



**United Nations**

Department of  
Economic and  
Social Affairs

# United Nations Population Estimates and Projections: enhancements to the World Population Prospects

**GCC Stat workshop**

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**Sara Hertog, Population Affairs Officer, UN-DESA**

# World Population Prospects (WPP)

- For all countries in the world, a consistent set of estimates and projections of population size and the three components of population change: fertility, mortality and net international migration
- 2022 revision: estimates from 1950 to 2022 and projections to 2100 for 237 countries or areas
- Prediction intervals associated with probabilistic projection, as well as 10 other projection variants
- Estimates and projections of all population indicators and demographic rates at the global, regional and country levels available at:  
<https://population.un.org/wpp/>

# A brief history of the WPP

- First revision published in 1951
  - total population of the world and 11 regions from 1920-1980
  - projections reflect mathematical model of growth rate
- 1960s
  - country-level estimates and projections from 1950-2000
  - disaggregated by sex and age in 1968
  - projections reflect cohort-component population change associated with births, deaths and migration
- 1970s-1980s
  - model life tables for mortality estimation
  - indirect methods for estimating fertility and mortality
  - projection horizon extended to 2025

# A brief history of the WPP

- 1990s
  - incorporates models of impact of HIV/AIDS
  - life tables extended from age 80+ to 100+
  - projection horizon extended to 2050
- 2000s
  - MDG era
  - interpolation of population indicators to single year of age and time
  - models of HIV/AIDS impact take into account the coverage of treatment
- 2010s
  - probabilistic projection methods
  - projection horizon extended to 2100
  - all population indicators distributed free of charge on the website of the Population Division

# WPP 2022

## On the road towards an enhanced, more transparent and reproducible WPP

- MAJOR overhaul of all methods and tools used to produce the WPP
  - Transition from 5-year periods and 5-year age groups to 1-year periods and 1-year age groups (“5x5” to “1x1”)
  - Probabilistic modelling of total fertility rate, age-specific fertility rates, and infant, child and adult mortality rates
  - Standardized methods for estimating and extending life tables to age 100+, including in contexts affected by HIV and AIDS
  - New methods to estimate net international migration making direct use of population benchmarks

# WPP 2022

## On the road towards an enhanced, more transparent and reproducible WPP

- WHY?
  - In response to demand for more granular age- and period-disaggregated data needed to compute SDG indicators
  - To better identify demographic milestones that help us to understand our world and how it is changing over time.
  - To better represent the demographic dynamics that can have large impacts on specific periods and age groups
    - e.g., natural disasters or conflicts that can have immediate and substantial effects on mortality, fertility or international migration (and refugee movements)
    - e.g., labour market dynamics that can have significant effects on population size and age structure in countries sending or receiving large numbers of migrant labourers

# Demographic milestones identified in the WPP2022



## A World of 8 Billion

### GLOBAL POPULATION GROWTH CONTINUES BUT IS SLOWING DOWN

On 15 November 2022, the world's population is projected to reach 8 billion people, having grown by 1 billion since 2010. This is a remarkable milestone given that the human population numbered under 1 billion for millennia until around 1800, and that it took more than 100 years to grow from 1 to 2 billion.<sup>1</sup> By comparison, the increase of the world's population over the last century has been quite rapid. Despite a gradual slowing in the pace of growth, the global population is projected to surpass 9 billion around 2037 and 10 billion around 2058 (figure 1).<sup>2</sup>

#### Key Messages

- » On 15 November 2022, the world's population is projected to reach 8 billion people, having grown by 1 billion since 2010.
- » The growth of the world's population is increasingly concentrated in a few countries, especially in Africa and Asia.
- » Between now and 2050, the world's population under age 25 is projected to increase by 1 billion, while the population under age 65 is projected to increase by 2 billion.
- » Wealthy countries are projected to experience a decline in population, while low-income and lower-middle-income countries are projected to experience a significant increase.



## India overtakes China as the world's most populous country

### TWO "POPULATION BILLIONAIRES", CHINA AND INDIA, FACE DIVERGENT DEMOGRAPHIC FUTURES

The latest estimates and projections of global population from the United Nations,<sup>1</sup> indicate that China will soon cede its long-held status as the world's most populous country. In April 2023, India's population is expected to reach 1,425,775,850 people, matching and then surpassing the population of mainland China (figure 1).

India's population is virtually certain to continue to

#### Key Messages

- » India's population is projected to continue to grow for several decades, whereas China's population has recently begun to decline.
- » Countries should adopt policies and take action to respond and adapt to the demographic changes taking place in their populations, such as investing proactively in health and education and protecting the well-being of older persons.
- » Taking account of future population trends in national



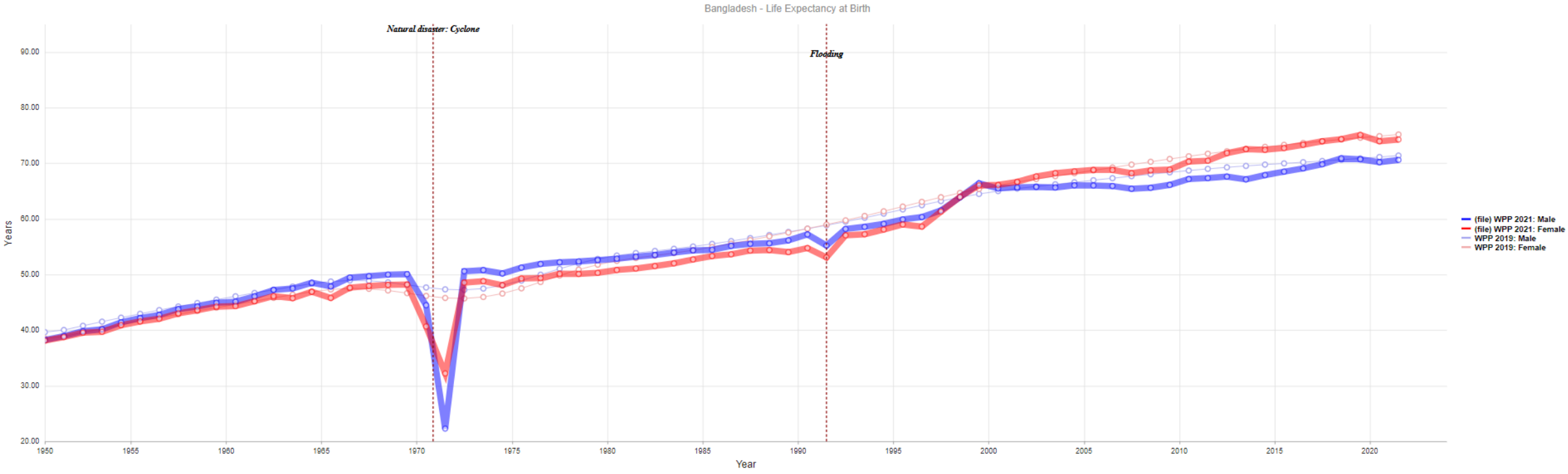
# WPP 2022

## On the road towards an enhanced, more transparent and reproducible WPP

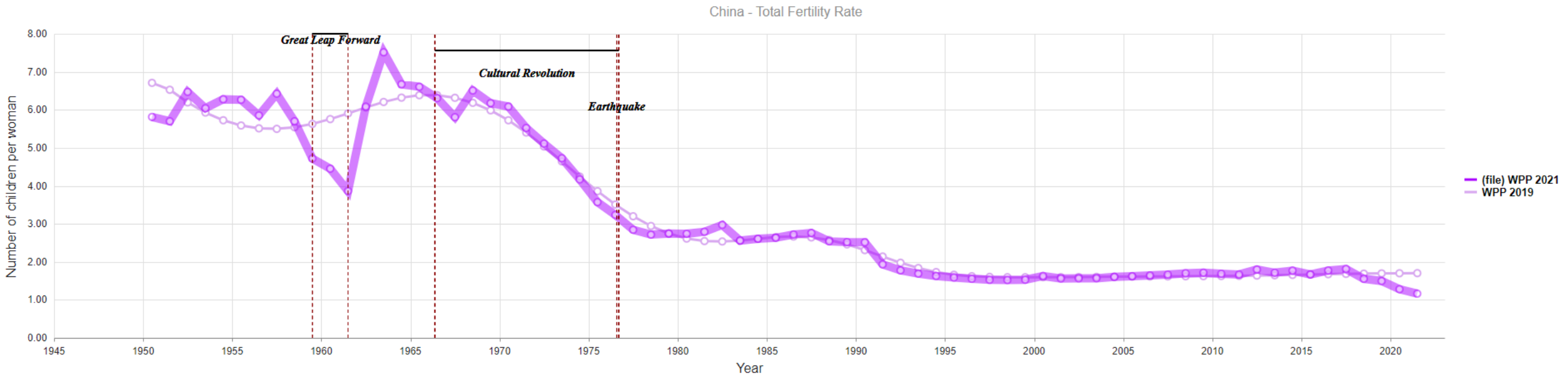
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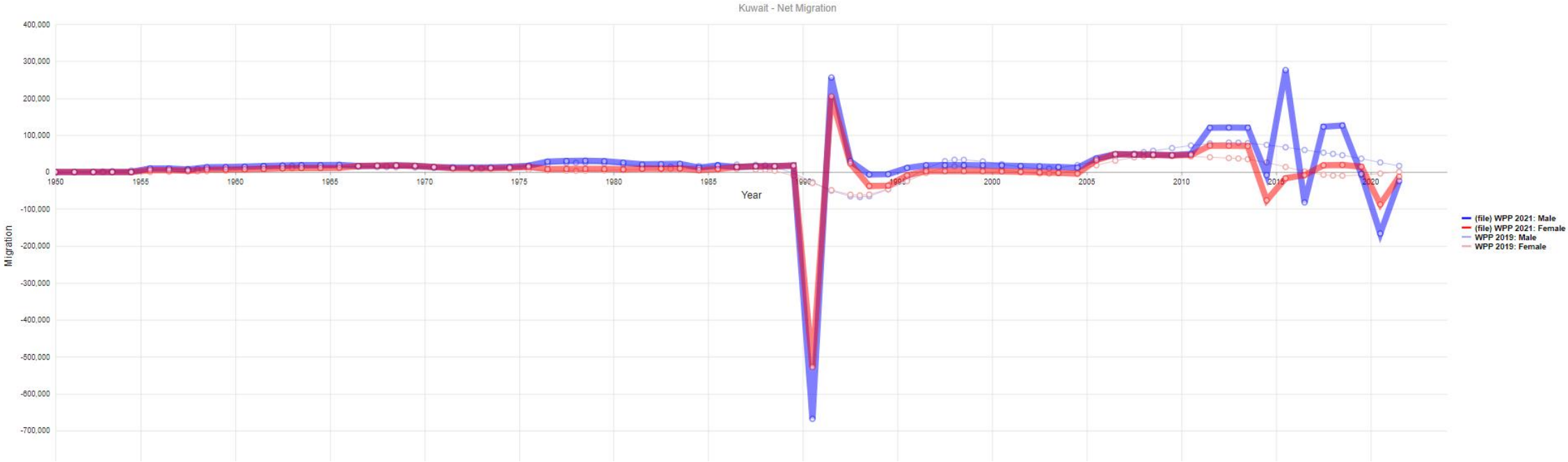
# Bangladesh, life expectancy at birth, WPP 2019 and WPP 2021 compared



# China, total fertility rate, WPP 2019 and WPP 2021 compared



# Kuwait, net international migration, WPP 2019 and WPP 2022 compared



# WPP 2022

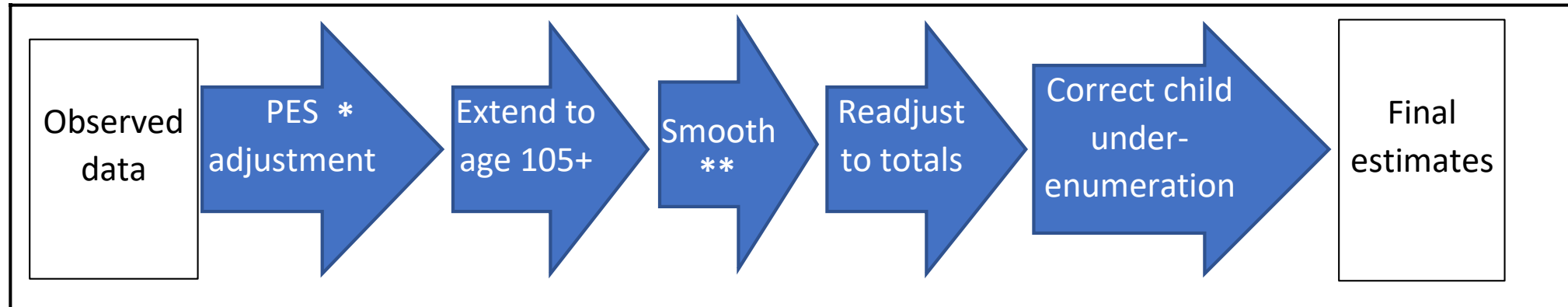
## On the road towards an enhanced, more transparent and reproducible WPP

- Enhanced, accessible data infrastructure (DemoData and DataPortal) and documentation of how empirical data sources on fertility, mortality and international migration are resourced for the WPP.
- New cohort-component population engine written in R and specifically designed for estimation of population based on demographic rates defined by single years of age and 1-year periods of time (“ccmppWPP” library)
- Direct and reproducible use of population “benchmarks” (i.e. censuses, registers or other high-quality sources of population counts by age and sex).

# WPP 2022

## On the road towards an enhanced, more transparent and reproducible WPP

- New evaluation and adjustment protocol for population censuses

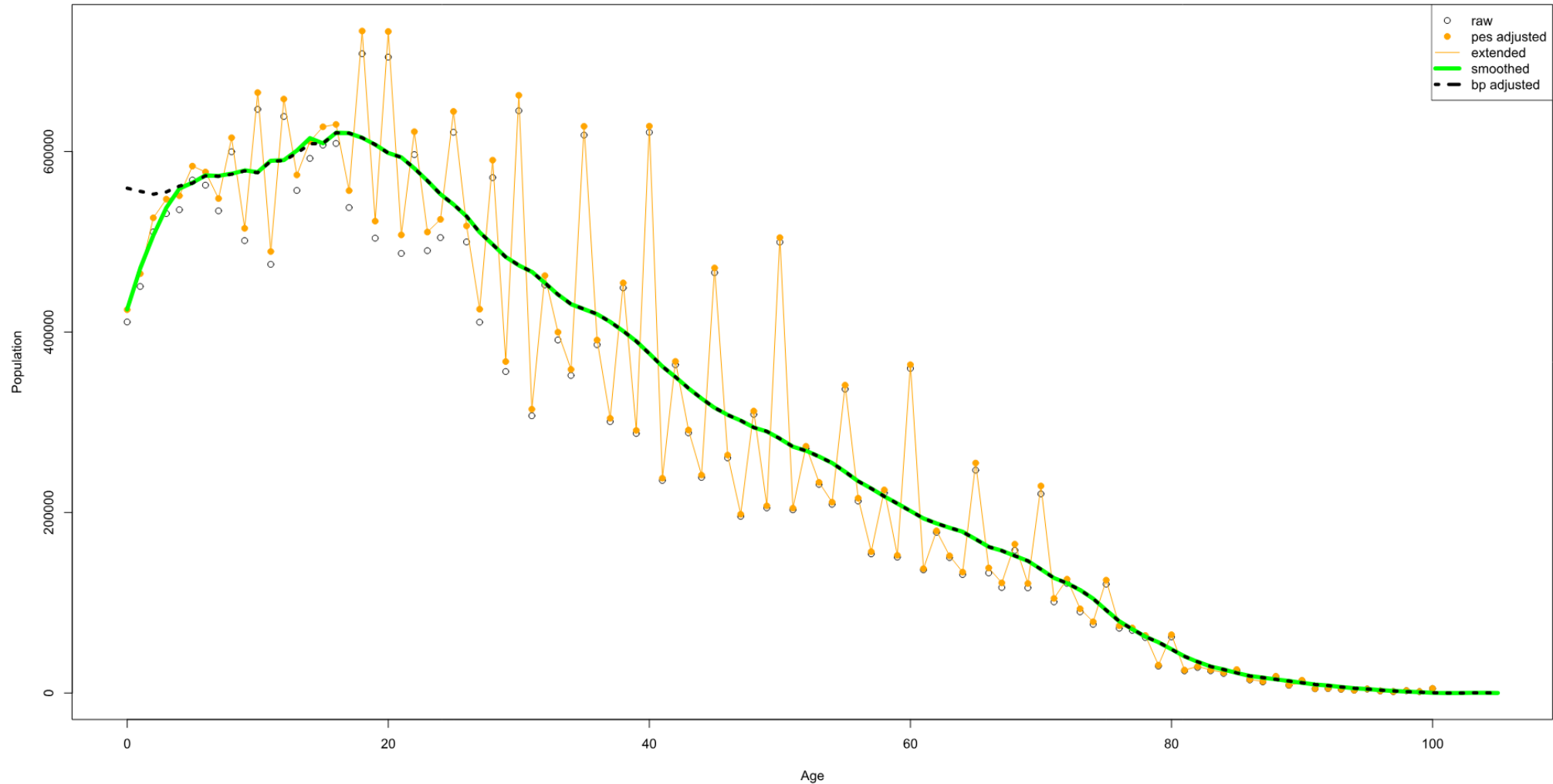


\* + additional territorial coverage adjustment as applicable for specific censuses

\*\* adaptative degree of smoothing based on digit preference and age heaping + graduation into single age as applicable

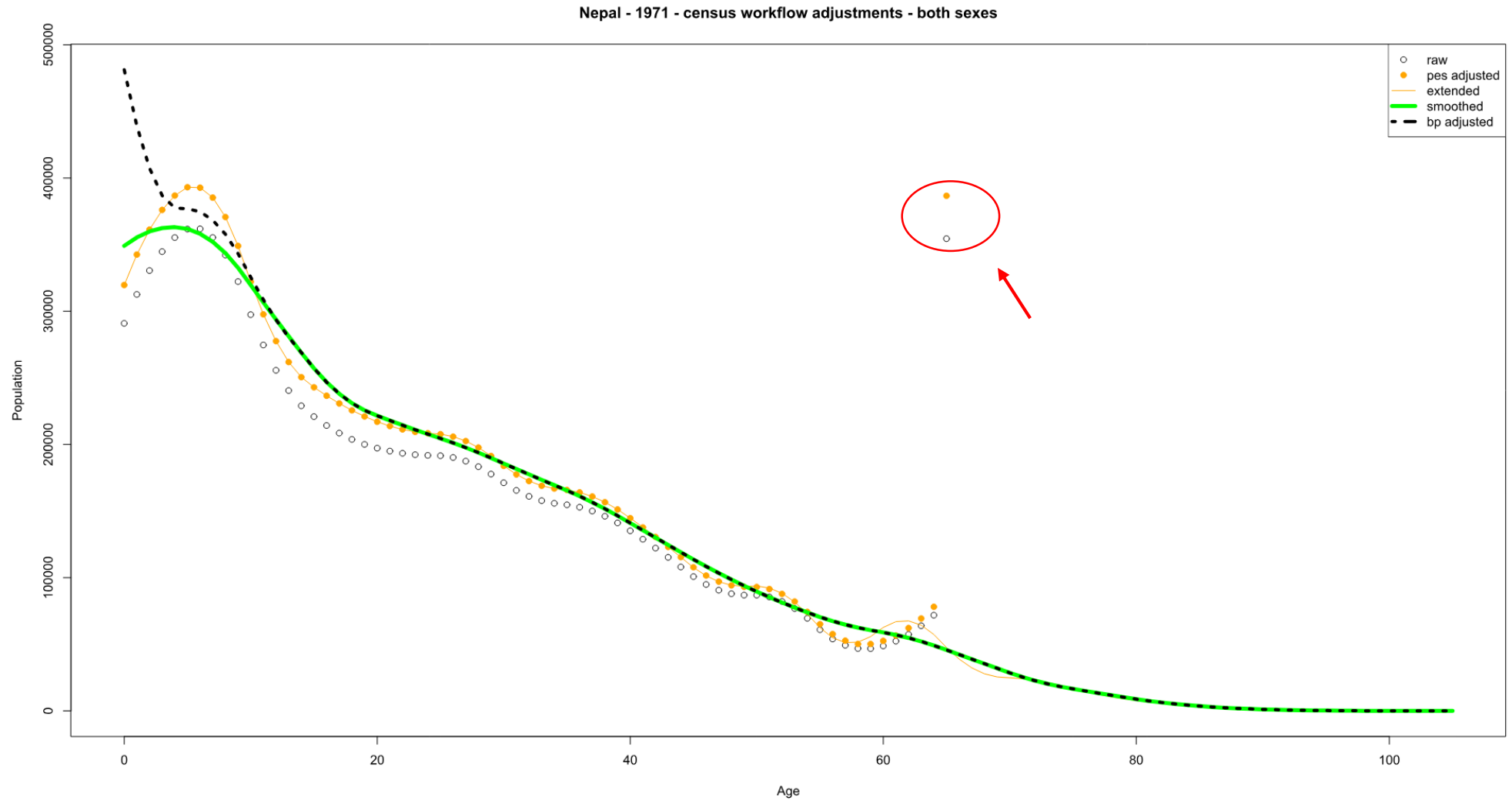
# Census population adjustment protocol applied

Nepal - 2021 - census workflow adjustments - both sexes



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# Census population adjustment protocol applied



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# WPP 2022

## On the road towards an enhanced, more transparent and reproducible WPP

- Details of the WPP census evaluation and adjustment protocol are available in this technical paper:

[https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa\\_pd\\_2022\\_tp-methodprotocol.pdf](https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd_2022_tp-methodprotocol.pdf)



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### Method protocol for the evaluation of census population data by age and sex\*

Peter Johnson\*\*, Thomas Spoorenberg\*\*\*, Sara Hertog\*\*\* and Patrick Gerland\*\*\*

#### Abstract

As part of its work in revising population estimates and projections for the biennial publication the *World Population Prospects* (WPP), the Population Division of the United Nations Department of Economic and Social Affairs (United Nations Population Division) reconstructs the population changes of all countries and areas of the world starting from 1950 up to today. To assess the consistency of the population reconstruction, reference data sources, such as an existing population census, are used as population benchmarks. For many countries, these population benchmarks are affected by several inconsistencies that need to be examined and possibly adjusted.

This technical paper details the procedures that the United Nations Population Division has developed to assess the quality of the population benchmarks and adjust, if needed, the population data by age and sex. The workflow presented here extends from preliminary steps, such as the definition of the population included in the

# WPP 2022

## On the road towards an enhanced, more transparent and reproducible WPP

- Historical censuses serve as **population benchmarks**.
- Allowing us to:
  - Check whether the population estimate produced in the cohort-component framework adequately reproduces the population size and age structure represented by historical censuses.
  - Estimate “**net residual migration**” as the residual population that needs to be added/subtracted to each group defined by sex and single year of age in order to reproduce census population size and age structure, given estimated fertility and mortality rates.

# WPP 2022

## On the road towards an enhanced, more transparent and reproducible WPP

- Newly developed R tools:
  - For performing demographic computations and analyses, including, for example, various methods for evaluating and adjusting data and for estimating life tables (**DemoTools**)
  - For dynamic interaction with the DemoData database (**DDSQLtools**)
  - For standardizing and harmonizing empirical counts of population, deaths, births (**ddharmony**)
  - For evaluating and adjusting population censuses (**censusAdjust**)
  - For the cohort-component projection engine and computation of WPP indicators (**ccmppWPP**)