

# Demographic Analysis and Population Projection System (DAPPS) and Rural/Urban Projections (RUP)

Presentation for the United Nations Virtual Expert Group Meeting on Methods for the World Population Prospects 2021 and Beyond

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# U.S. Census Bureau International Programs: What We Do

Promote international development and capacity building on a reimbursable basis through

- Technical assistance
- Training
- Demographic and economic research
  - International Database (IDB)
- Software and methodological tools development

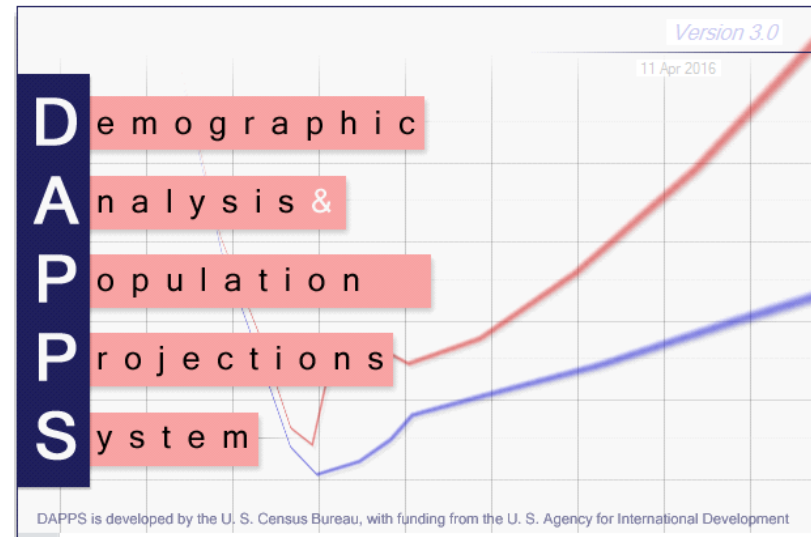


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# DAPPS (Demographic Analysis and Population Projection System)

- Software package designed to help users produce and analyze population projections
- Use
  - National Statistical Organizations use it to produce their own country population projections
  - IDB estimates and projections
- Runs Rural/Urban Projections (RUP) program in the background
- R version in progress



# DAPPS/RUP Features

- One-one cohort-component projection
  - Projection by single years of age
    - Allows you to track specific cohorts that may be smaller or larger than surrounding cohorts due to past demographic events
    - Allows for special age groups that do not fall into conventional 5-year age groups.
  - Year-by-year projection
    - Allows you to input information on demographic events for a particular year (e.g., excess mortality due to an earthquake) rather than spreading the effect over a 5-year period
    - Produces outputs for each year without having to interpolate with data from surrounding years



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# DAPPS/RUP Inputs

- Minimum inputs
  - Base population, by age and sex
  - Mortality structure, by age and sex
  - Fertility structure, by age and sex
  - Optional component of net migration pattern (up to 2 streams), by age and sex of migrant
- Input data can be provided in single ages or 5-year age groups
  - Converts all data to single years of age before performing the projection
  - Can input a mix of single and 5-year age groups
- Open-ended age group of the input data can vary between 50 years and over and 100 years and over.

# DAPPS/RUP Inputs

- Accepts a variety of input types
  - Mortality and fertility rates
  - Births, deaths, and number of migrants
    - Can use vital statistics without first calculating rates
- Enter input data for any year, including years prior to or following the projection period.
  - Input years for each component can differ from each other.
  - Data inputs for years outside the projection period are used to interpolate estimates for years in the projection period and/or age patterns of the component.



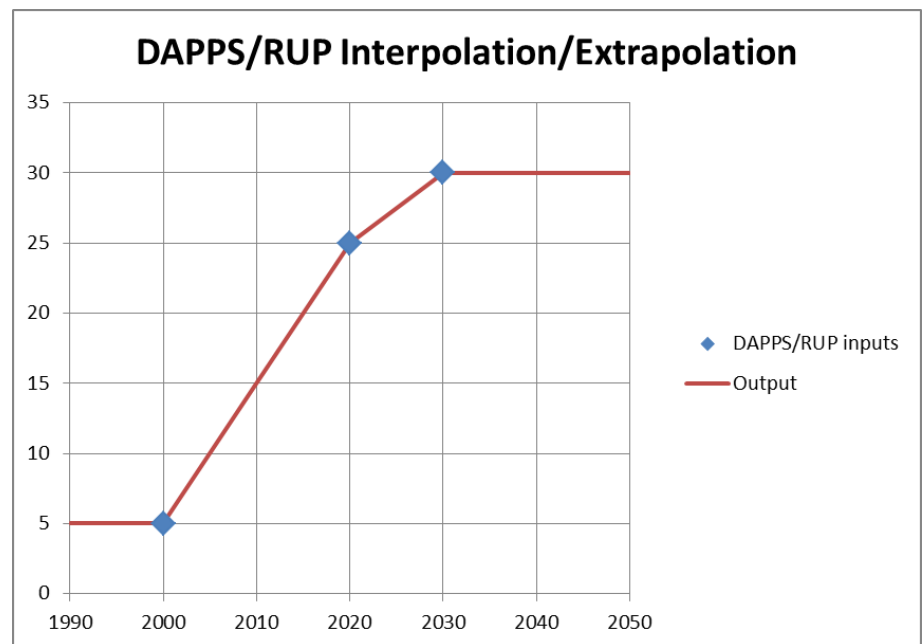
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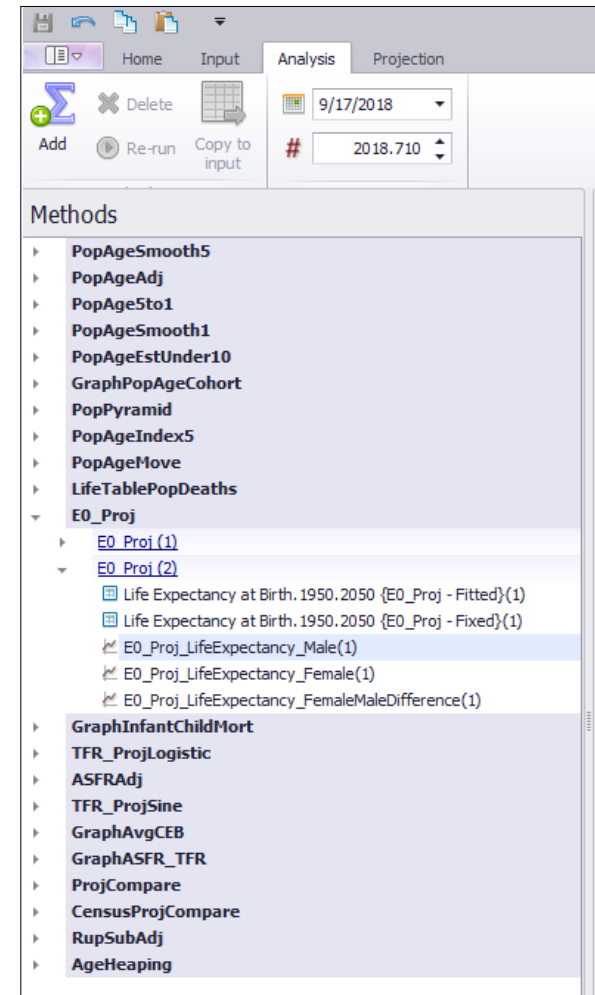
# DAPPS/RUP Features

- Reference dates/periods
  - Population: midyear
  - Rates and Events: calendar years
- Inputs NOT required for each year of projection
- For years without inputs, levels are interpolated (between two inputs) or held constant (before the first input or after the last input)



# Demographic Analysis Tools in DAPPS

- Age smoothing
- Evaluate and adjust for undercount of children under 10
- Extrapolate total fertility rates
- Project life expectancy
- Compare projected population to census counts
- Many more and more in progress!

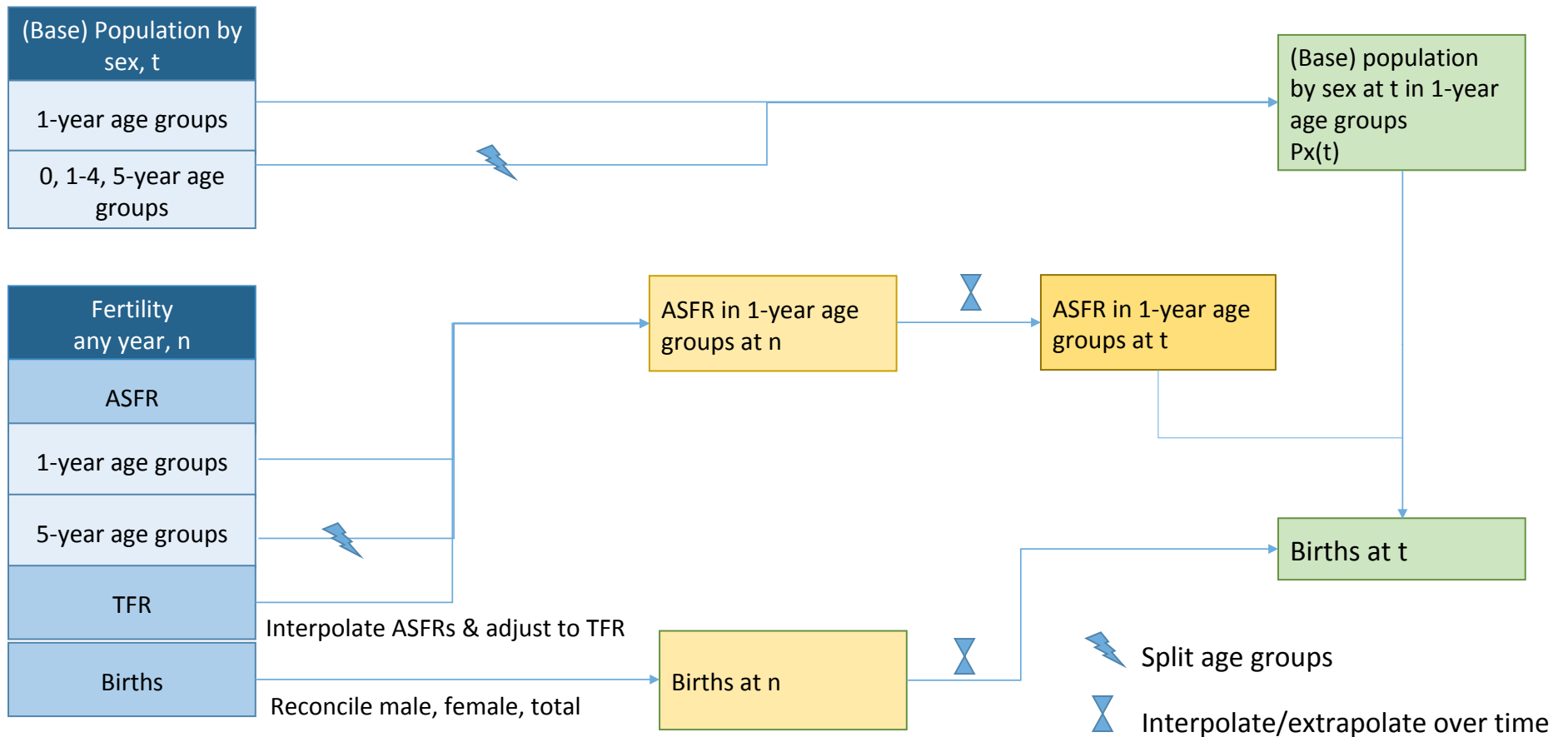


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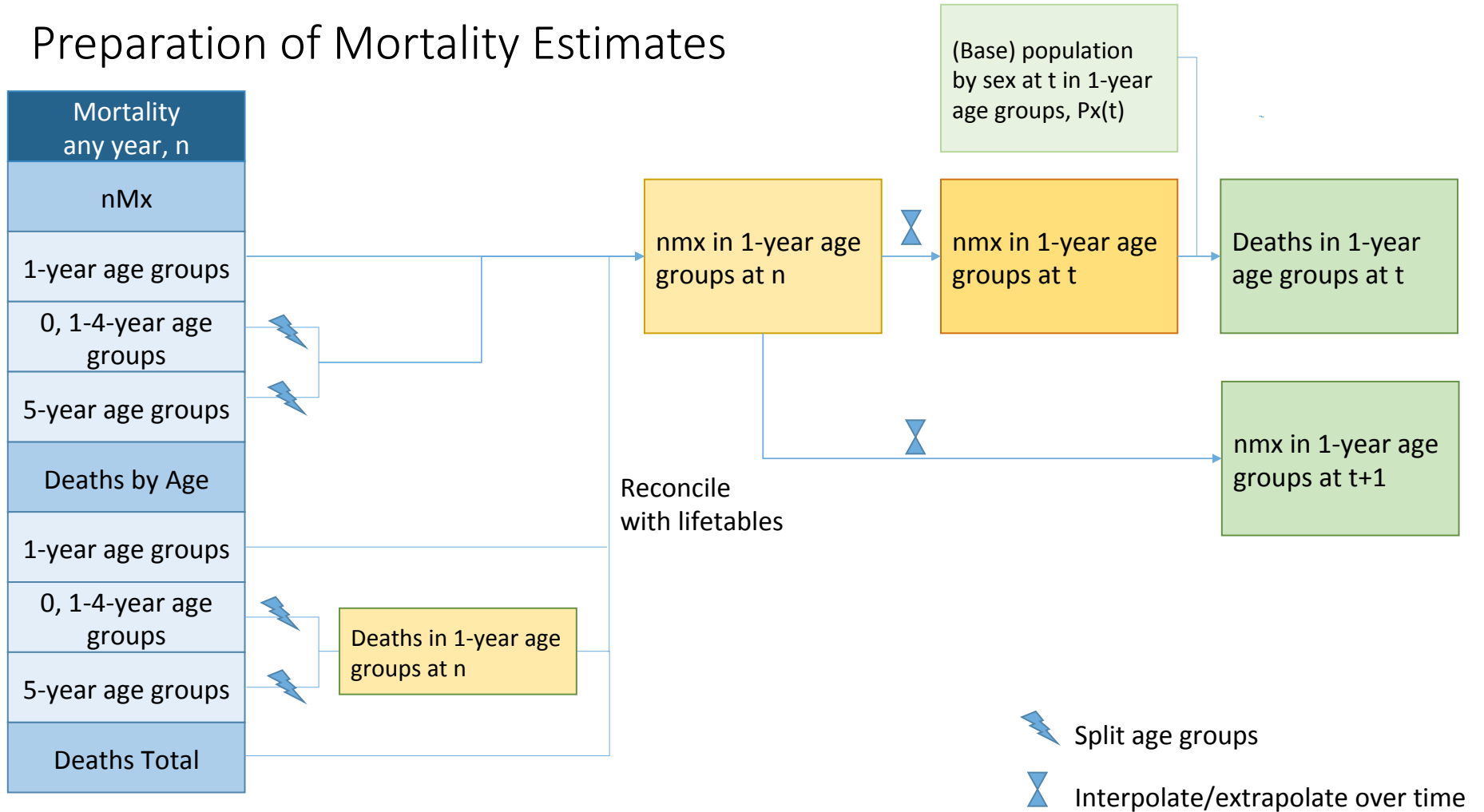




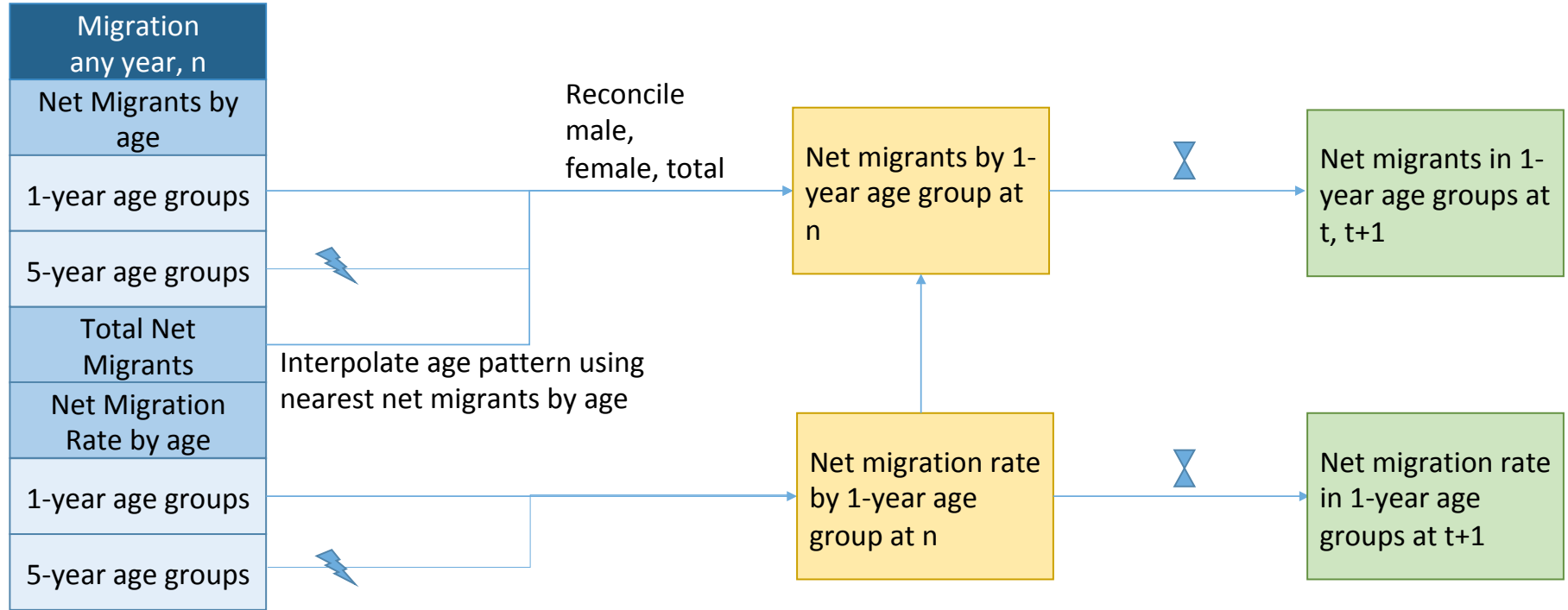
# Preparation of Population and Fertility Estimates




# Preparation of Mortality Estimates



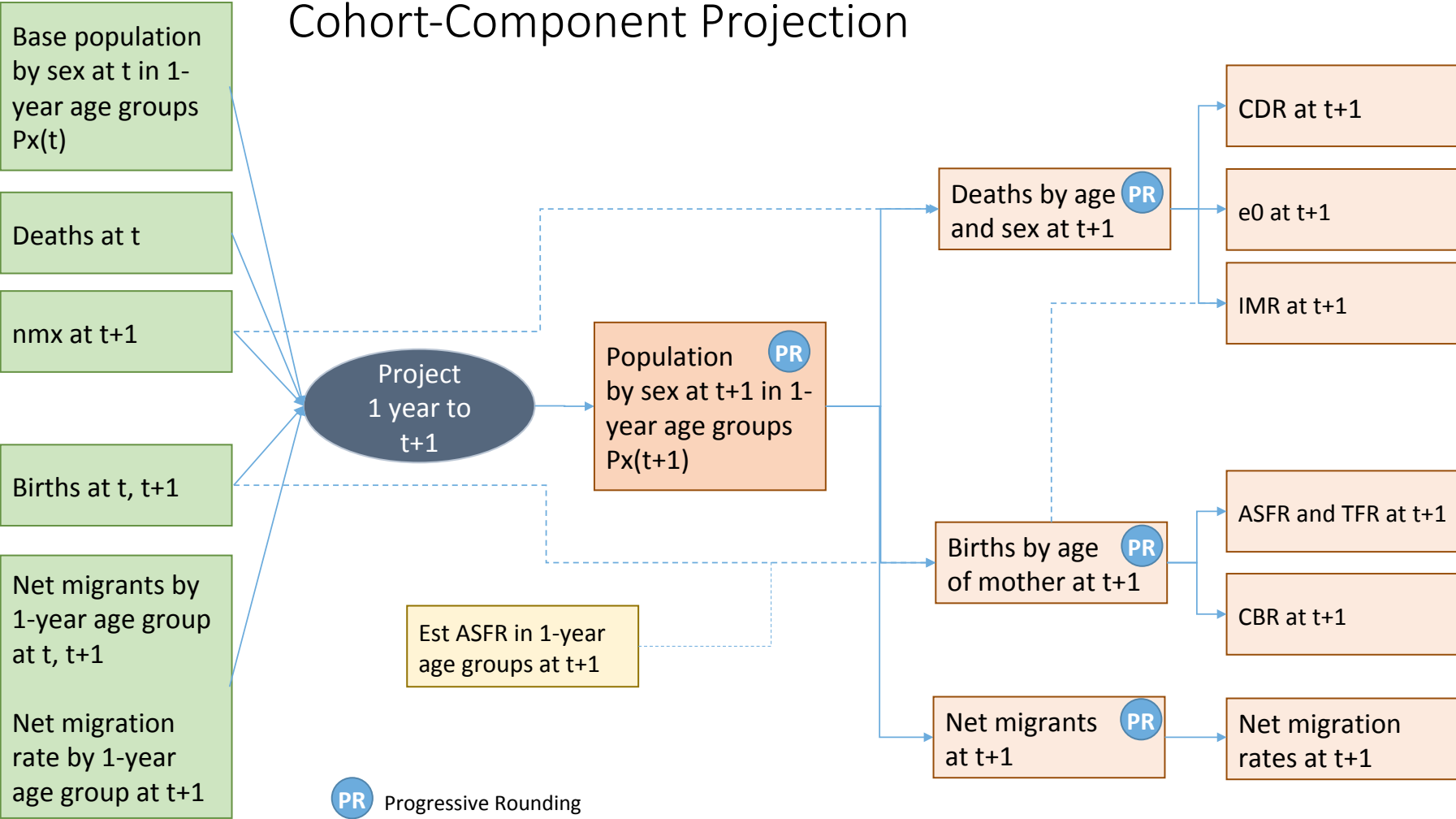
# Preparation of Migration Estimates



 Split age groups

 Interpolate/extrapolate over time

# Cohort-Component Projection



# DAPPS/RUP Outputs

- Wide variety of outputs including:
  - Population by sex and age (single years, 5-year age groups, special groups) and summary measures of age (percentages, sex ratios, median ages, dependency ratios).
  - Summary vital rates (crude rates, life expectancy, infant mortality rates, and total fertility rates).
  - Life tables (complete and abridged)
  - Net numbers of migrants or migration rates by age and sex
  - Number of deaths, by age and sex
  - Number of births, by age of mother, and age-specific fertility rates

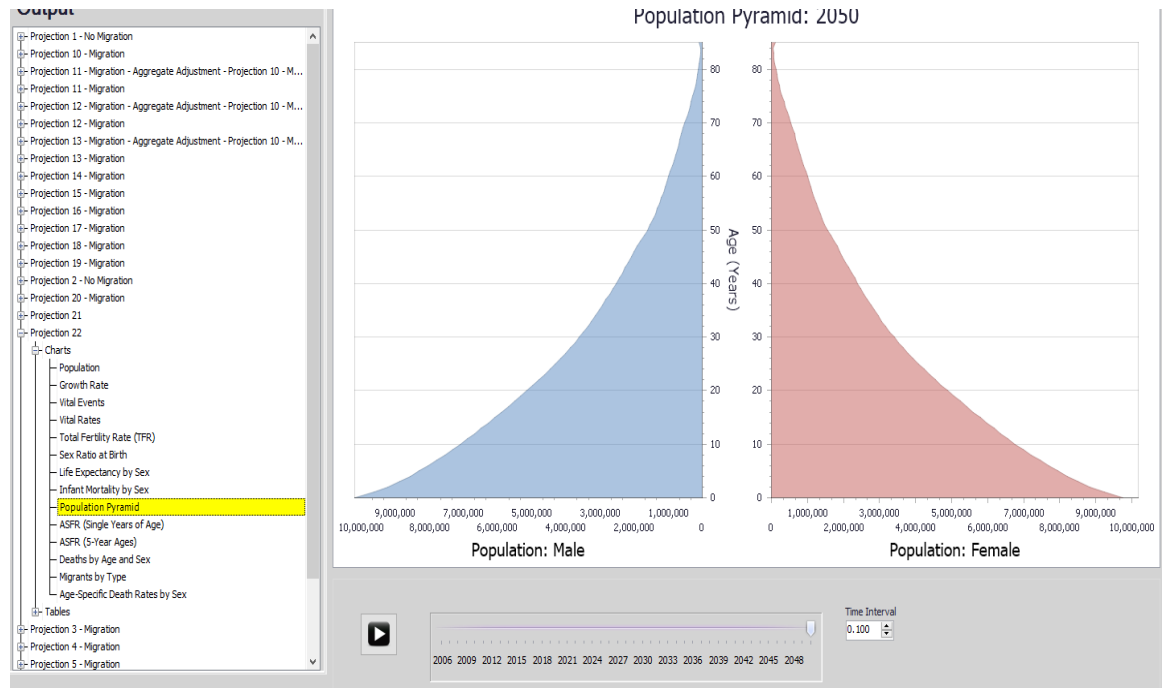


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# Outputs

- Variety of charts and tables for each projection run
- Dynamic charts
- Organized display



# Future Directions for DAPPS

- DAPPS/RUP implementation in R
- Full suite of demographic analysis tools
- Incorporate fully the Subnational Toolkit
  - <https://www.census.gov/data/software/sp-toolkit.html>
  - Currently, function to control the subnational projections to the national projection exists
  - We hope to add more features



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# Lessons Learned

- Over 70 countries trained
  - Useful for NSOs
  - Even more useful after full implementation of demographic analysis tools
- Being able to accept a wide variety of data makes it flexible for countries to use available data
- Easy to understand methodology that many countries already use
- But preparation of estimates can be a challenge when facing poor data quality, particularly at the subnational levels