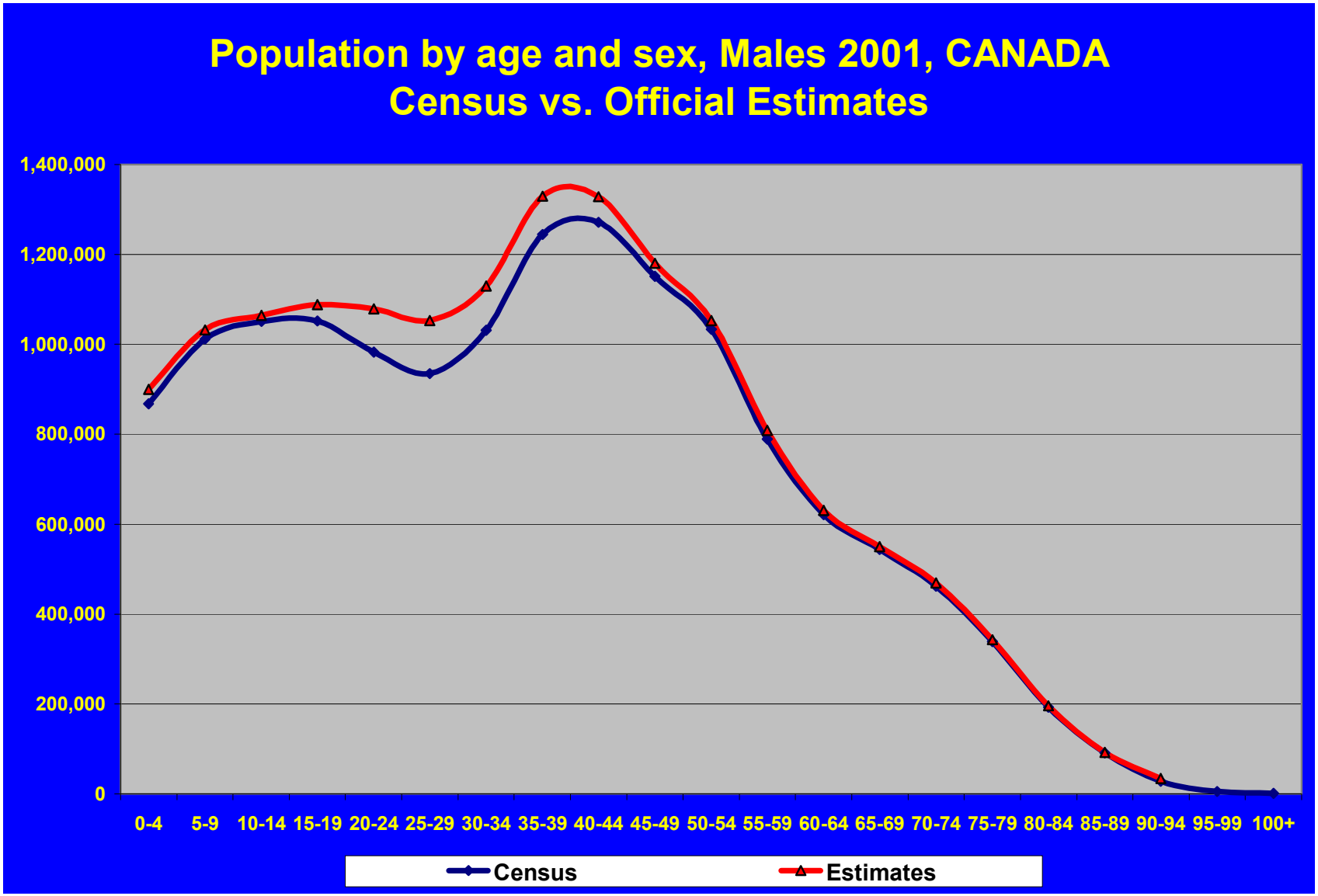
- Dealing with immigration is more difficult, since immigrants are added to the population

A. Assumptions are more often formulated in terms of *absolute numbers* and not by rates (related to policies)

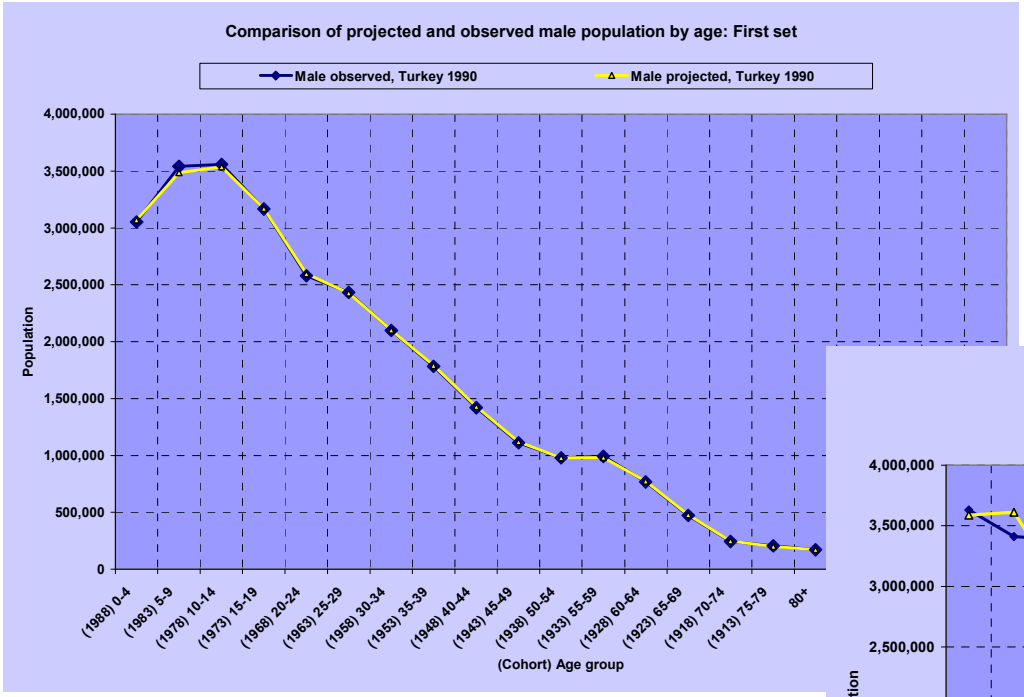
B. Migrants are also exposed to giving births and dying

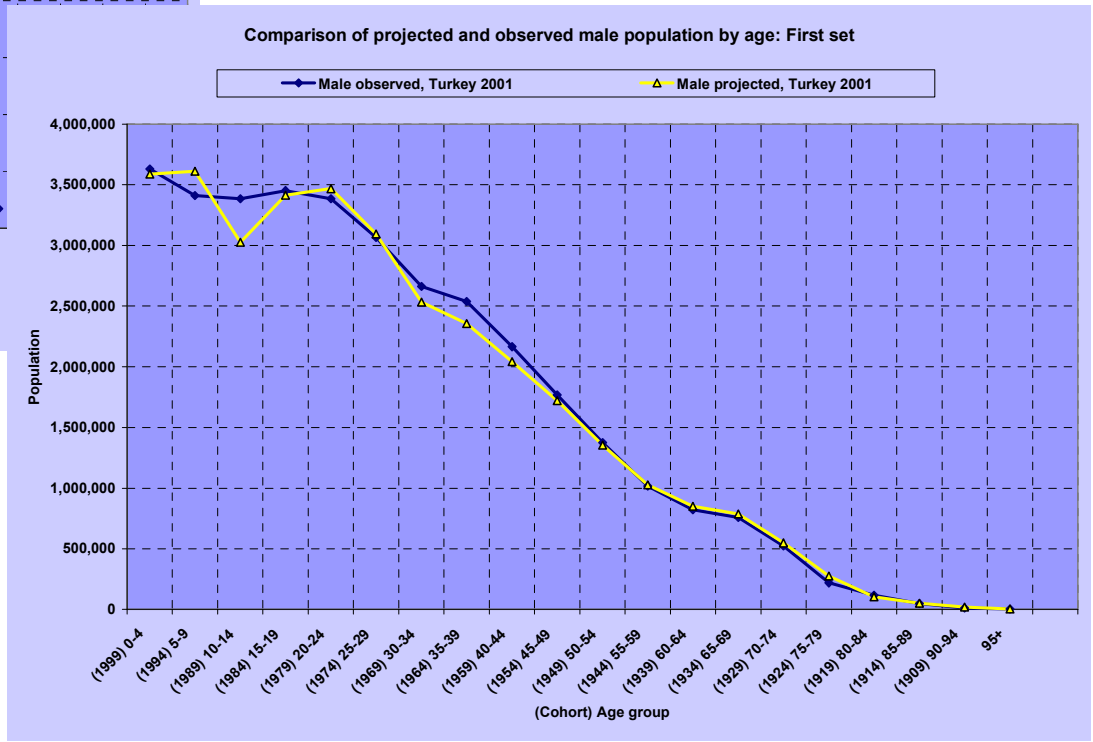
A few examples of “data issues”

Under-reporting in censuses

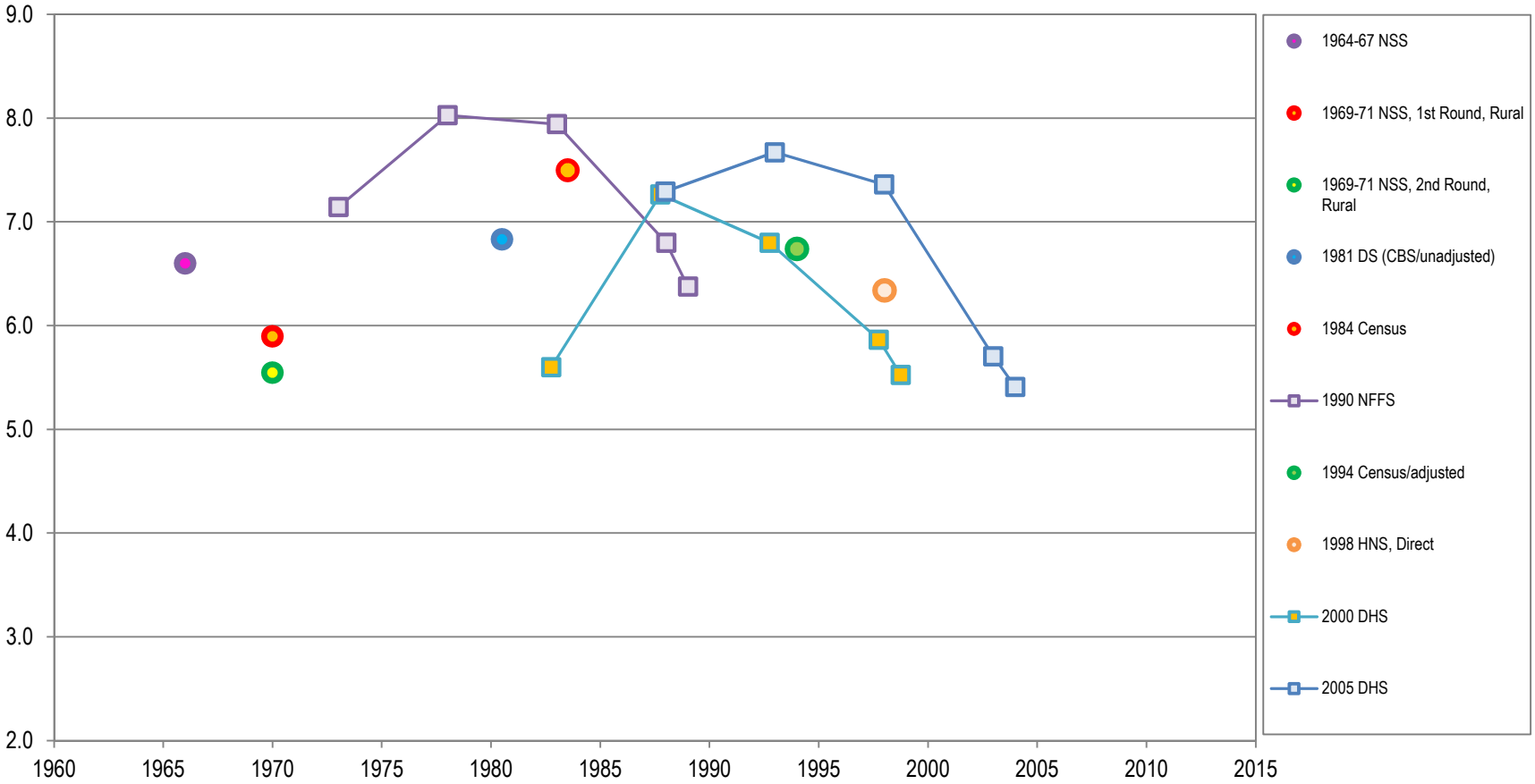


Observing cohorts over time





Total fertility estimates in Ethiopia based on different censuses and surveys



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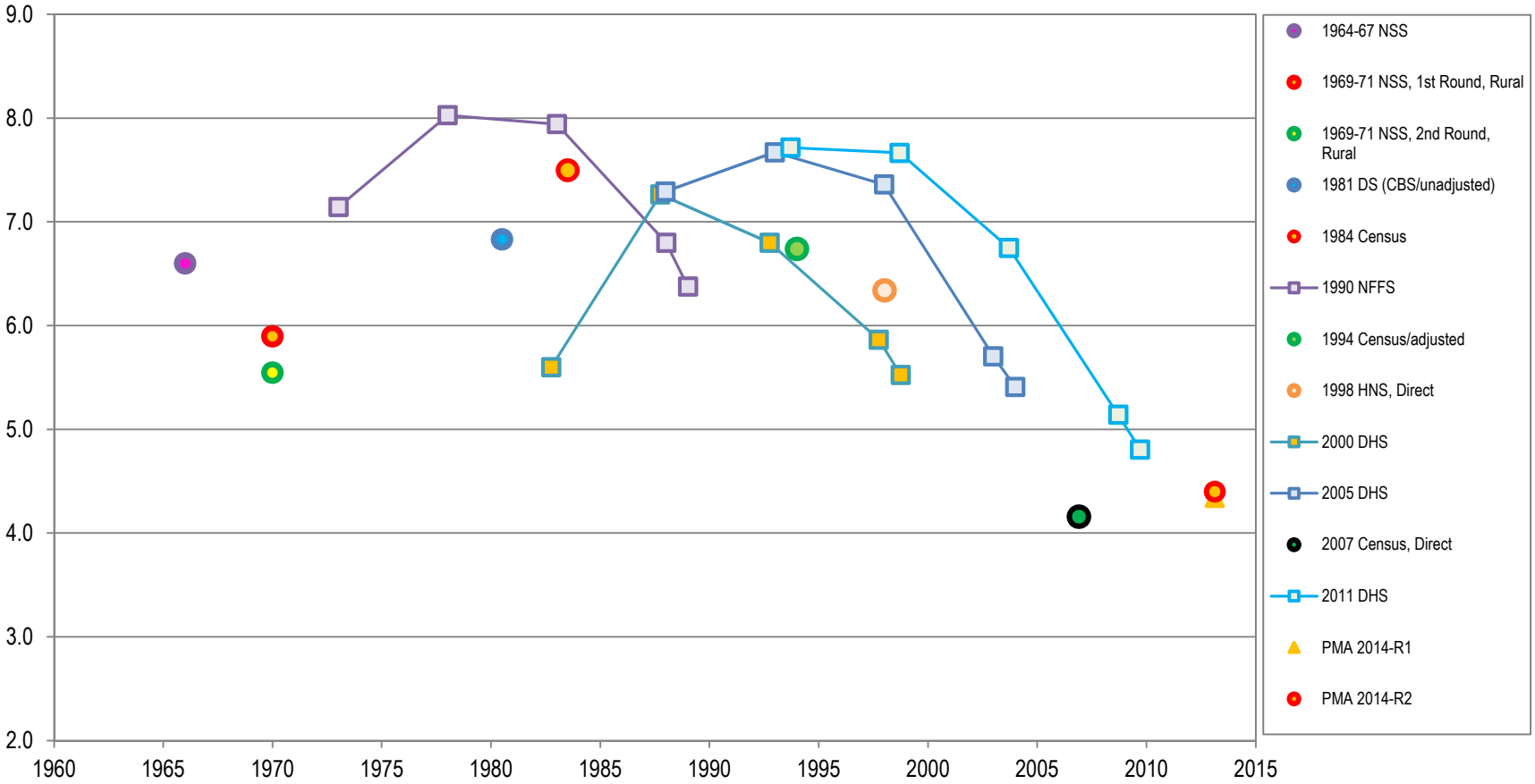

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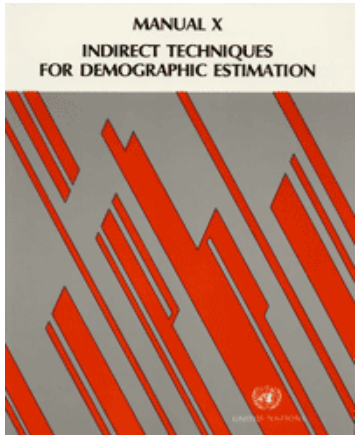
Indirect techniques – Main references



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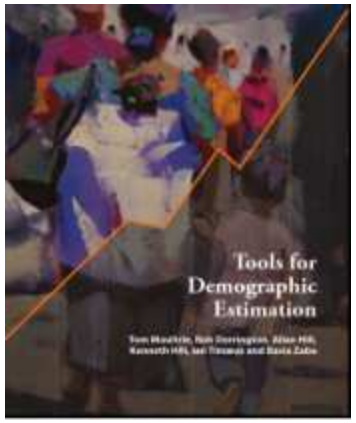
- http://www.un.org/en/development/desa/population/publications/manual/estimate/demographic-estimation.shtml



- Moultrie T.A., R.E. Dorrington, A.G. Hill, K. Hill, I.M. Timæus & B. Zaba (eds) (2013), *Tools for Demographic Estimation*. Paris: International Union for the Scientific Study of Population. available online at:
- http://demographicestimation.iussp.org/
- Available in PDF:
- http://demographicestimation.iussp.org/content/get-pdf-book-website

Indirect techniques – Main packages

- **MORTPAK** – The United Nations software package for demographic measurement, available online:
- http://www.un.org/en/development/desa/population/publications/mortality/mortpak.shtml

Excel templates provided with each chapter each chapter of Moultrie et al. (2013), available online:
http://demographicestimation.iussp.org/

Thank you

Questions?

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