WorldPop Global2 population of children under 1 year old combined with WorldPop bespoke population of children under 1 year old mosaics at 1km scale (2015-2023). R2025 V1

6 May 2025

Update 19 May 2025: WorldPop are aware of some inconsistencies with their 2015-2030 data for some countries (e.g. BIH, CZE, EGY, TCD, PAK, NPL, CYP, PER) and are working to resolve these.

Description

This data release includes mosaics of WorldPop Global2 gridded population estimates of children under 1 year of age for the years between 2015-2023 and the bespoke population estimates of children under one produced by WorldPop for 11 countries (Ghana, Kenya, Mozambique, Niger, Sierra Leone, South Sudan, Uganda, Zambia, Guinea, Cameroon, and Nigeria).

Release Content

- 9 mosaics of unconstrained Global2 1km population of children under 1 year old and selected WorldPop bespoke population of children under 1 left unadjusted to UN population estimates: *G2wbespoke_[year]_0to1_1km_unconstrained_noadj_R2025_v1.tif*
- 9 mosaics of unconstrained Global2 1km population of children under 1 year old and selected WorldPop bespoke population of children under 1 adjusted to UN population estimates: *G2wbespoke_[year]_0to1_1km_unconstrained_adj_R2025_v1.tif*
- 9 mosaics of constrained Global2 1km population of children under 1 year old and selected WorldPop bespoke population of children under 1 left unadjusted to UN population estimates: *G2wbespoke_[year]_0to1_1km_constrained_noad_R2025_v1j.tif*
- 9 mosaics of constrained Global2 1km population of children under 1 year old and selected WorldPop bespoke population of children under adjusted to UN population estimates: *G2wbespoke_[year]_0to1_1km_constrained_adj_R2025_v1.tif*

Method:

These datasets were made by mosaicking WorldPop Global2 and WorldPop bespoke age/sex disaggregated datasets together to facilitate granular analysis at a global scale. Bespoke adm0

boundaries (at a scale of 100m square grid cells) for 11 countries (Ghana[1], Kenya[2], Mozambique[3], Niger[4], Sierra Leone[5], South Sudan[6], Uganda[7], Zambia[8], Guinea[9], Cameroon[10], Nigeria[11]) were aligned with the WorldPop Global2 100m adm0 boundaries[12] and then clipped to the WorldPop Global2 1km adm0 boundaries[13]. Areas where bespoke data extended beyond the WorldPop Global2 1km boundaries were polygonised for quality control purposes to identify any densely populated areas that were cut from the bespoke datasets—this was the case in three countries: Cameroon, Niger, and Nigeria.

Two of the bespoke datasets (Nigeria and Cameroon) did not have mastergrid boundaries that could be used to define the adm0 border for the dataset. This needed to be created. This was done by placing a point at the centroid of each populated pixel of the original bespoke dataset. A buffer was generated around each of these points and the boundaries between these buffers were dissolved. The size of the buffer can vary but should be of a size that simultaneously removes most holes within the interior of the country but also does not overgeneralise the shape of the outer boundary. Remaining holes in the country polygon were removed so that the interior of the country did not contain holes. Finally, the outer edges of the edited country extent were clipped using a negative buffer just less than the outer buffer to create an outline of the bespoke country data that include all cells with population data.

Buffers used for countries that underwent this process:

- Nigeria
  - Outer buffer = .2 degrees
  - Inner buffer = -.19 degrees
- Cameroon
  - Outer buffer = .2 degrees
  - Inner buffer = -.19 degrees

Areas where the bespoke data did not extend to the edges of the WorldPop Global2 adm0 boundaries were polygonised. These polygons were then used to mosaic the population of children under the age of one. In the mosaic, priority was given to the bespoke population data. Areas where the bespoke data did not reach the WorldPop adm0 boundary (usually along the borders of the countries), were filled first with population data from neighbouring bespoke datasets, and then, where gaps still existed, WorldPop Global2 population data[14]. See Figures 1-3 below which visualise this process.

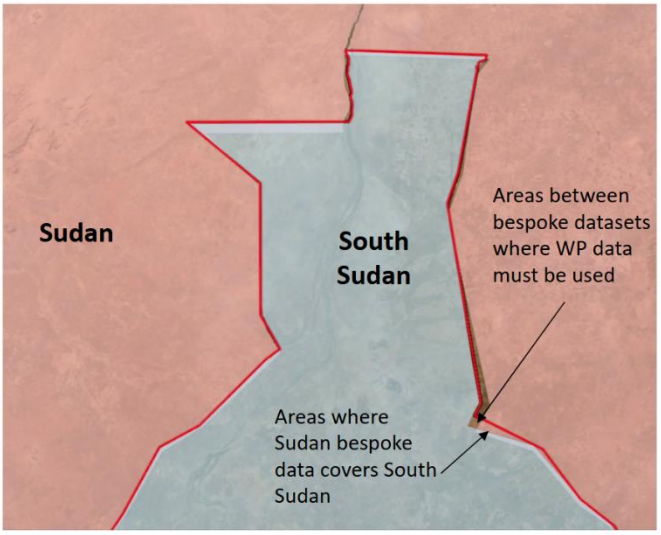

Figure 1: Example of overlapping bespoke boundaries with South Sudan data in blue and Sudan data in pink. The WorldPop Global2 adm0 boundary is in red.

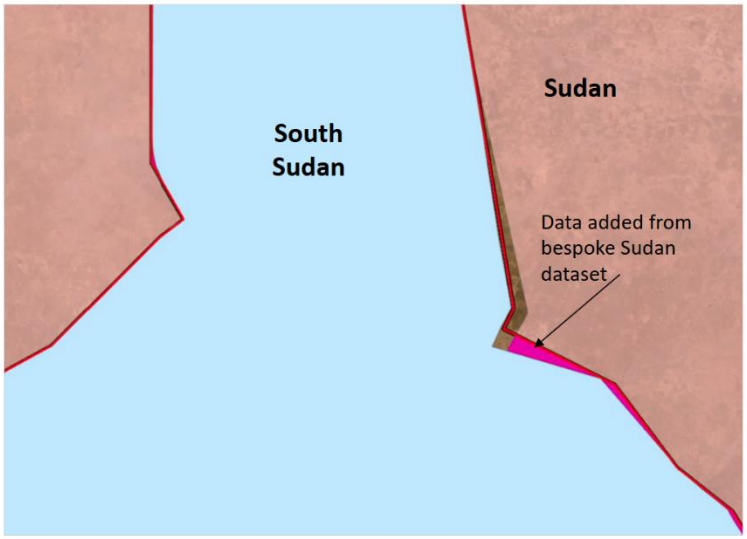

Figure 2: Example of where bespoke Sudan data (bright pink) is mosaicked onto South Sudan bespoke data (blue) to extend population data to the WorldPop Global2 adm0 boundary (red)

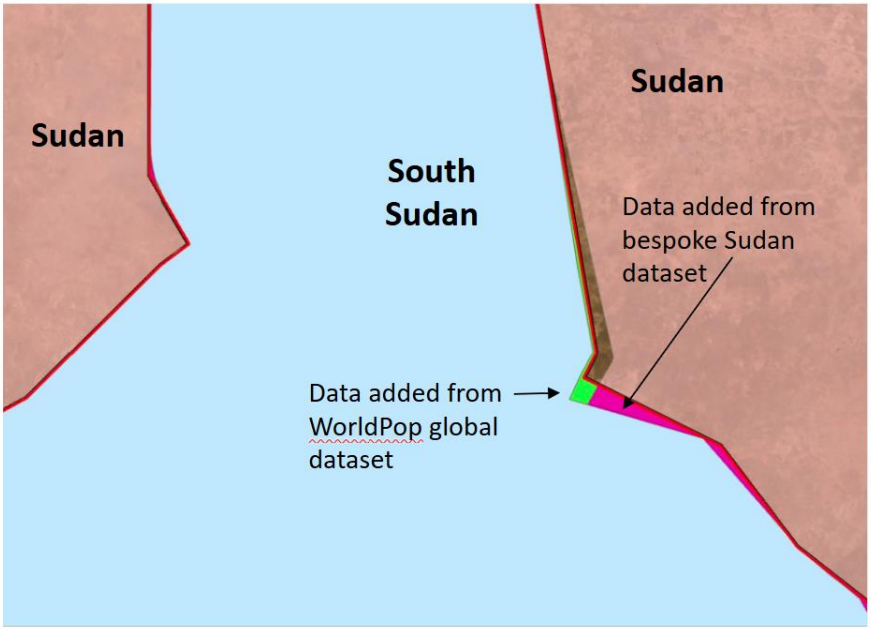

Figure 3: Example of where bespoke WorldPop Global2 adm0 100m data (bright green) fills any remaining gaps in South Sudan to extend population data to the WorldPop Global2 adm0 boundary (red).

Two outputs were generated. The first was a single raster with unadjusted population data extending to the WorldPop Global 2 1km adm0 boundaries. The second output adjusts the population values to the UN estimates for that country. For the countries that did not have densely populated areas clipped from their boundaries, the adjustment was done by summing the total population of the new mosaicked bespoke raster and then dividing the value of each cell by this number. This generates a new raster where value of each cell is the proportion of the national population that cell contains. These values were multiplied by the UN adjusted national population value[15*] to distribute adjusted population values across the country.

[*] Worldpop Global 2 population estimates are constrained at the national level to the January 1st estimates of the 2024 iteration of the UN World Population Prospects. The January 1st reference date is used because it allows the demographic accounting identity to be respected when combined with birth, death and migration data measured by calendar year. The demographic accounting identity states that

For the three countries where densely populated areas were clipped away along the national boundaries—all clipped cells were assigned to the nearest adm2 unit[16]. The population of each adm2 unit, including the newly assigned clipped cells, was calculated from the bespoke dataset. The value of each cell was then divided by the total population of its assigned adm2 unit so that the value of each cell was the proportion of population within each adm2 unit. Next, we calculated the proportion of the national population each adm2 unit should contain by dividing the total population of each adm2 unit by the total population of the bespoke dataset. This was then multiplied by the national UN adjusted population value (2023) to calculate the population of each adm2 unit according to UN adjusted values. Adjusted values were then distributed to each cell by adm2 unit by multiplying the proportional cell value by the total adjusted population of each adm2 unit.

The bespoke datasets were then mosaicked into the WorldPop Global 2 global mosaics of children under 1 year old, both constrained and unconstrained[17]. Outputs labelled as 'noadj' in their filenames indicate unadjusted bespoke population values were used in the mosaic, while those labelled as 'adj' in their filenames indicate adjusted bespoke values were used in the mosaic.

Additionally, there is a known error in the Global 2 population of northeast Pakistan where population in disputed areas with India was not modelled. To correct this error, the population proportion of each cell in the constrained and unconstrained Global1 data of children under 1 year old at 1km for Pakistan[18] was found. This proportional raster was multiplied by the UN estimates for each year between 2015 and 2023 to find the adjusted values of each Global 1 cell. The erroneous area was then clipped and mosaicked into the Global 2 data for Pakistan for each matching year. The new Pakistan mosaic was then adjusted again to the UN population estimate for the entire country and then mosaicked into the matching Global2/bespoke population datasets described above.

Suggested citation:

Steingraber, Aubrey; Tejedor-Garavito, Natalia; Bondarenko, Maksym. WorldPop Global2 population of children under 1 year old combined with WorldPop bespoke population of children under 1 year old mosaics at 1km scale (2015-2023). R2025 V1. 2025. WorldPop - School of Geography and Environmental Science, University of Southampton. DOI: 10.5258/SOTON/WP00814

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the national January 1st population estimates for one year equal the corresponding estimate for the previous year, plus births, minus deaths, plus net migration.

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