

# Modelled sub-state estimates by Indigenous status, Queensland, methodology paper

## Introduction

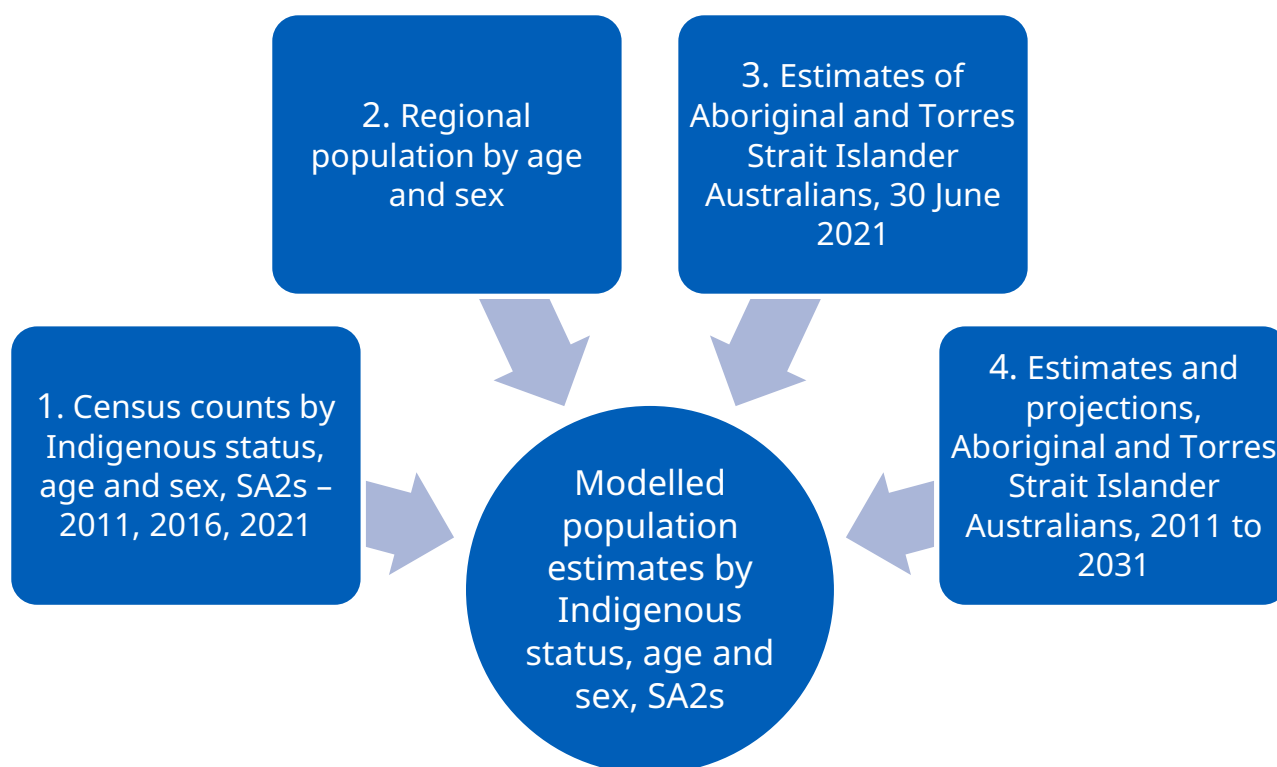
There is strong demand within the Queensland Government and community for sub-state time series population estimates by Indigenous status, age and sex. These estimates are used as denominators in rate calculations. They support measurement of social and economic temporal change within Aboriginal and Torres Strait Islander and non-Indigenous populations, and evidence-based resource allocation and decision making.

The Australian Bureau of Statistics (ABS) typically releases population estimates and projections by Indigenous status after the five-yearly Census of Population and Housing. However, these estimates do not always contain the geographical detail needed by the Queensland Government and the broader community. As a result, the Queensland Government Statistician's Office (QGSO) has developed detailed modelled estimates (on a usual residence basis) by Indigenous status, age and sex for Queensland Statistical Areas Level 2 (SA2s). These can be aggregated to produce estimates for larger, customisable areas. Estimates for SA4s and remoteness areas (RAs) are publicly available on the QGSO website ([www.qgso.gov.au](http://www.qgso.gov.au)). The 2025 edition includes estimates for SA4s and RAs for years 2011 to 2024 based on the 2021 Australian Statistical Geography Standard boundaries (ASGS 3rd Edition).

## Methodology

### Data sources

The diagram below shows the data sources<sup>i,ii,iii,iv</sup> used to compile the estimates:



## Method

### Step 1: Develop final population estimate by Indigenous status for census years

- For SA2s: 2011, 2016 and 2021 Census usual residence counts by Indigenous status, age<sup>1</sup>, sex and SA2 (Data source 1) were smoothed to reduce the effect of ABS introduced perturbation and then adjusted to sum to the following data sources using iterative proportional fitting techniques:
  - Population estimates by Indigenous status, age and sex, as at 30 June 2011, 2016 and 2021 for Queensland (data source 4)
  - Total population by age and sex, as at 30 June 2011, 2016, 2021 (data source 2)
  - Total population by Indigenous status as at 30 June 2021 (data source 3, only used for scaling 2021 Census counts<sup>2</sup>).

### Step 2: Calculate Indigenous proportions<sup>3</sup> for census years

- Using the data sets created in Step 1, Indigenous proportions were calculated for each age and sex category.

### Step 3: Estimate Indigenous proportions for non-census years

- Indigenous proportions were calculated for each age and sex category for non-census years, using linear interpolation and extrapolation techniques, based on the assumption that Aboriginal and Torres Strait Islander age and sex cohorts move through the overall population between census years.
  - For example, proportions for each age and sex category for each year from 2017 to 2020 were based on the interpolation of the proportions in 2016 and 2021 (as generated in Step 2).
- To model cohort movement, the linear interpolation accounted for age movement over time.
  - For example, the Indigenous proportions for males aged 12 years in 2016 and aged 17 years in 2021 are used to calculate Indigenous proportions for males aged 13 years in 2017, 14 years in 2018, 15 years in 2019, and 16 years in 2020.
- Proportions for years beyond 2021 were based on the extrapolation of the change in the proportions between 2016 and 2021.

### Step 4: Preliminary estimates of the Aboriginal and Torres Strait Islander population for non-census years

- The proportions calculated in Step 3 were multiplied by estimates of the total population by age and sex category (data source 2), for each non-census year.

### Step 5: Preliminary estimates of the non-Indigenous population for non-census years

The estimates from Step 4 were subtracted from population estimates of the total population by age and sex category (data source 2), for each non-census year.

### Step 6: Final population estimates by Indigenous status for non-census years

- For each non-census year, data by single year of age were produced for 0 to 19 years, and five-year age groups from 20 to 64 years, and then the 65 years and over age group.

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<sup>1</sup> By single year of age from 0 to 19 years, then 5 years age groups from 20–24 years to 80–84 years, then 85 years and over.

<sup>2</sup> The release of these data was based on the results of the 2021 Census.

<sup>3</sup> Defined as the number of Aboriginal and Torres Strait Islander persons as a proportion of the total (Aboriginal and Torres Strait Islander, and non-Indigenous) population.

- These preliminary estimates for single years of age under 20 years, five-year age groups from 20 to 64 years, and 65 years and over, were then adjusted to sum simultaneously to the following data sources using iterative proportional fitting techniques:
  - Population estimates and projections<sup>4</sup> by Indigenous status, single year of age and sex, for Queensland (data source 4)
  - Total population by single year of age and sex (data source 2).

## Other adjustments

- Indigenous status remains unknown where a response to the ABS standard Indigenous question was not stated. For the purposes of the construction of the population estimates by Indigenous status, these records are allocated within each age, sex, and SA2 category to either Aboriginal and Torres Strait Islander or non-Indigenous, using iterative proportional fitting techniques (see Step 1 above).
- The Indigenous proportions calculated in the method are bounded and kept within the 0 to 1 range.
- The application of interpolation and extrapolation techniques to the calculation of Indigenous proportions for non-census years assumes that Aboriginal and Torres Strait Islander cohorts move through the overall population over time. However, there may be cases where these cohorts may remain relatively stationary within a population over an extended period. This may occur, for example, in predominantly Indigenous communities which experience ongoing migration inflows of non-Indigenous persons aged 20–24 years. As a result, for each SA2, an age profile was calculated for each census year showing the Indigenous proportion in each age and sex category. An analysis was undertaken on these profiles to detect peaks and troughs which were consistently evident for all census years. These constant features were retained in the population estimates by Indigenous status.

## Results

Detailed population estimates by Indigenous status have been compiled by:

- Indigenous status (Aboriginal and Torres Strait Islander, and non-Indigenous)
- Queensland SA2s (based on the 2021 ASGS), with data for larger geographies constructed using correspondences to SA2s.
- Age
  - single year under 20 years, five-year age groups from 20 to 64 years, and 65 years and over
- Sex
- Years: 2011 to 2024, with subsequent years to be added with future ABS releases of data source 2.

These estimates supersede any previously released sub-state estimates produced by QGSO.

The final, revised or preliminary status of these modelled estimates is consistent with the status of small area population estimates in the corresponding edition of *Regional population by age and sex* (data source 2).

Data published on the QGSO website are for Queensland SA4s and Remoteness areas by five-year age groups to 64 years, and 65 years and over, by sex.

For different specifications of data (for example: tailored to other geographies concorded from SA2s), a request can be submitted for review and consideration to QGSO, alongside a brief statement/business case outlining the need and proposed use.

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<sup>4</sup> In *Estimates and projections, Aboriginal and Torres Strait Islander Australians, 2011 to 2031*, figures for years to 2021 are classified as estimates while figures from 2022 onwards are projections.

# Data quality

There are several data quality issues inherent in the four data sets used to compile the population estimates by Indigenous status, and these affect the overall quality of the estimates. More detailed information can be found in the accompanying data quality statement.

The modelled estimates have been developed for individual cross tabulations of age, sex, Indigenous status, and SA2, but a high degree of accuracy at this level of disaggregation should not be assumed.

It is strongly recommended that the modelled estimates be aggregated before being used, and caution should still be exercised when using the modelled data at more aggregated levels.

## Glossary

### Indigenous status

The Aboriginal and Torres Strait Islander population comprises people who identify as being Aboriginal, Torres Strait Islander, or both Aboriginal and Torres Strait Islander.

An Aboriginal and Torres Strait Islander person, according to the widely accepted Commonwealth definition, is a person who:

- is of Aboriginal and/or Torres Strait Islander descent who
- identifies as being of Aboriginal and/or Torres Strait Islander origin, and who is
- accepted as such by the community with which the person associates.

The ABS Standard Indigenous Question is based on the Commonwealth working definition but does not include the third element of the Commonwealth definition. Collecting information on the basis of community acceptance is often impractical in a survey or administrative data collection setting and can lead to inaccuracies. For these reasons, it is not included in the ABS Indigenous status standard. The definition of Indigenous status is therefore operationalised as whether or not a person identifies as being of Aboriginal and Torres Strait Islander 'origin'.

The term 'origin', when used in the context of the ABS Standard Indigenous question, relates to a person's Australian Aboriginal and/or Torres Strait Islander descent and, for some (but not all), their cultural identity. The Census question for the three censuses utilised in the modelling of the estimates was unchanged.

The 2021 Census of Population and Housing (Household form) asked the following question of each person:

<b>11. Is the person of Aboriginal or Torres Strait Islander origin?</b>  • For people of <b>both</b> Aboriginal and Torres Strait Islander origin, mark both 'Yes' boxes.	<input type="checkbox"/> No	<input type="checkbox"/> No
	<input type="checkbox"/> Yes, Aboriginal	<input type="checkbox"/> Yes, Aboriginal
	<input type="checkbox"/> Yes, Torres Strait Islander	<input type="checkbox"/> Yes, Torres Strait Islander

The data in this publication are reported according to the ABS Indigenous status standard, with the categories Aboriginal, Torres Strait Islander, and Both Aboriginal and Torres Strait Islander, combined to form the grouping 'Indigenous' for modelling purposes.

### Iterative proportion fitting

A procedure for adjusting a table of data cells such that they add up to selected totals for both the columns and rows (in the two-dimensional case) of the table.

# Sources

<sup>i</sup> Australian Bureau of Statistics. (2021, November 19). *TableBuilder*. ABS. <https://www.abs.gov.au/statistics/microdata-tablebuilder/tablebuilder-for-2021>, and customised unpublished data sourced from ABS as a consultancy.

<sup>ii</sup> Australian Bureau of Statistics. (various years). *Regional population by age and sex*. ABS. <https://www.abs.gov.au/statistics/people/population/regional-population-age-and-sex/latest-release>

<sup>iii</sup> Australian Bureau of Statistics. (2021, June 30). *Estimates of Aboriginal and Torres Strait Islander Australians*, (Table 4: Estimated resident Aboriginal and Torres Strait Islander, non-Indigenous and total populations, Statistical areas level 2). ABS. <https://www.abs.gov.au/statistics/people/aboriginal-and-torres-strait-islander-peoples/estimates-aboriginal-and-torres-strait-islander-australians/latest-release>.

<sup>iv</sup> Australian Bureau of Statistics. (2011-to-2031). *Estimates and projections, Australian Aboriginal and Torres Strait Islander population*. ABS. <https://www.abs.gov.au/statistics/people/aboriginal-and-torres-strait-islander-peoples/estimates-and-projections-australian-aboriginal-and-torres-strait-islander-population/latest-release>.

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