

Gridding global male and female populations: New data from the Gridded Population of the World (GPW)

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November 10, 2015
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<http://sedac.ciesin.columbia.edu>

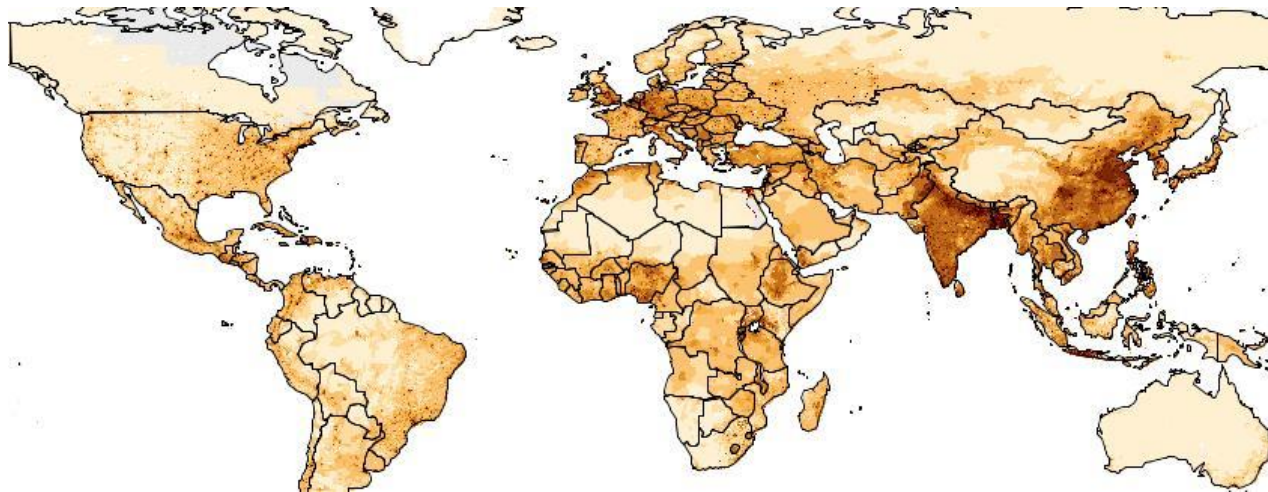


Overview

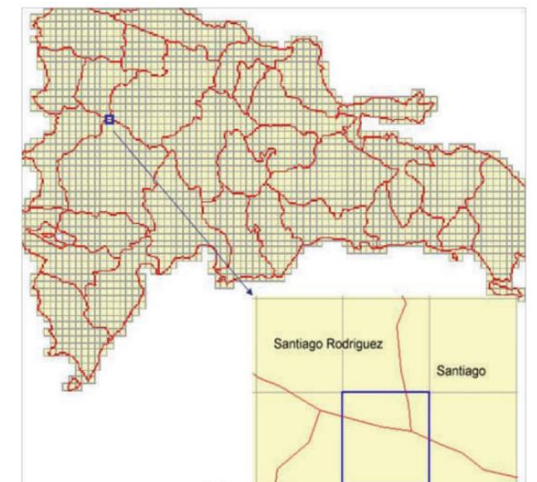
- What is GPW?
- Methods for creating GPWv4 grids of population by sex
- Challenges in acquiring and integrating data
- Early look at grids of males and females

Gridded Population of the World (GPW)

- Raster data product developed to provide a **spatially-disaggregated population surface** that is compatible with data sets from social, economic, and Earth science fields.
- Census population data are transformed from their native spatial units to a global grid of quadrilateral latitude-longitude cells (Balk et al. 2010)
- Free and openly available

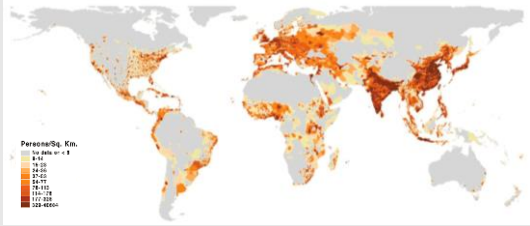
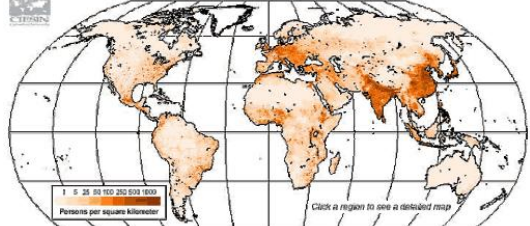
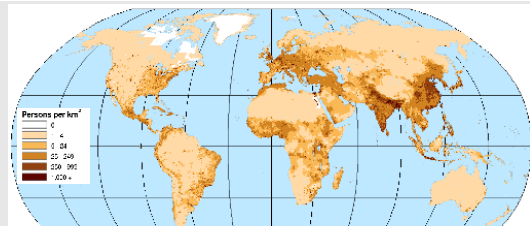
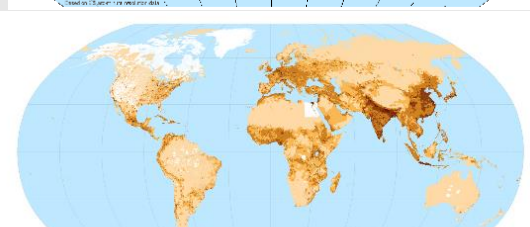


GPW version 3, 2000 population density




Transforming census units to a grid

Development of GPW

	Publication Year	Years of Estimation	Grid Resolution	Number of Input Units	Census variables	Population Density Grid
GPWv1	1995	1994	5 arc-minute (~10 km)	19,000	Total Population	 <p>1994</p>
GPWv2	2000	1990, 1995	2.5 arc-minute (~5 km)	127,000	Total Population	 <p>1995</p>
GPWv3	2005	1990, 1995, 2000	2.5 arc-minute (~5 km)	~ 400,000	Total Population	 <p>2000</p>
GPWv4	2015	2000, 2005, 2010, 2015, 2020	30 arc-second (~1 km)	~ 12,500,000	Total Population, Sex, Age, Urban/Rural status	 <p>2010</p>

GPW Applications

- Broad use in research, policy making, communications, and human and environmental problem-solving
- Often combined with satellite remote sensing or other biophysical data
- Demand from research community to include demographic information in global population grids




Contents lists available at [ScienceDirect](#)

Health & Place

ELSEVIER journal homepage: www.elsevier.com/locate/healthplace

Spatial and social factors drive anemia in Congolese women

Jane P. Messina ^{a,*}, Kashamuka Mwandagirwa ^b, Steve M. Taylor ^{c,d}, Michael Emch ^{e,f}, Steven R. Meshnick ^c

 CrossMark



Journal of Biogeography (J. Biogeogr.) (2009) **36**, 2264–2278

ORIGINAL ARTICLE

Establishment success of invasive ring-necked and monk parakeets in Europe

Diederik Strubbe* and Erik Matthysen



Environmental Toxicology and Chemistry

Hazard/Risk Assessment

Worldwide estimation of river concentrations of any chemical originating from sewage-treatment plants using dilution factors

Virginie D.J. Keller¹, Richard J. Williams¹, Caryn Lofthouse² and Andrew C. Johnson

Issue

 OPEN

700+ GPWv3 citations to date

GPW Applications

*“In order to monitor the implementation of the SDGs, it will be important to improve the availability of and access to data and statistics disaggregated by income, **gender**, **age**, **race**, **ethnicity**, **migratory status**, **disability**, **geographic location** and **other characteristics relevant in national contexts.**”*

-SDG Open Working Group report

Sustainable Development Goals



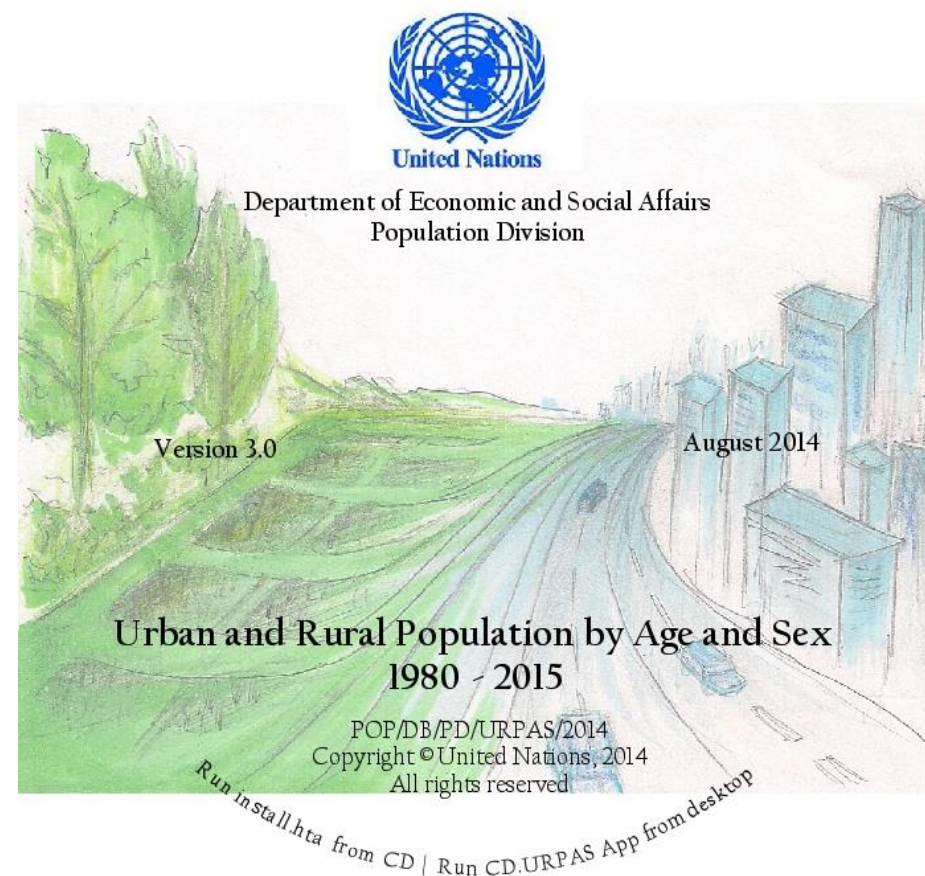
GPWv4: Global population gridded by sex, age, and urban/rural designation

GPWv4 Methods: Population grids by sex

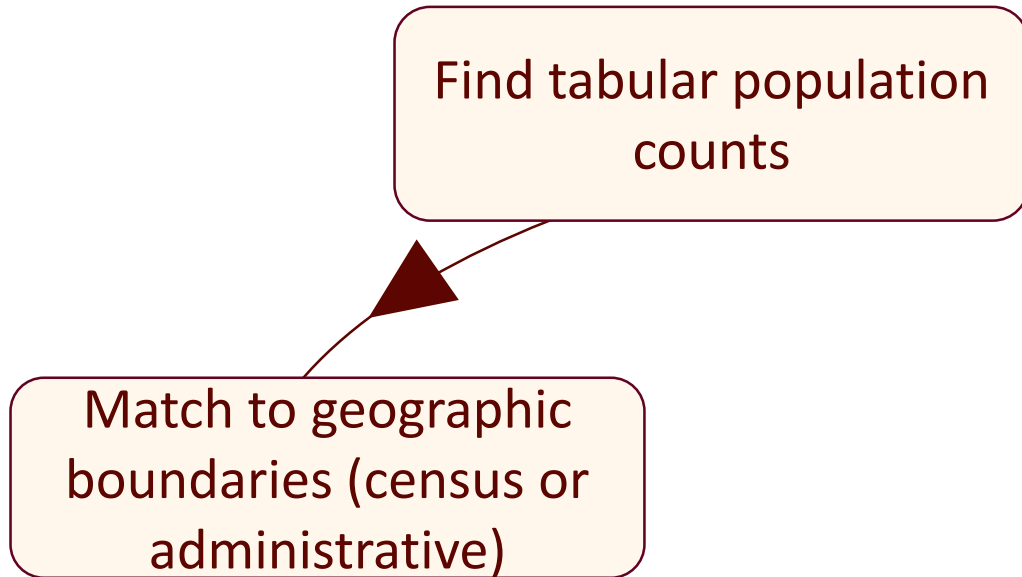
Find tabular population counts

Hierarchy of Population Data

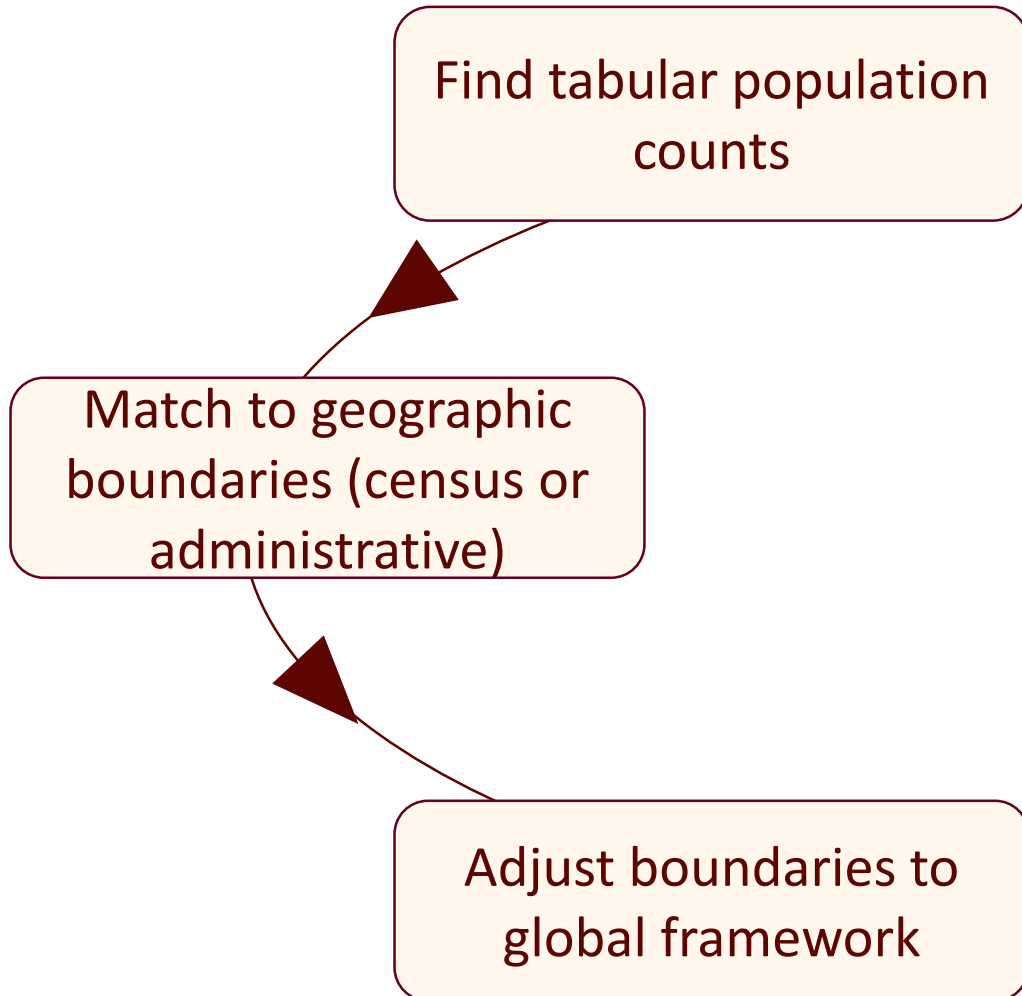
1. Census or Population Register data
2. Official total population estimates from NSO
3. National-level estimates by sex for 2010 from UN URPAS



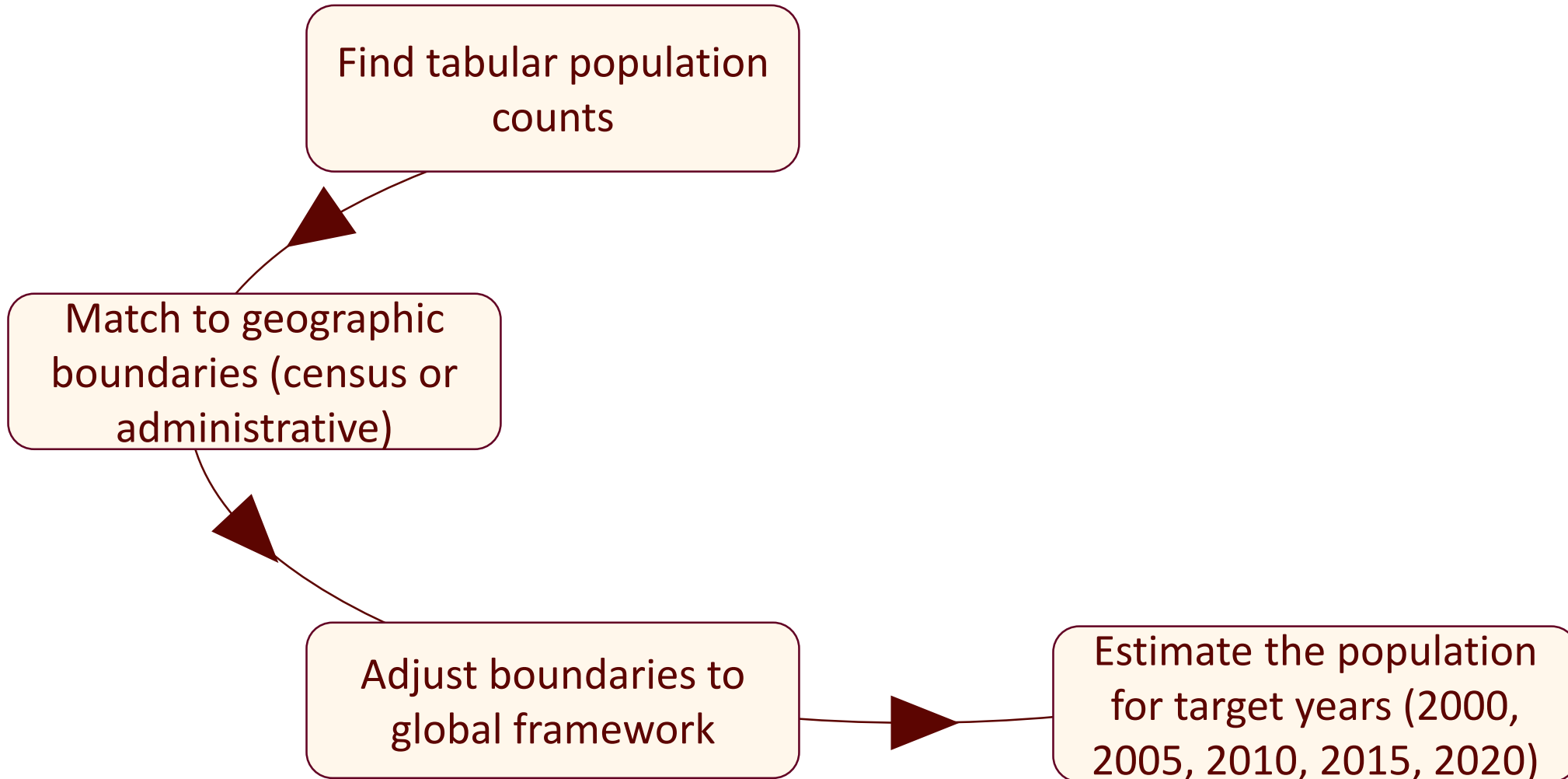
GPWv4 Methods: Population grids by sex



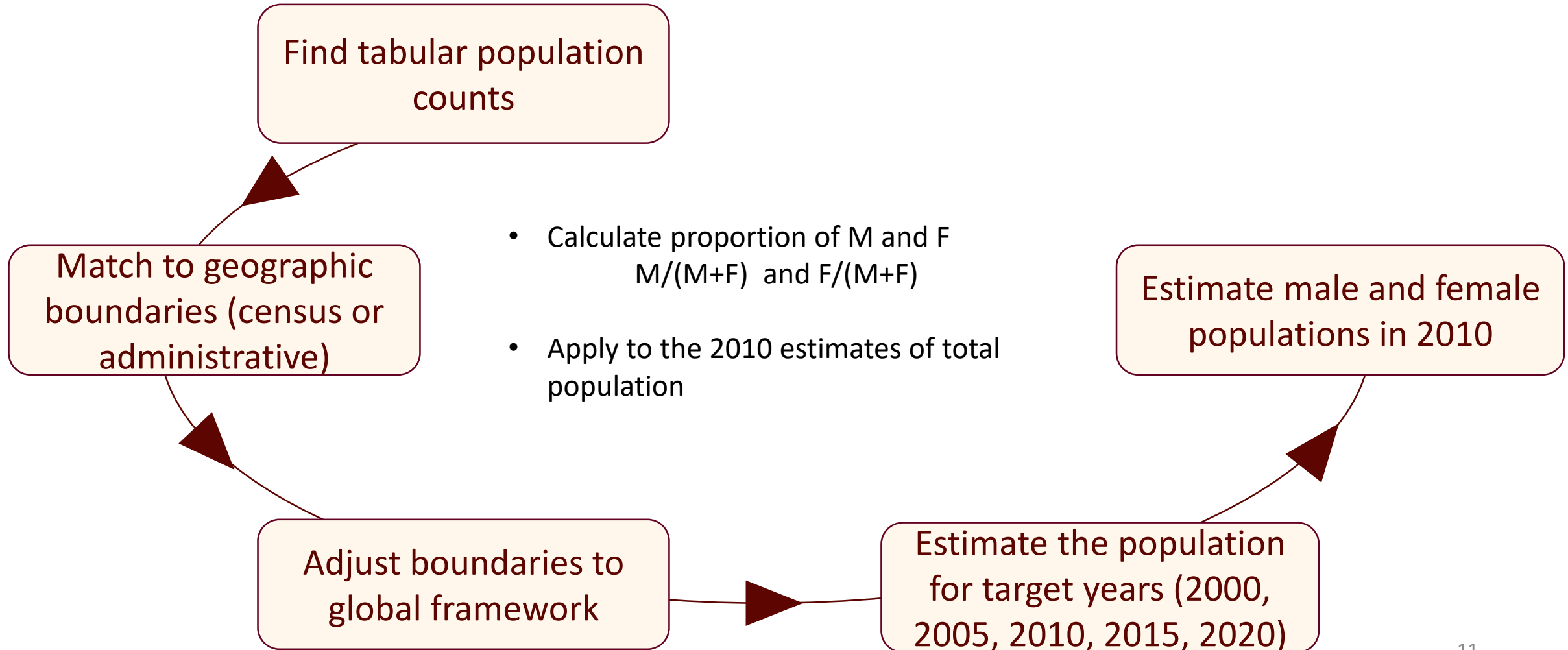
GPWv4 Methods: Population grids by sex



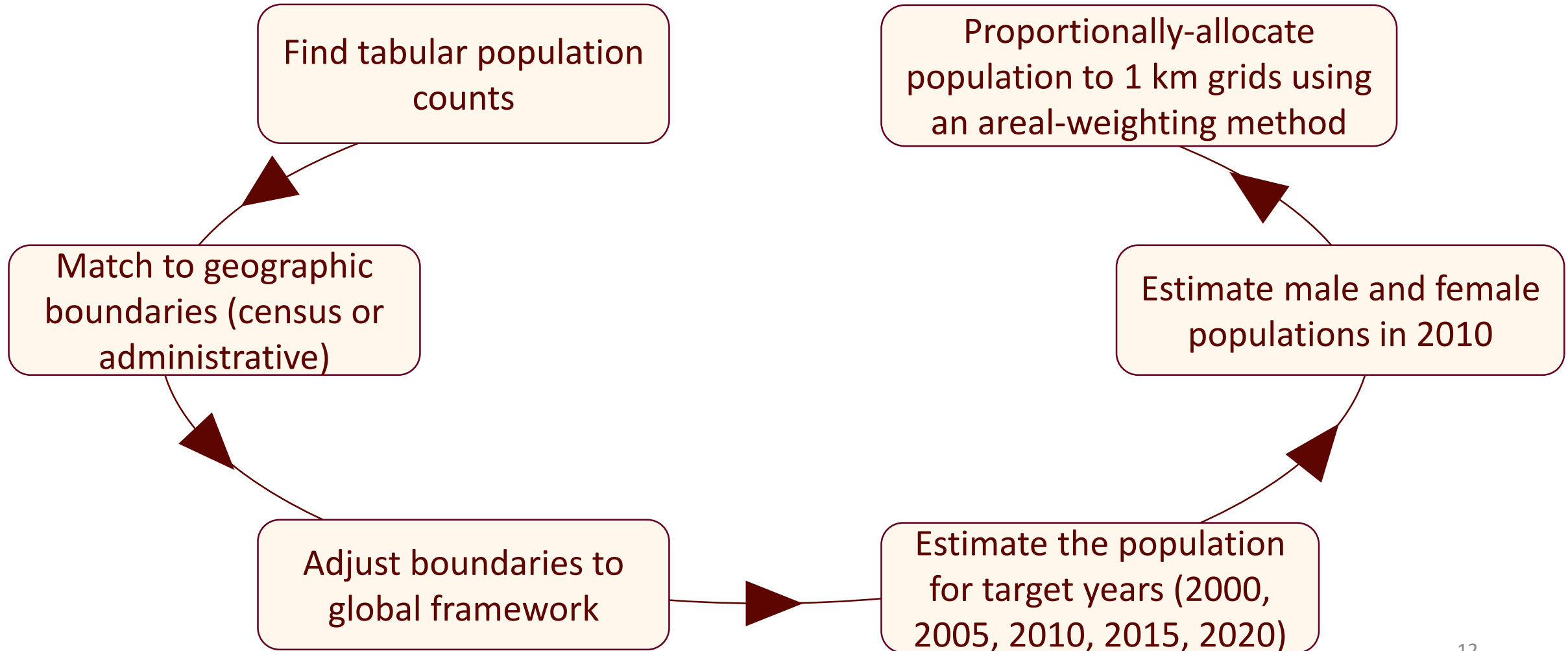
GPWv4 Methods: Population grids by sex



GPWv4 Methods: Population grids by sex



GPWv4 Methods: Population grids by sex



Challenges: Availability of Sex Data

Population by sex not as readily available as total population

Solution 1

Use coarser resolution data for sex (16 countries)

- Canada: too much data suppression at L5; used L3 for more complete coverage
- Colombia: 2005 census was adjusted following its release; however adjusted sex data was not available to the same level as total pop

Solution 2

Use national-level estimates for 2010 from UN URPAS (19 countries)

- No recent census: e.g. Lebanon, Iraq, Somalia, Uzbekistan
- Challenges in finding tabular data: e.g. Morocco

Calculate proportions of males and females at coarse level, apply to higher resolution 2010 total population estimate

Challenges: Privacy constraints

Random rounding

Privacy
Constraints

Suppression of
characteristic data
for units with high
non-response rates

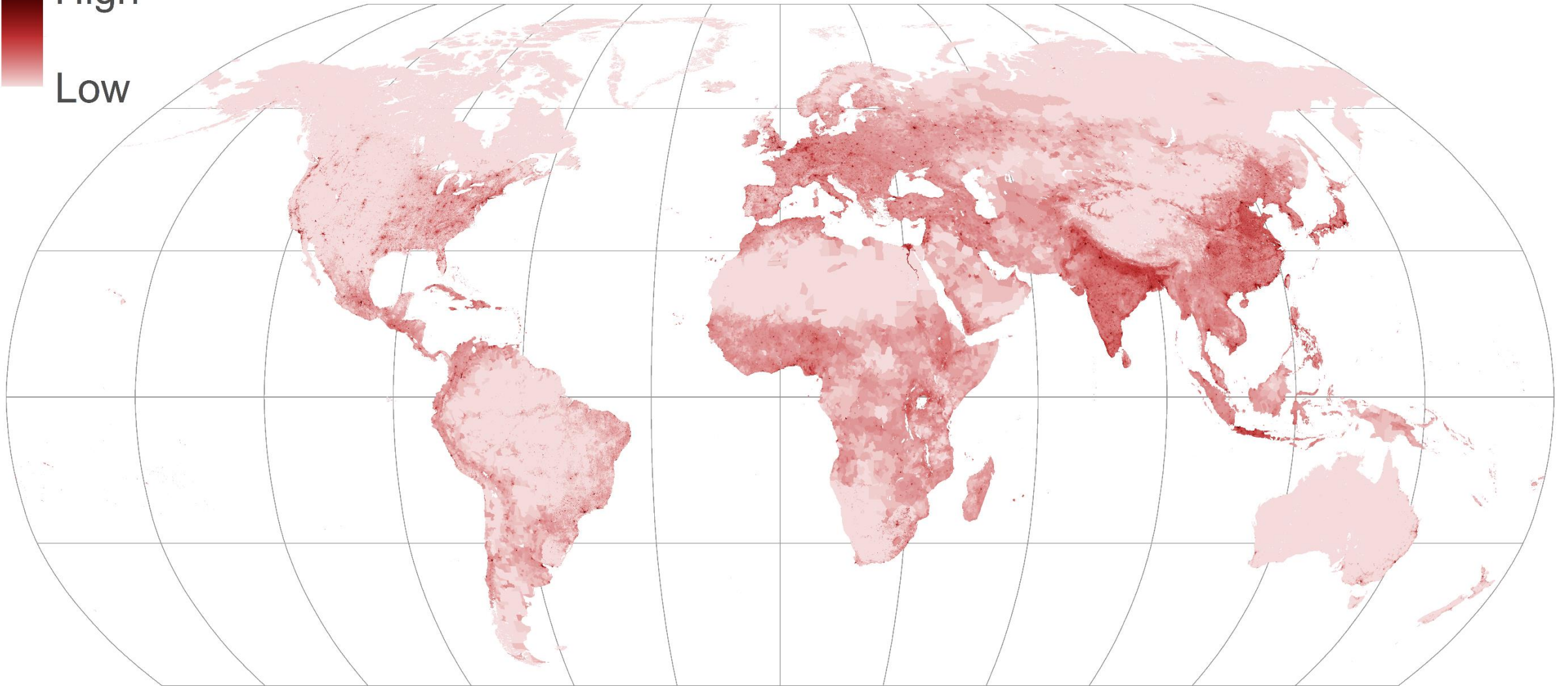
Suppression of
characteristic data
for units with counts
below a threshold

Implications:

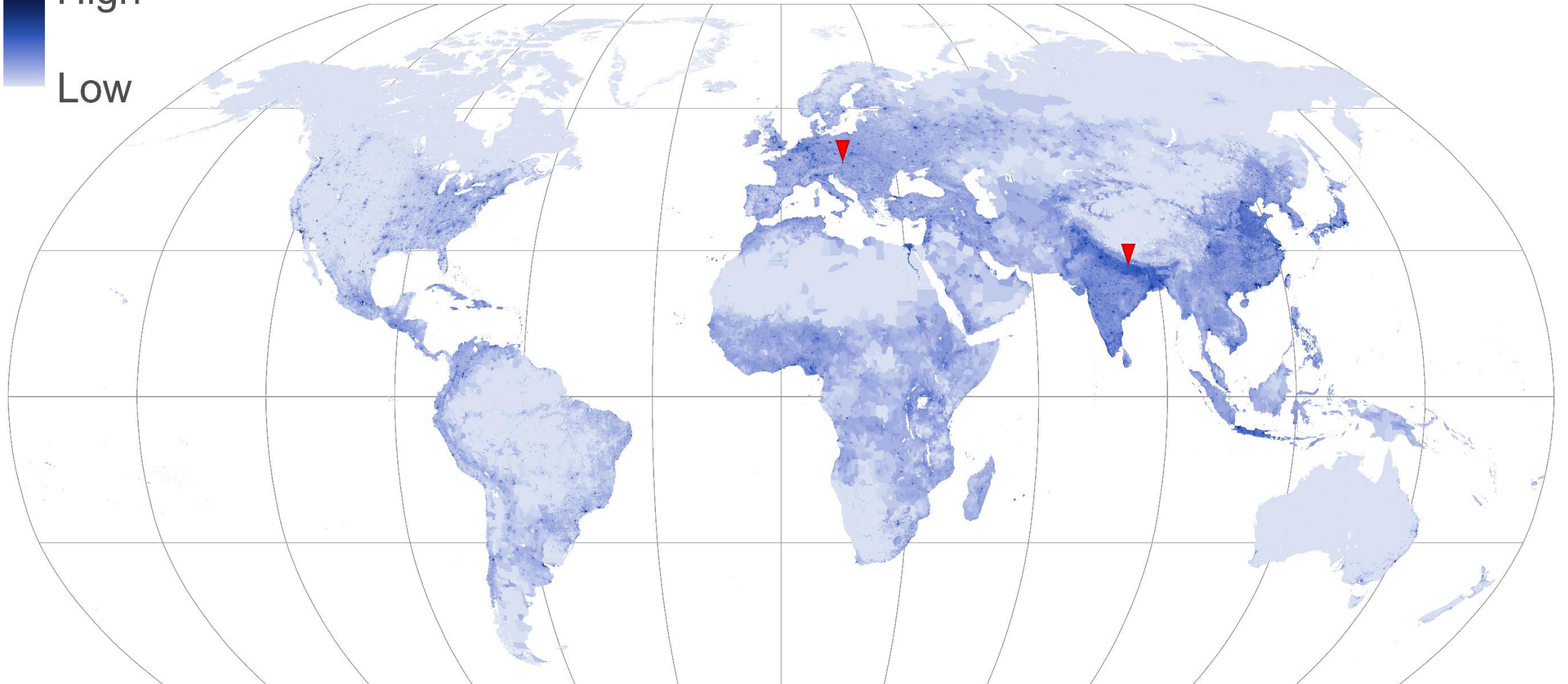
- Choose sex data from a coarser resolution
- Male grid + Female grid \neq Total grid
- Grids may have No Data for a number of units

Females per km²

High
Low

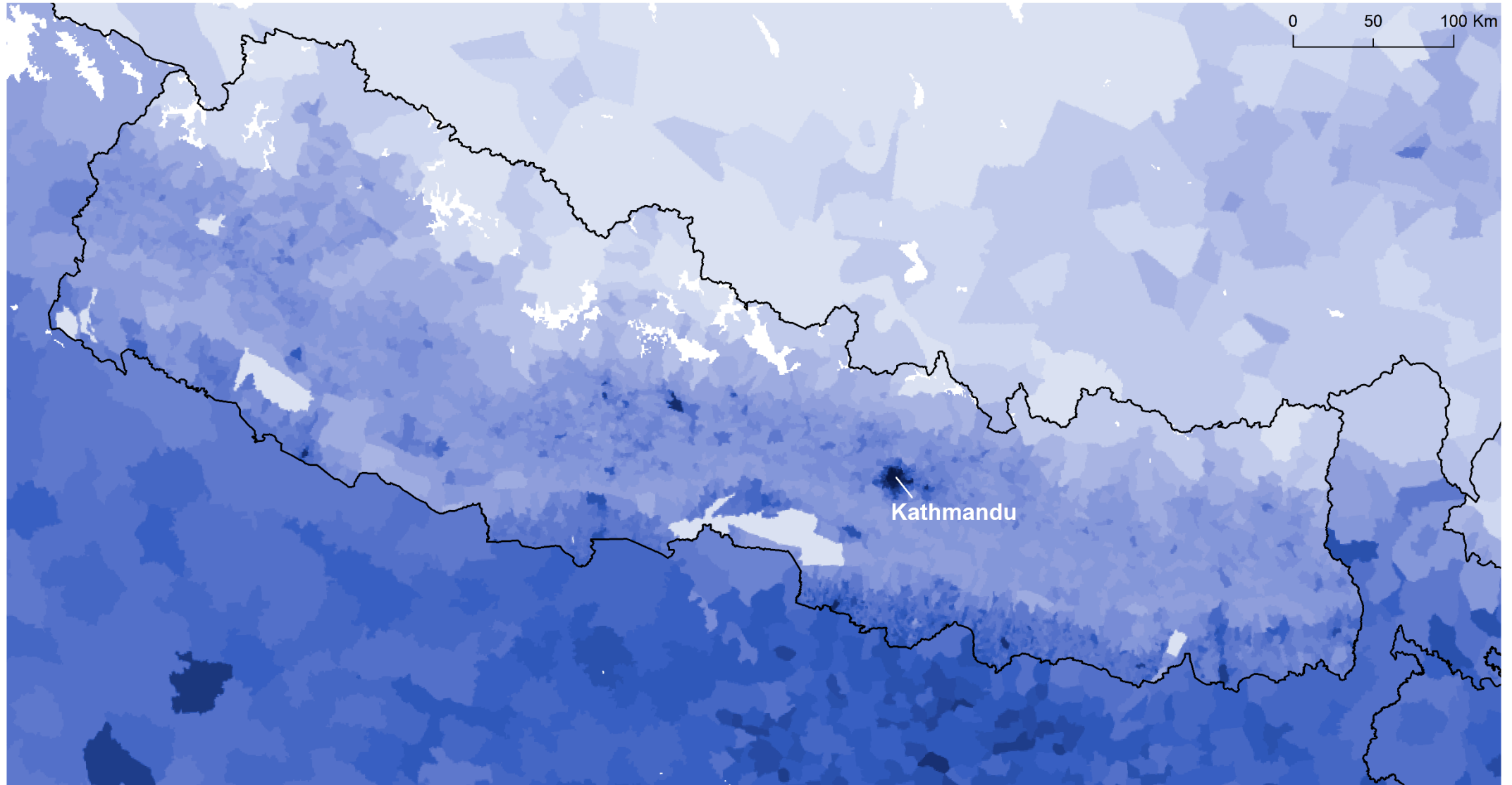
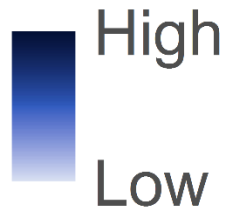


Males per km²



Males per km²

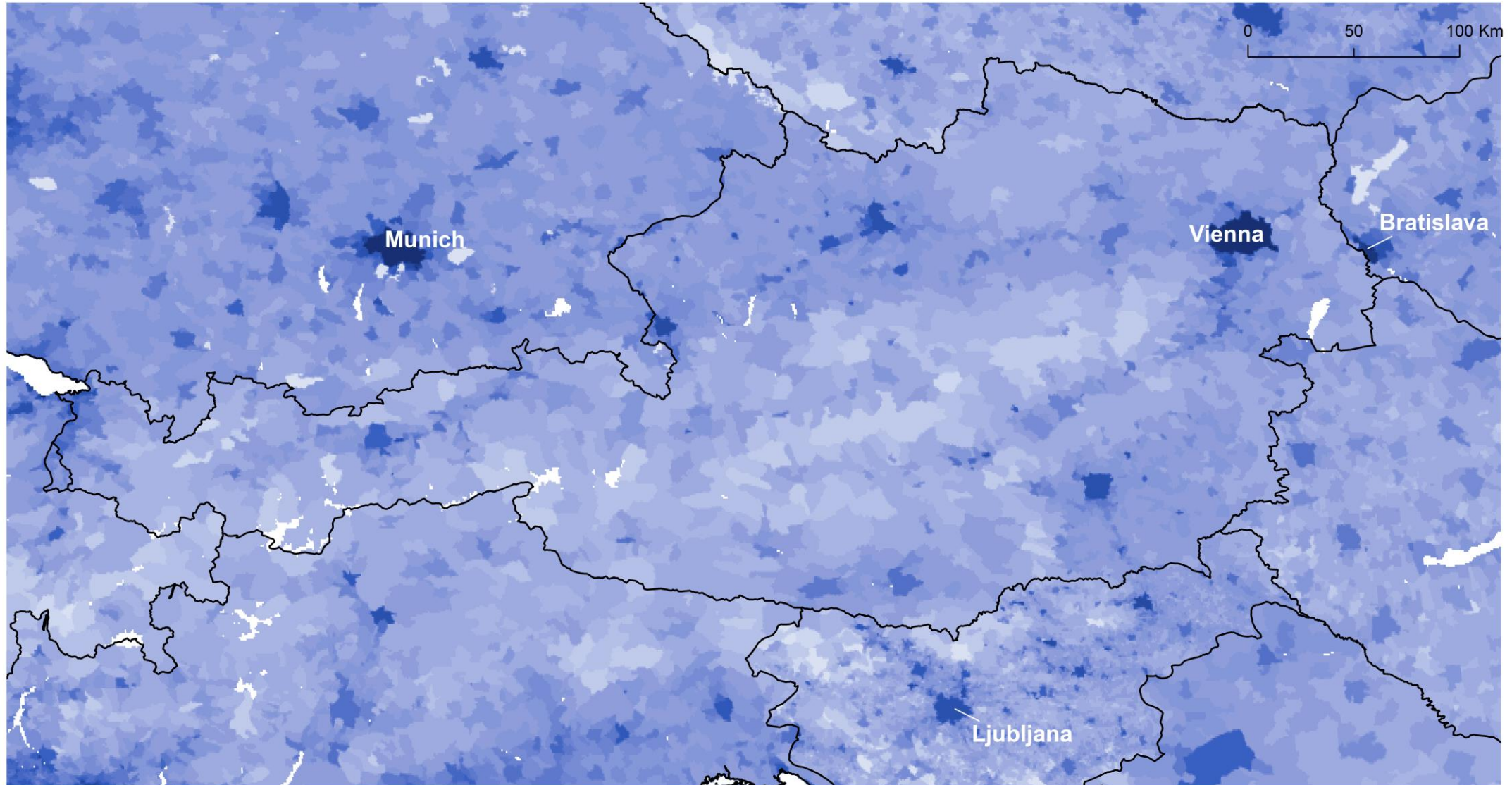
Nepal



Males per km²

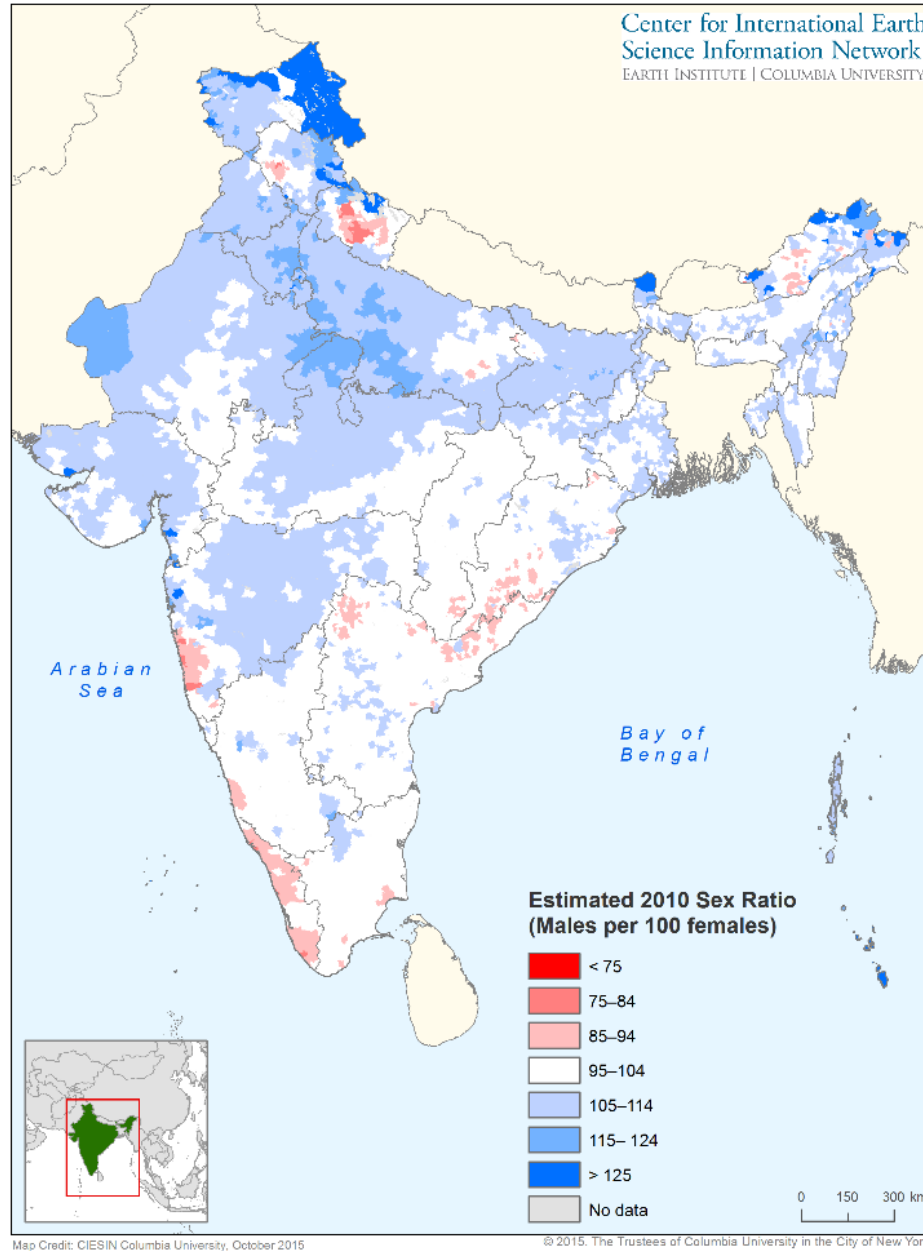


Austria

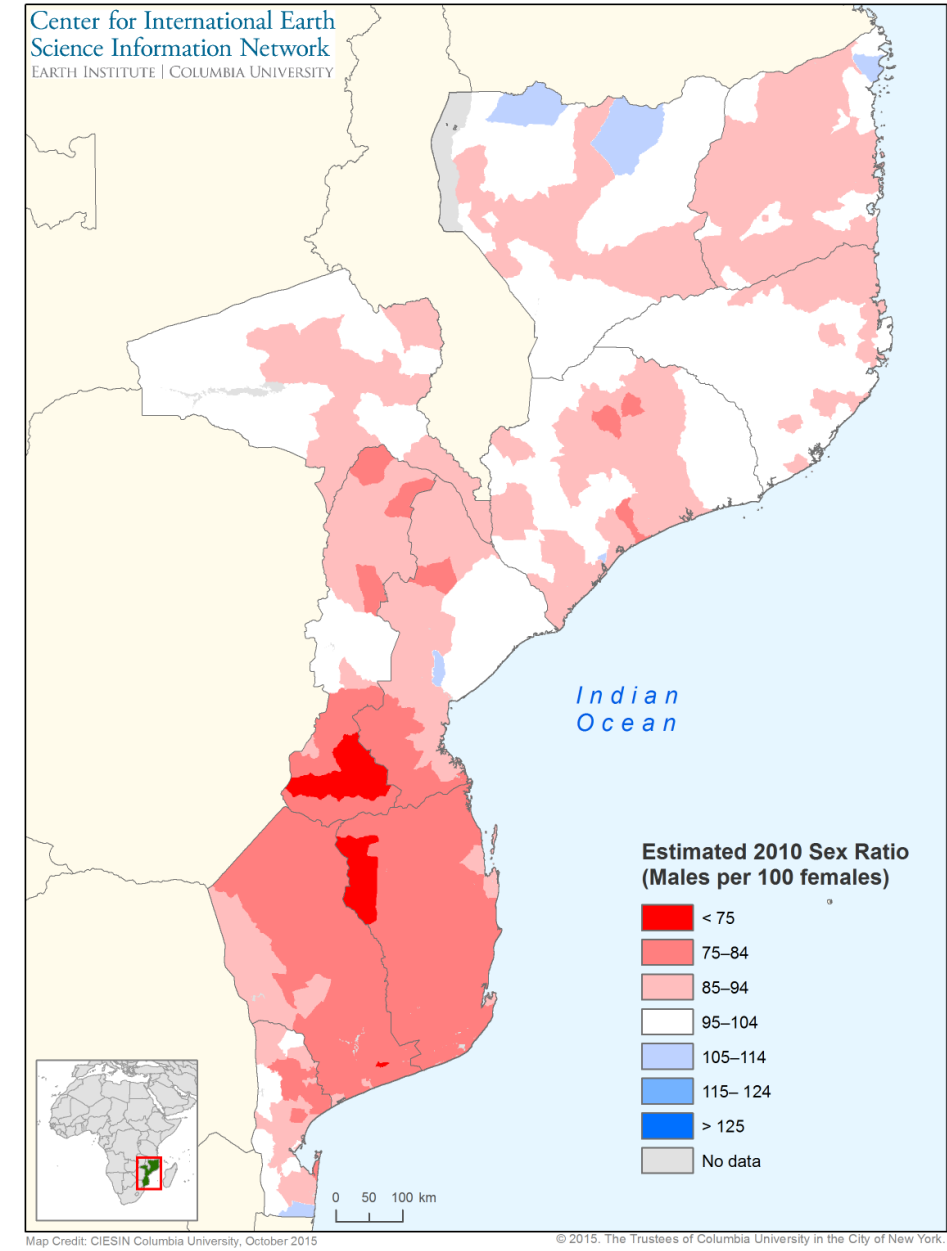


Preliminary Sex Ratio Grids

India



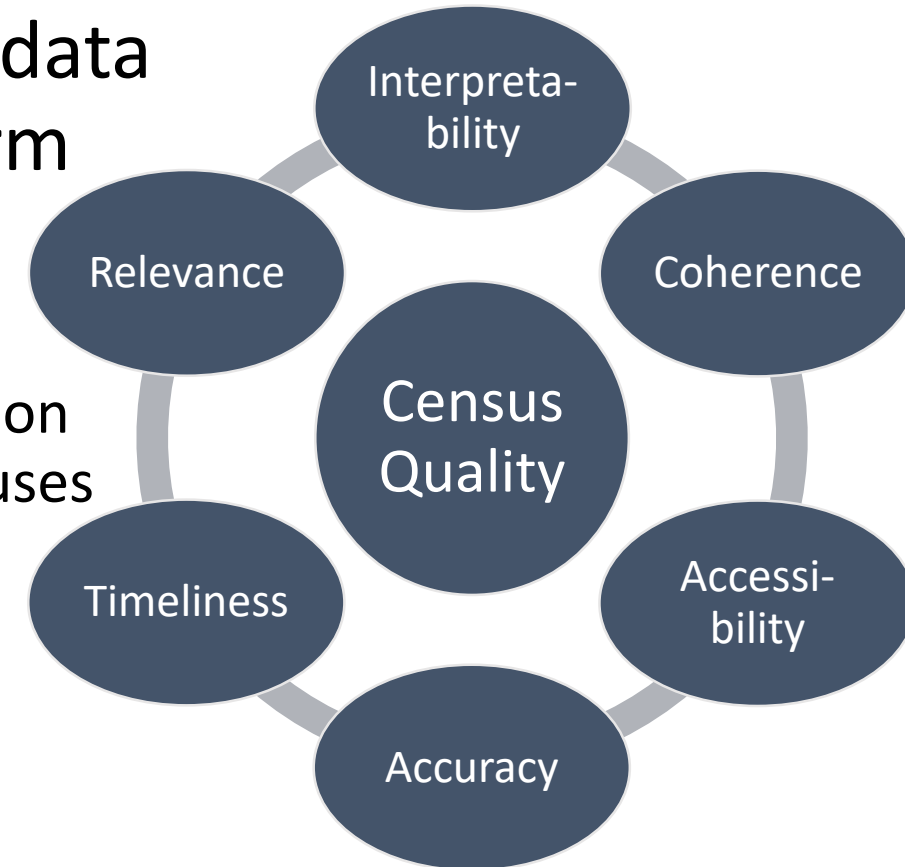
Mozambique



Evaluation of Census Data Quality

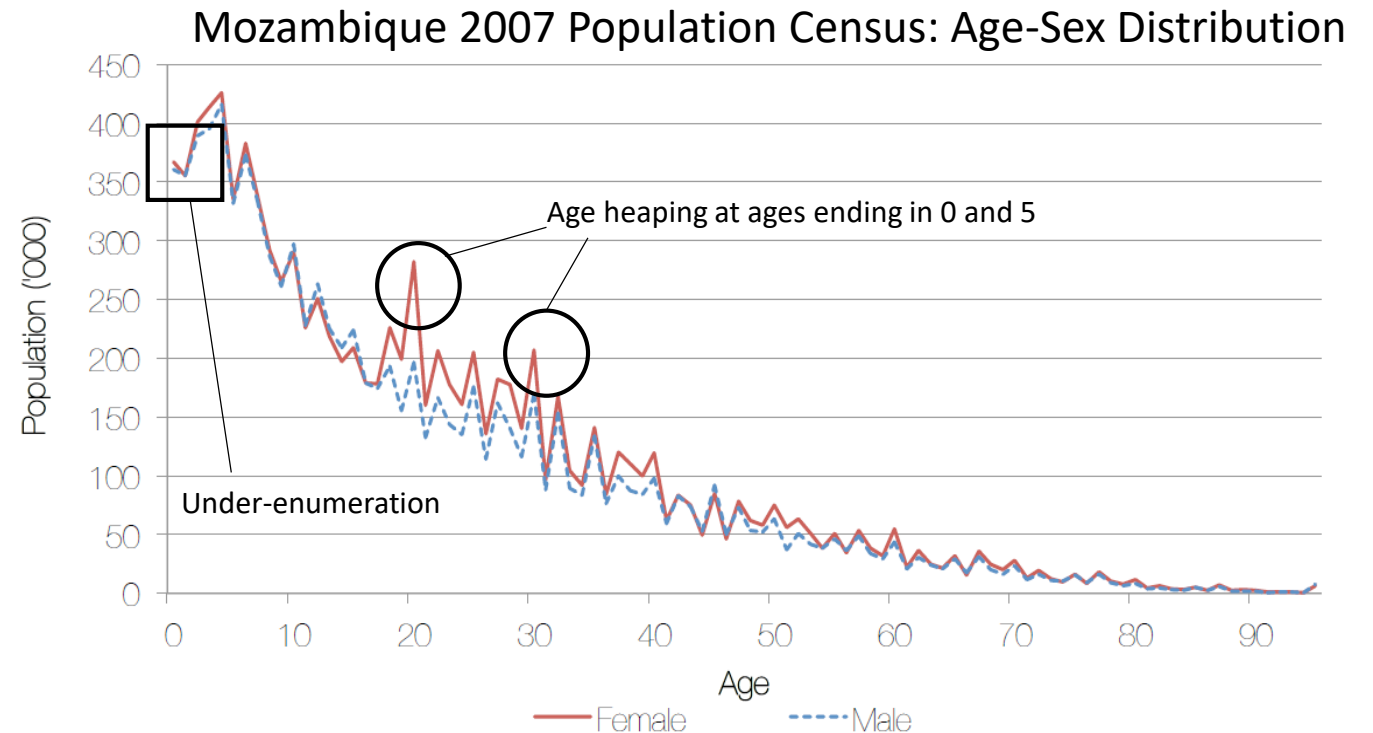
GPWv4 will include national-level metadata and other qualitative indicators to inform users of:

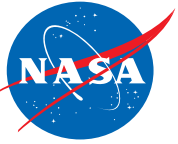
1. The currency of the population data
2. Whether the data is from estimates, population registers, preliminary censuses, or final censuses
3. Coverage errors evaluated in post-enumeration surveys
4. Evaluation of age-sex distribution



Evaluation of Census Data Quality: Age-Sex Distribution

- Provide classic numeric indices of age-sex quality
 - Whipple's index
 - Myer's Blended Method
 - UN Age-sex accuracy index
- Provide graphs
- Provide text describing results





Overall, GPW is a census-based global population grid that is:

- Free and open source
- Well-documented and transparent
- Highly used
- Widely applicable
- Expanding to include global grids of sex, age, and urban/rural designation

Email gpw@ciesin.columbia.edu to request:

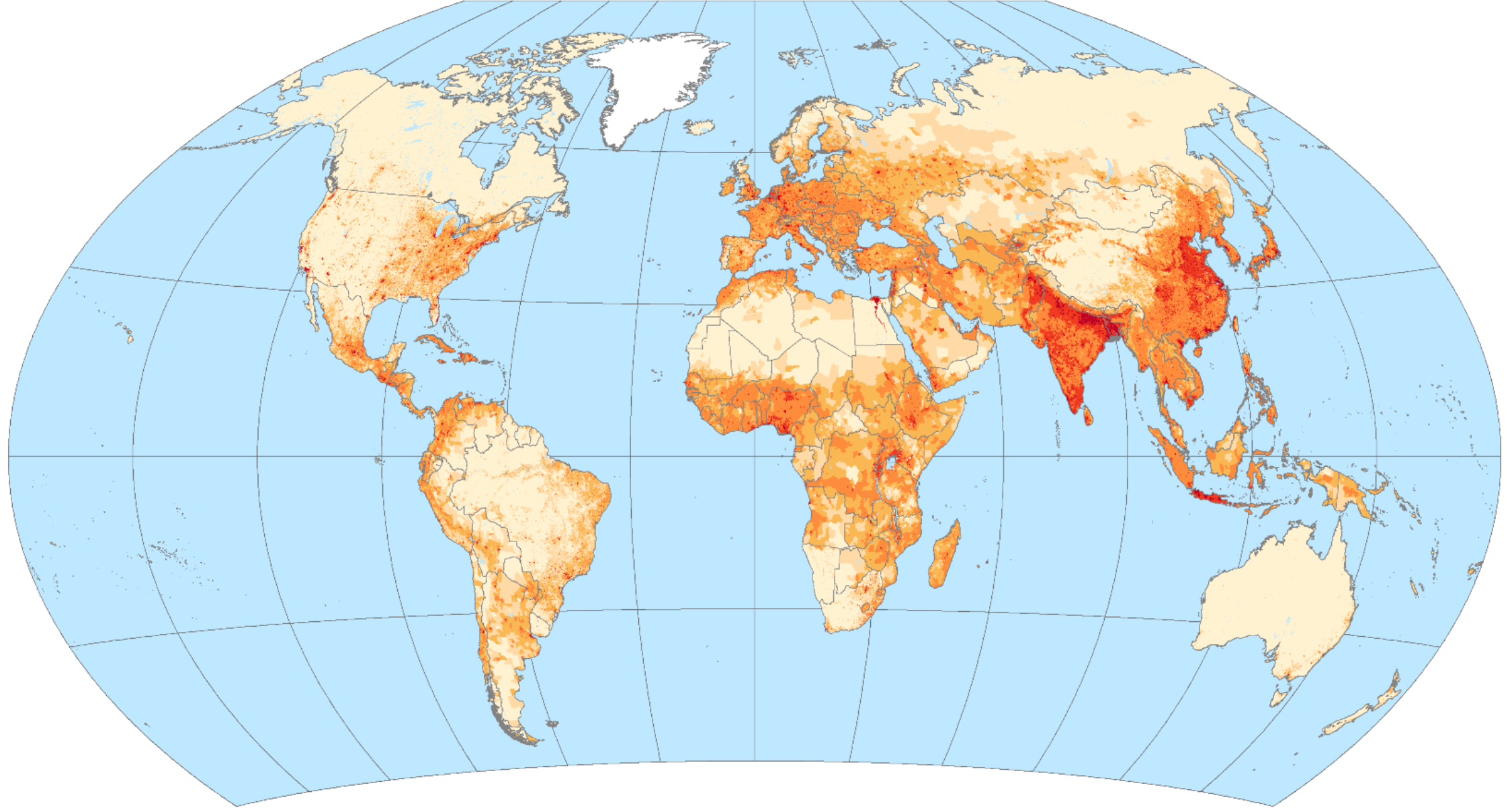
- Grids of total population (for beta testing)
- Grids of population by sex (preliminary data)







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Estimated 2015 Population Density

Center for International Earth
Science Information Network
EARTH INSTITUTE | COLUMBIA UNIVERSITY



Persons per km²  <1  1-4  5-24  25-249  250-1,000  1,000+

Data Context

