Australian Government
Jobs and Skills Australia

Jobs and Skills Atlas

Methodology

November 2023

Overview

The Jobs and Skills Atlas is an integrated data platform with a range of labour market data from various sources. Its primary focus is to provide industry, occupations, skills priorities and demographic data at the regional level. It is designed to be used by a range of stakeholders — economists, policy analysts, managers, employers and employment providers, industry associations, local government, and the public.

Data Sets included

- Australian Bureau of Statistics (ABS) Labour Force Survey (LFS)
- ABS Census of Population and Housing, 2021
- Jobs and Skills Australia (JSA) Internet Vacancy Index (IVI)
- JSA Nowcast of Employment by Region and Occupation (NERO)
- JSA Skills Priority List (SPL).

The LFS, IVI and NERO data are updated monthly however certain tables within the LFS are updated quarterly. The SPL is updated annually and the Census is updated every 5 years.

This document outlines data sources and processing methods used to compile the statistics and charts presented in the Atlas.

Contents

Methodology Scope and Limitations

The Jobs and Skills Atlas (the Atlas) provides an overview of the labour market at national, state and regional level by occupation, skill and industry. By combining various data sets and information sources in one tool the Atlas enables access to the information in a consistent and user-friendly format.

This document describes the source data and the processing applied to produce the statistics and charts presented in the product. It does not describe the methodology behind the sources, but rather how those sources have been treated.

By making the underlying data visible and showing the treatment of the data, we aim to enable analysts, economist's researchers and other otherwise curious users to understand the tool in more detail.

This document provides information on:

- where the data is obtained from
- what transformations and filtering have been applied
- what display rules, such as rounding precision and data suppression are used
- other assumptions, caveats and limitations that apply to the data.

Caveats and definitions

Within the Atlas, caveats and definitions are provided that outline the limitations of the data and guide interpretation and appropriate use.

As an aggregate of other data sources, the Atlas is susceptible to the limitations of those datasets. For example, NERO is an experimental dataset. The Employment count from NERO used within the Atlas has the same limitations as the original dataset.

Data Privacy

Privacy and anonymity are an important principle in presenting data on the Atlas. The risk increases where data sets are small. Measures taken to preserve privacy include:

- Data suppression to prevent reporting counts for small populations - such as those in a region who work in a particular profession. Where this approach is taken for a dataset, it is identified.
- Perturbation, an approach in which random adjustments of the data are made to values in the data.[1]

[1] Australian Bureau of Statistics (ABS), 'Perturbation and interpreting tables with small cells, sparsity and relative standard errors', *ABS, TableBuilder Confidentiality and relative standard error*, 19 November 2021.

Product Layout

The Atlas reports on the labour market at different spatial granularities: at the national, state and territory, and regional (Statistical Area 4 – SA4) level. The Atlas can be viewed at 'Regional' or 'National and State' level. Throughout the app, national data is provided as a baseline for context and comparison purposes. A third view option, via the compare tab, allows the user to view and compare information between two locations (region (SA4), state/territory, or nationally), side-by-side.

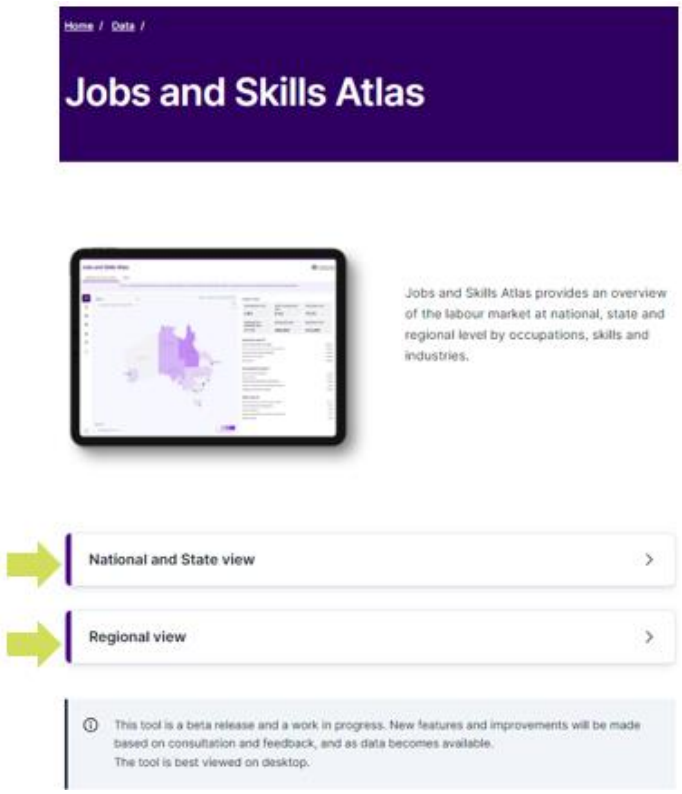

Figure 1 Jobs and Skills Atlas view options.

This section explains the content of the information components included as separate tabs in the dashboard:

- Overview
- Labour Market
- Industries
- Occupations
- Downloads

Overview tab (landing page)

This tab presents an overview of the data available in all the other tabs (Labour Market, Industries, and Occupations). This data can be chosen via the clickable map of Australia or by selecting the drop-down menu and postcode feature.

Figure 2 shows the overview tab on desktop and mobile devices.

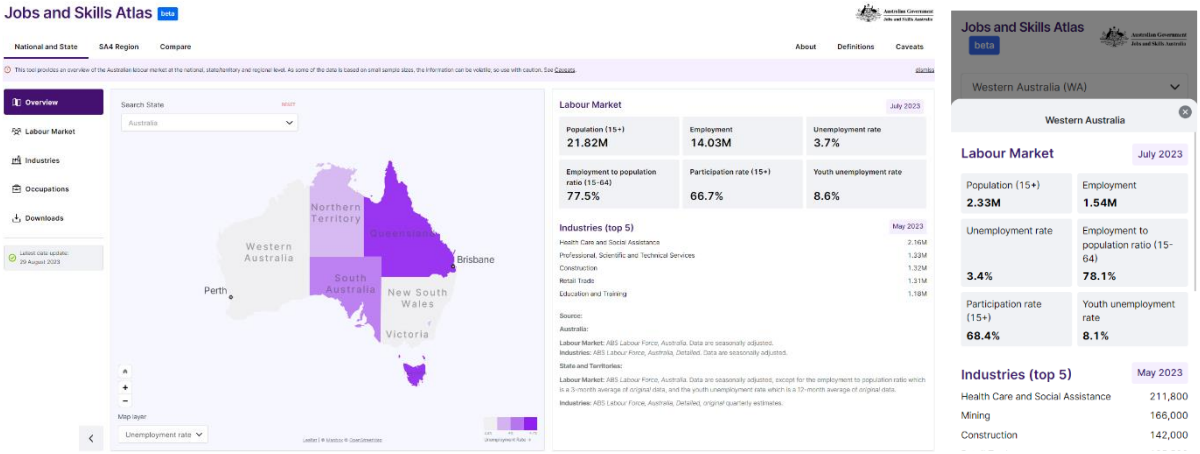

Figure 2 Atlas landing page on a clickable map of Australia (left). The mobile version (right) summarises the key stats in a view optimised for mobile devices.

The user can choose a region by clicking on the interactive map or from the dropdown list selector. The selector includes a search field in which users can type the region (SA4) name or the State/Territory name (depending on the view the user has chosen). The user can also type a postcode or suburb name which will show the corresponding region or State/Territory containing that suburb/postcode.

This search functionality is available from any content tab within the Atlas.

Once an area has been selected, a summary of various statistics is shown.

Labour Market tab

The **Labour Market tab** contains statistics for the population, employment, unemployment rate, employment to population ratio, participation rate, and the youth unemployment rate. For each metric, a 5-year time series of history is shown.

Demographic breakdowns by age and sex are shown for population, employment, employment to population ratio, and participation rate metrics. Note that breakdowns are not shown for the unemployment rate and youth unemployment rate due to volatility from small sample sizes for these indicators at the SA4 level.

Information about educational attainment and Indigenous status is available under the population metric.

The data source for all the metrics and breakdowns by age and sex is the Australian Bureau of Statistics (ABS) Labour Force Survey (LFS)[2] which gets updated every month. On the other hand, Indigenous status and educational attainment data come from the 5-yearly

[2] ABS, 'Labour Force, Australia', latest release.

ABS, 'Labour Force, Australia, Detailed', latest release.

Australian Census Population and Housing, last held in 2021[3] and is thus not updated monthly.

The treatment to the data varies depending on the geographical level (whether they are regional areas (SA4s), state/territories, or national), and some metrics require processing specific to their data source. For details on exactly what treatment has been applied to each metric, please see Appendix B.

Industries tab

For a given area, the **Industries tab** shows employment counts based on the Australian and New Zealand Standard Industrial Classification (ANZSIC) which shows 19 broad industry groups. The data comes from the ABS Labour Force Survey. Values are reported as latest counts of employed people, percentage share of employment in the industry in comparison to total employment in that area, as well as historic counts for the previous 5 years. See the Appendix for more information about specific treatments applied based on geographical level.

By clicking on an industry, its employment time series for up to 5 years is displayed, as well as the percentage of males and females employed in the industry according to the latest Census of Population and Housing.

Please note that the source for the time series varies depending on the geographical level. The state/territory data is based on a trend series produced by JSA, the national data is based on a trend series produced by the ABS, and the regional data is a 4-quarter average of original data. As a result, care should be taken when making any comparisons between them.

Occupations tab

The **Occupations tab** presents employment (nowcast), vacancy data, and shortage and future demand ranks by occupation for a selected area. All of which is updated quarterly.

The list of occupations comes from the Australian and New Zealand Standard Classification of Occupations (ANZSCO), 2013 version 1.3. This classification of occupations has a 5-level hierarchical structure.

Occupational shortage and future demand data come from the Skills Priority List (SPL) and are presented at the most detailed level of the ANZSCO structure, which are the 6-digit occupation codes, referred to in the Atlas as occupations.

One level of aggregation higher in the hierarchy are 4-digit codes, which are 6-digit occupations grouped together into unit groups (referred to in the product as occupations as well). Employment (nowcast) and job vacancy data are reported at the 4-digit unit group level.

Employment (nowcast) comes from the Nowcast of Employment by Region and Occupation (NERO). As at the date of this release, employment (nowcast) is only available for the SA4 region's view (and not available for the States/Territories view).

[3] ABS, Census of Population and Housing, accessed September 2023.

Estimated vacancies per occupation come from the Internet Vacancy Index (IVI). This metric is available for all geographical views, with different treatments being applied according to geographical levels.

Note that estimated vacancies by SA4 and occupation are not publicly available for download.

A third metric, vacancy rate, is calculated combining the two sources above:

$$Vacancy\ Rate = \frac{Estimated\ Vacancies}{Employment\ Nowcast}$$

Since employment (nowcast) is only available at the SA4 level, vacancy rate is also only available at the SA4 level.

Note that shortage and future demand are shown once an occupation in the table has been selected by the user. Remember, the table presents 4-digit codes or unit groups. After selecting one, shortage and future demand for the 6-digit occupations (under the 4-digit code unit group) will be presented.

The shortage category is shown for the corresponding state and at the national level, whereas future demand is only categorised at the national level.

Downloads tab

Downloads currently provides links to the data releases used to generate the visualisations and tables shown in the product.

Compare

A **compare tab** allows the user to view and compare information between two locations (region (SA4), state/territory, or nationally), side-by-side. The compare tab provides a subset of the information available elsewhere in the app, in 3 sections:

- Labour Force
    - Population, employment, unemployment rate, employment to population ratio, participation rate, youth unemployment rate
    - Year-on-year changes for the above metrics
- Industries
    - Top 10 industries for each selection in descending order of employment size
- Occupations
    - Top 10 4-digit ANZSCO unit groups for each selection in order descending of employment size and estimated vacancies. Since Employment (nowcast) is not available for state/territory and national, these selections are ordered in descending order of estimated vacancies only.

Caution needs to be exercised when comparing values that have different treatments, for example if seasonally adjusted data is being compared to 6-month averaged data. Different smoothing treatments affect how quickly changes in the underlying data are reflected in the reported values, thus this kind of comparison can lead to discrepancies that reflect the

different treatments applied to the data rather than differences in underlying conditions between the two regions.

Data Methodology

This section describes the data sources in the Atlas. This includes any processing, filters, and treatments applied, as well as caveats and notes relevant to that dataset. The data sources are listed in Table 1 and further detail is included in the subsections for each dataset. For information about specific tables, smoothing parameters, and rounding, please see the Appendix.

Table 1 Data sources and classification standards in the Atlas

Name	Appears	Frequency	Granularity
Labour Force, Australia	Overview tab, Labour Market tab	Monthly	State/Territory, National
Labour Force, Australia, Detailed	Overview tab, Labour Market tab, Industries tab	Monthly and quarterly (dependent on source table)	SA4 Regions, State/Territory, National
2021 Census	Labour Market tab	Every five years	SA4 Regions, State/Territory, National
Jobs and Skills Australia Trended Industry and Occupation Employment Data	Industries tab	Quarterly	State/Territory, National
Internet Vacancy Index (IVI)	Occupations tab	Monthly	SA4 Regions, State/Territory, National (4-digit ANZSCO unit group)
Nowcast of Employment by Region and Occupation (NERO)	Overview tab, Occupations tab	Monthly	SA4 Regions (4-digit ANZSCO unit group)
Skills Priority List (SPL)	Occupations tab	Annual	State/territory and national (6-digit ANZSCO occupation group)
Australian Statistical Geography Standard (ASGS) shapefile boundaries	Overview tab	Updated if/when SA4 boundaries used in the LFS and NERO change.	SA4 Regions, State/Territory, National

Data is updated in an automated process which retrieves the latest available publication of each data source every month.

Labour Force, Australia and Labour Force, Australia, Detailed

The ABS Labour Force Survey (LFS) is a key source for the Atlas. The Atlas draws from two core ABS releases: Labour Force, Australia; and Labour Force, Australia, Detailed.

The Labour Force, Australia dataset includes headline estimates of employment, unemployment, underemployment, participation, and hours worked at the state, territory and national level.

The Labour Force, Australia, Detailed dataset provides detailed monthly and quarterly Labour Force Survey data, including labour force status by region, and employment by industry and occupation.

LFS statistics are based on a multi-stage area sample of approximately 24,000 private dwellings, discrete Aboriginal and Torres Strait Islander communities, and non-private dwellings (including hotels, hospitals, and retirement villages), resulting in a total sample of about 50,000 people.

While the LFS includes regional data in its output, it is primarily designed to produce statistics at the state/territory level and higher and does not produce estimates of a consistent quality for all regions. Importantly, LFS estimates at the regional level are often based on relatively small sample sizes which may not be representative of conditions in the region. The figures can show considerable volatility and should be used with caution.

Labour Force Survey tables used in the Atlas

From Labour Force, Australia:

- GM1. Labour force status and Gross changes (flows) by Age, Sex, State and Territory, Original (Monthly)
- Table 12. Labour force status by Sex, State and Territory - Trend, Seasonally adjusted and Original (Monthly)
- Table 12a. Labour force status by Sex, Territory - seasonally adjusted (Monthly).
- Table 13. Labour force status for 15–24-year-olds by Sex - Trend, seasonally adjusted and Original (Monthly)
- Table 16. Labour force status for 15–24-year-olds by State, Territory and Educational attendance (full-time) - Original (Monthly)
- Table 18. Labour force status for 15–64-year-olds by Sex - Trend, seasonally adjusted and Original (Monthly)
- Table 22. Underutilised persons by Age and Sex - Trend, seasonally adjusted and Original (Monthly).

From Labour Force, Australia, Detailed:

- RM1. Labour force status by age, labour market region (ASGS) and sex, October 1998 onwards (pivot table) (Monthly)
- RQ1. Employed persons by Industry division of main job (ANZSIC), Labour market region (ASGS) and Sex, Annual averages of the preceding four quarters, Year to August 1999 onwards which provides industry employment, by ANZSIC, in SA4 regions (Quarterly)

- Table 04. Employed persons by Industry division of main job (ANZSIC) - Trend, seasonally adjusted, and Original (Quarterly)
- Table 05. Employed persons by State, Territory and Industry division of main job (ANZSIC) (Quarterly).

Most of the Labour Force survey data is updated monthly, although some datasets, specifically table 04, table 05, and RQ1, from the Labour Force, Australia, Detailed release, are updated quarterly.

The LFS statistics are based on the place of usual residence of the people being surveyed, and this may not be the same location as someone's place of work.

Calculated labour force metrics

The following metrics are derived from the Labour Force Survey tables:

- Working age population
- Employment
- Unemployment rate
- Participation rate
- Employment to population ratio
- Youth unemployment rate.

Population refers to the civilian population (as defined in the LFS), aged 15 and over unless otherwise stated. The *working age population* refers to the civilian population aged 15 to 64.

$$Working\ Age\ Population\ =\ Population_{aged\ 15-64}$$

Employment is calculated by combining the count of full-time employed persons and part-time employed persons.

$$Employment\ =\ Employed_{full-time}\ +\ Employed_{part-time}$$

The *unemployment rate* is calculated by dividing the unemployed by the labour force (employed persons + unemployed persons).

$$Unemployment\ Rate\ =\ \frac{Unemployed\ Total}{Unemployed\ Total\ +\ Employment}$$

The *participation rate* is the *labour force* (which is the sum of *employment* and *unemployment*) divided by the *population* (which is the sum of *labour force* and *not in the labour force*).

$$Participation\ Rate\ =\ \frac{Employment\ +\ Unemployed\ Total}{Population}$$

The *employment to population ratio* is the count of *employed* persons aged 15-64 years divided by the *population* aged 15-64.

$$Employment\ To\ Population\ Ratio\ =\ \frac{Employment_{aged\ 15-64}}{Population_{aged\ 15-64}}$$

The *youth unemployment rate* is calculated by dividing the count of unemployed persons aged 15-24 by the labour force aged 15-24.

$$Youth\ Unemployment\ Rate\ =\ \frac{Unemployed\ Total_{aged\ 15-24}}{Unemployed\ Total_{aged\ 15-24}\ +\ Employment_{aged\ 15-24}}$$

The product also uses different tables from the LFS to obtain metrics for different population cohorts including age and sex for a subset of the above metrics. The listing of sources and data sets for all labour force variables are provided in Appendix A.

Smoothing treatment

Surveys, such as the Labour Force Survey, collect data from a sample and then use this to produce an estimate for the total population of an area, and are thus subject to sampling error (as well as other sources of bias).

Different metrics, geographical levels, and breakdown segments (age, sex, educational attainment, etc.) might be reported using different smoothing methods, such as moving averages of different periods (for example 3, 6 or 12-month averages), or seasonal adjustments and trend decompositions performed by the ABS.

It is important to consider that a given measurement or estimate may have different smoothing treatments at different levels (that is National, State/Territory, or SA4s). Therefore, caution should be exercised when making comparisons of values from different geographical levels.

At the regional level (SA4s), the Australian Capital Territory is the only region for which monthly seasonally adjusted data are available. For all the other regions:

- Figures are not adjusted for seasonal variations. Therefore, it is recommended to make year-on-year comparisons within the same time series, as movements between different months of the year may be influenced by seasonal factors.
- Metrics have been averaged over 6 or 12 months to help to reduce the inherit volatility in the original data. However, when regional data is further disaggregated by sex and age groups, the estimates will be subject to a greater degree of statistical variability and may not reflect actual labour market conditions for those sex or age groups in the SA4.
- Youth unemployment rates are generally based on small sample sizes and, as a result, are subject to very high levels of volatility. This metric (and its movements) may not reflect actual youth labour market conditions in the SA4 and should be interpreted with a high degree of caution.

Rounding treatment

The metrics are calculated using unrounded values and are rounded for display with the precisions as listed below:

- Population (15+) – nearest 100*
- Employment – nearest 100*
- Unemployment Rate – one decimal place
- Employment to population ratio (15-64) – one decimal place
- Participation rate – one decimal place
- Youth unemployment rate – one decimal place
- Age, sex, education, and indigenous breakdown percentages - one decimal place
- Age, and sex breakdown counts - nearest 100*
- Indigenous breakdown counts – not rounded*
- Industries – nearest 100

- 1-year changes - one decimal place.

* When the value is greater than 1 million, the value is rounded to the nearest ten thousand

Data suppression

Employment count by industry and SA4 can in some cases result in small sample sizes. This can make interpretation difficult and require extra data security measures where information about survey respondents may be discernible.

To address these issues, in cases where there are fewer than 1000 persons employed in an industry for a selected area, the value is omitted showing ≤1000 instead, and the accompanying percentage share is not calculated.

Definition of sex within the Labour Force Survey

The datasets obtained from the ABS include a variable for the sex of labour market participants. This variable describes the sex at birth of survey participants, and not gender or other variations of sex characteristics. Sex recorded at birth is defined in an operational definition on the ABS website[4]. The legislated requirements for collecting data about sex are specified in the Census and Statistics Regulation 2016[5].

Australian Capital Territory as an SA4 and territory

Australian Capital Territory is both an SA4 and a territory. When viewing ACT from within the SA4 region tab of the Atlas (as well as the National and State tab), all data sourced from LFS shows the smoothing and treatments for the ACT as a territory, rather than as an SA4. Therefore, caution is advised when making comparisons between the ACT and other SA4s.

Western Australian Outback North and South

The Labour Force Survey (LFS) uses the list of SA4s from the version of the Australian Statistical Geography Standard (ASGS) published in 2011[6], whereas the Nowcast of Employment by Region and Employment (NERO), uses the version from 2016[7].

Those versions differ in the way Western Australia Outback is reported. The 2016 ASGS version used by NERO divides the region into Western Australia - Outback North and Western Australia – Outback South, while the ABS reports using Western Australia – Outback (North and South) as a whole. Accordingly, LFS figures are not available for Western Australia - Outback North and Western Australia – Outback South in the Atlas.

The LFS figures for both of these regions in the Atlas relate to the combined region of Western Australia – Outback (North and South).

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[4] ABS, 'Standard for Sex, Gender, Variations of Sex Characteristics and Sexual Orientation Variables', *ABS, Standards*, latest release.

[5] Australian Government, 'Census and Statistics Regulation 2016', *Federal Register of Legislation*, 11 February 2020.

[6] ABS, 'Australian Statistical Geography Standard (ASGS): Volume 1 - Main Structure and Greater Capital City Statistical Areas, July 2011', *ABS*, 23 December 2010.

[7] ABS, 'Australian Statistical Geography Standard (ASGS): Volume 1 - Main Structure and Greater Capital City Statistical Areas, July 2016', *ABS*, 12 July 2016.

2021 Census

Every five years, the ABS counts every person and household in Australia[8]. The Atlas presents data from the 2021 Census to provide a breakdown of the population by their educational attainment and by their Indigenous status.

These breakdowns are shown in the Labour Force tab and are available at the national, state/territory and SA4 level.

It should be noted that the 2021 Census was conducted during the COVID period, so some data will be reflective of this time. Therefore 2021 Census data should be interpreted with this context in mind.

Frequency

It should be noted that while much of the data presented in the Atlas is monthly, data from the Census is a snapshot from 2021 and caution is advised in making comparisons between Census data and more recent data sources.

Educational attainment

This breakdown is derived from the 2021 census variable HEAP[9] and shows the count of persons according to their highest educational attainment. The Atlas reports 5 groups:

- Below year 12 (incl. Cert I/II)
- Year 12
- Certificate III & IV
- Advanced diploma and diploma
- Bachelor degree or above.

Census respondents younger than 15 or older than 64, as well as people currently enrolled in primary or secondary school, and responses that are inadequately described or not stated, have been excluded from this count.

Indigenous attainment

This variable derived from the 2021 census shows the count of persons, aged 15-64, who self-identify as First Nations peoples.

This census variable labelled Indigenous status (INGP[10]) can take 6 distinct values. The response 'Overseas visitor' has been excluded while the responses 'Aboriginal', 'Torres Strait Islander', and 'Both Aboriginal and Torres Strait Islander' have been combined into 'Aboriginal and/or Torres Strait Islander'. The responses 'Not stated' and Non-Indigenous' have been left as is.

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[8] ABS, Census of Population and Housing, accessed September 2023.

[9] ABS, 'Level of highest educational attainment (HEAP)', *ABS, Guide to Census data*, 15 October 2021, accessed July 2023.

[10] ABS, 'Indigenous status (INGP)', *ABS, Guide to Census data*, 15 October 2021, accessed July 2023.

This information is collected through self-identification and any changes in how a person chooses to respond will affect the count. The count is also affected if respondents did not answer this question. The national non-response rate for Indigenous status (INGP) was 4.9% in the 2021 Census.

Perturbation

This approach, in which random adjustments are made to values in the data[1] is accepted as a satisfactory technique to avoid releasing confidential data. It has been used with the Census 2021 datasets via the Census Table Builder Pro service provided by the ABS[3]. Perturbation enables the release of a greater range of more detailed data. However, this may result in minor differences between totals calculated directly when compared with the sum of the sub-populations included in that total.

Jobs and Skills Australia Trended Industry and Occupation Employment Data

Jobs and Skills Australia (JSA) trends data from the detailed Labour Force Survey to create an estimation of employment over time across all Industries (down to ANZSIC 3-Digit level) and Occupations (down to ANZSCO 4-Digit level) nationally and by state. The trending methodology used by JSA applies significant smoothing, meaning it serves as a better reflection of longer-term trends within an occupation or industry.

Currently, Atlas presents JSA trended data for the industries employment figures at the state level. For certain industries, values over the COVID period (March 2020 to November 2021) are not included and care should be taken when referring to any figure from this period. Figures may also be subject to historical revisions in the future.

Please note that JSA trended series differs from the 1-Digit ANZSIC trend series released by the ABS in Table 4 of the detailed Labour Force Survey. As a result, the state and national figures are not directly comparable, and the state figures will not add to the national. Similarly, given that the regional data is a 4-quarter average of original data, SA4 figures will not add up to the state trended data.

The trended series is not publicly available for download yet. Once the full series is published on the JSA website, along with the methodology paper, the link will be provided in this section.

Internet Vacancy Index

The Internet Vacancy Index[11] (IVI) is an administrative dataset that provides data on online job vacancies from advertising activity each month.

The count of online job ads (IVI job value) is collected from a range of online advertising boards including SEEK, CareerOne, and Workforce Australia. It provides an estimate of the count of vacancies by 4-digit ANZSCO unit groups and different geographical levels; national, state/territory, and a custom set of regions unique to IVI called ‘IVI region’.

The IVI does not:

[11] Jobs and Skills Australia (JSA), ‘Internet Vacancy Index’, *JSA website*, latest release; JSA, ‘Internet Vacancy Index Methodology’, *JSA website*, latest release.

- reflect the total number of job advertisements in the Australian labour market
- account for jobs advertised through other online job boards, employer websites, social media, newspapers, or other informal methods such as word-of-mouth
- take account of multiple positions being advertised in a single job advertisement.

Job vacancies and job advertisements are different. Some employment opportunities are not advertised by employers, who may instead fill their vacancies via internal promotion or alternative recruitment methods.

Online job advertisements can be slightly biased towards higher skilled positions. Employers with lower skilled vacancies tend to use informal recruitment methods like social media or word-of-mouth more regularly.

Please note that IVI data presented at the SA4 level are an experimental series that have been created by corresponding data from the 37 IVI regions across to the 88 ABS SA4s. Accordingly, these estimates a subject to a degree of estimation error.

Note that this concordance from IVI region to SA4 is not publicly available for download.

Be aware that this data is based on the location of the estimated vacancy, or place of work, unlike the rest of the data in the Atlas, which is based on place of usual residence. This should be considered when interpreting, and especially combining data in the Atlas.

Further information on the IVI data, the rationale for the custom geographic structure, other limitations and details involved in the preparation of the data and counting procedures can be found at the 'Sources and Citation' section.

Rounding treatment

The Estimated vacancies value is rounded to the nearest whole number.

Smoothing treatment

The smoothing approach depends on the geographical level.

For estimated vacancies aggregated by SA4 and 4-digit ANZSCO unit group, the sample size can be quite small. To mitigate volatility, a 6-month moving average is applied. At the state/territory and national level, vacancies are seasonally adjusted.

Data suppression

If the estimated vacancies are fewer than 5, then values are suppressed for the sake of data privacy.

For the estimated vacancies time series, if any data point in the series is less than 5, then the entire time series chart is suppressed.

Nowcast of Employment by Region and Occupation

Nowcast of Employment by Region and Occupation (NERO)[12] is an experimental dataset providing information on employment in 355 occupations across 88 SA4 regions in Australia.

[12] JSA, 'Nowcast of Employment by Region and Occupation (NERO)', *JSA website*, latest release; JSA, 'Nowcast of Employment by Region and Occupation Methodology', *JSA website*, latest release.

Previously, this type of data was only readily available every five years as part of the ABS Census of Population and Housing. With NERO these insights can be produced monthly.

Given its experimental nature NERO is subject to error resulting from its model of the labour market including errors in the data it uses, its estimates and the model structure. NERO estimates are based on the place of usual residence which may not be the same location as someone's place of work.

For additional information about the nowcasting methodology used see the NERO methodology paper.

Smoothing treatment

NERO data has already been smoothed according to a complex, multi-step smoothing process and therefore no further treatment is applied.

Data suppression

If the employment (nowcast) is less than 100 then values are suppressed for the sake of data privacy.

For the employment (nowcast) time series, if any data point in the series is less than 100 then the entire time series chart is suppressed.

Vacancy rate calculation

Online job advertising count data from the Internet vacancy index is combined with the employment counts from NERO to calculate the vacancy rate.

The vacancy rate for an occupation in a region is found with the formula:

$$Vacancy\ rate_{ANZSCO4} = \frac{employment_{ANZSCO4}}{vacancies_{ANZSCO4}},$$

It should be noted that while IVI data is based on place of work, NERO is based on place of usual residence. Therefore, misalignments can occur, causing data at the SA4 level to not accurately reflect vacancies by residency. This effect is particularly relevant in the case of capital cities.

This vacancy rate is only calculated at SA4 level, as Employment count at a state level is not available within the dashboard.

Rounding treatment

The vacancy rate is rounded to 1 decimal place.

Smoothing treatment

While no smoothing is applied after the vacancy rate calculation, it must be noted that the estimated vacancies (of which only the SA4 level data is used) uses a 6-month average, while NERO uses a significantly more complicated, multi-step smoothing process.

Data suppression

The vacancy rate is suppressed if and only if either of the instances of data used to derive it are suppressed. Concretely, this means that the vacancy rate is suppressed if the:

- employment (nowcast) is less than 100
- estimated vacancies are fewer than 5.

The time series chart is suppressed if any data point in the:

- NERO series is less than 100
- estimated vacancies series is less than 5.

Skills Priority List

The Skills Priority List (SPL)[13] provides a rating of current demand for occupations in Australia at the state and national levels. In the Atlas, when an SA4 is selected, the SPL rating for the corresponding state or territory is presented.

The ratings provide information about shortage and future demand based on evidence from labour market analysis, stakeholder consultation, employer surveys, and other information specified in the Skills Priority List Methodology. Shortage can be one of:

- **Shortage**: A shortage indicates that employers are struggling to find qualified candidates for a specific occupation under the current pay and working conditions, and in reasonably accessible locations. In some cases, shortages may be apparent for specialisations within the occupation, but not for all instances of that occupation. In these cases, provided there is sufficient evidence, that occupation will still be considered in shortage.
- **Regional shortage:** Shortages are restricted to regional areas.
- **No shortage:** Research has not identified any significant difficulty filling vacancies. For some occupations, a lack of evidence will, by default, result in an occupation being rated as 'No Shortage'.

Future demand is rated as either 'Above economy-wide average', represented with a blue up arrow; 'at economy-wide average', represented with a grey dash symbol; or 'Below economy-wide average', represented with a red down arrow, next to the occupation name.

Frequency

The SPL was first released in 2021, and the current release was published in 2023. It is updated annually.

Australian Statistical Geography Standard shapefile boundaries

The Atlas displays various data and information at a number of geographic levels: SA4, State/Territory and National. It uses shapefiles to display the boundaries of each region on the map.

The region selection feature allows users to search for a region by postcode and makes use of a correspondence between the postcode and SA4 boundaries to allow searching by postcode or region name.

SA4 Region shapefile

The Australian Statistical Geographic Standard (ASGS) is a hierarchical geographical classification, defined by the Australian Bureau of Statistics (ABS), which is used in the collection and dissemination of official statistics.

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[13] Jobs and Skills Australia (JSA), 'Skills Priority List', *JSA website*, latest release; JSA, 'Skills Priority List Methodology', *JSA website*, latest release.

Statistical area level 4 (SA4) regions are one of the spatial units defined under the ASGS.

SA4s were designed for reporting the output of ABS Labour Force Survey (LFS) data and the areas represent labour markets or groups of labour markets within each State and Territory. There is a total of 88 SA4 regions shown in the Atlas but as noted above, the ABS LFS combines the two regions of Western Australia – Outback North and Western Australia – Outback South, into Western Australia – Outback (North and South), and therefore LFS data are only available for 87 regions.

A state-based shapefile from the same source is used for the state and national level map.

The version of the ASGS used currently in the product was released in 2016[7] and the post code search feature uses postal areas defined in the 2021 release under Non-ABS Structures[14].

Processing

The original ABS shapefile was simplified using the Visvalingam weighted area procedure[15] to reduce the size of the map for a faster load time and better user experience.

[14] ABS, 'Postal Areas', *ABS, Australian Statistical Geography Standard (ASGS) Edition 3*, 6 October 2021, accessed June 2023.

[15] M. Visvalingam & J. D. Whyatt, 'Line generalisation by repeated elimination of points', *The cartographic journal* 30.1 (1993): 46-51.

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12. Jobs and Skills Australia (JSA), 'Internet Vacancy Index', *JSA website*, latest release; JSA, 'Internet Vacancy Index Methodology', *JSA website*, latest release.
13. JSA, 'Nowcast of Employment by Region and Occupation (NERO)', *JSA website*, latest release; JSA, 'Nowcast of Employment by Region and Occupation Methodology', *JSA website*, latest release.
14. National Skills Commission (NSC), 'Skills Priority List', *NSC website*, latest release; NSC, 'Skills Priority List Methodology', *NSC website*, latest release.
15. ABS, 'Postal Areas', *ABS, Australian Statistical Geography Standard (ASGS) Edition 3*, 6 October 2021, accessed June 2023.
16. M. Visvalingam & J. D. Whyatt, 'Line generalisation by repeated elimination of points', *The cartographic journal* 30.1 (1993): 46-51.

Appendix A

This appendix lists the source tables used in constructing the Atlas data model. The ABS provides LFS data in original, seasonally adjusted and/or trend series. In some instances the Atlas team implemented additional smoothing by taking a moving average and where this has been done the number of months over which the figure has been averaged is indicated (for example 3MA refers to data that are a 3-month average).

Table 2 National LFS metrics

Disaggregation	Variable	Series Type	Source
-	Population (15+)	Original	Table12
-	Employment	Seasonally adjusted	Table12
-	Unemployment rate	Seasonally adjusted	Table12
-	Employment to population ratio (15-64)	Seasonally adjusted	Table18
-	Participation rate (15+)	Seasonally adjusted	Table12
-	Youth unemployment rate	Seasonally adjusted	Table13
Age	Employment	Seasonally adjusted	Table22
Age	Employment to population ratio (15-64) (segments '15-24 years' and '25-54 years' only)	Seasonally adjusted	RM1 and Table22
Age	Employment to population ratio (15-64) (segments '55-64 years' only)	3MA	RM1
Age	Participation rate (15+)	Seasonally adjusted	RM1 and Table22
Age	Population (15+)	3MA	RM1
Sex	Employment	Seasonally adjusted	Table22
Sex	Employment to population ratio (15-64)	Seasonally adjusted	Table18
Sex	Participation rate (15+)	Seasonally adjusted	Table12
Sex	Population (15+)	3MA	RM1

Table 3 State/Territory LFS metrics

Disaggregation	Variable	Series Type	Source
-	Population (15+)	Seasonally adjusted	Table12 and Table12a
-	Employment	Seasonally adjusted	Table12 and Table12a
-	Unemployment rate	Seasonally adjusted	Table12 and Table12a
-	Employment to population ratio (15-64)	3MA	GM1
-	Participation rate (15+)	Seasonally adjusted	Table12 and Table12a
-	Youth unemployment rate	12MA	Table16
Age	Employment	12MA	RM1
Age	Employment to population ratio (15-64)	12MA	RM1
Age	Participation rate (15+)	12MA	RM1
Age	Population (15+)	12MA	RM1
Sex	Employment	Seasonally adjusted	Table12 and Table12a
Sex	Employment to population ratio (15-64)	3MA	RM1
Sex	Participation rate (15+)	Seasonally adjusted	Table12 and Table12a
Sex	Population (15+)	3MA	GM1

Table 4 Statistical Area 4 region LFS metrics

Disaggregation	Variable	Series Type	Source
-	Population (15+)	6MA	RM1
-	Employment	6MA	RM1
-	Unemployment rate	6MA	RM1
-	Employment to population ratio (15-64)	6MA	RM1
-	Participation rate (15+)	6MA	RM1
-	Youth unemployment rate	12MA	RM1
Age	Employment	12MA	RM1
Age	Employment to population ratio (15-64)	12MA	RM1
Age	Participation rate (15+)	12MA	RM1
Age	Population (15+)	12MA	RM1
Sex	Employment	12MA	RM1
Sex	Employment to population ratio (15-64)	12MA	RM1
Sex	Participation rate (15+)	12MA	RM1
Sex	Population (15+)	12MA	RM1

Table 5 National, State/Territory and Statistical Area 4 region LFS industries data

Region type	Variable	Series Type	Source Table
National	Labour force head counts by ANZSIC major group	Seasonally adjusted	Table 4
State	Labour force head counts by ANZSIC major group	Original series	Table 5
SA4	Labour force head counts by ANZSIC major group	4 quarter average	RQ1

Appendix B

This appendix lists the product business rules.

Table 6 Business rules.

Business rule	Rule type
LFS	
For the SA4 region values (excluding ACT) a 6-month moving average is applied except for when the data is disaggregated by age or sex, where a 12-month moving average is applied.	Smoothing
For the industry employment counts at the SA4 level a 4-quarter average is applied.	Smoothing
For reporting the labour force metrics for all regions (map overview and labour force tabs), the following precision rules apply: For counts – nearest 100 (nearest 10,000 if over 1 million) For rates and ratios – 1 decimal place.	Rounding
Employment to population ratio age bands is based on the population aged 15 years or older and less than 65 years old. The age breakdown of employment to population ratio is based on the age-bands; 15-24, 25-54 and 55-64.	Definition
In the industry tab we suppress data that is based on an excessively small sample. This is deemed to be the case if a region and industry major group combination contains fewer than 1000 individuals. In this case the number of employed and the percentage share for that industry will not be shown and instead will appear ≤1000 and no percentage share are calculated.	Data suppression
The unemployment rate and youth unemployment rate metrics are not displayed for age or gender cohorts due to the risk of high volatility arising from a small sample.	Data suppression
NERO	
Nowcast (NERO) employment counts rounded to nearest 100.	Rounding
The Atlas allows users to report results for several regions together giving an average value weighted by population. If NERO employment estimates to aggregated include values of 10 then the vacancy rate and the employment count is not displayed.	Aggregation
IVI	
A 6-month moving average is used to smooth vacancies by occupations (4-digit ANZSCO).	Smoothing
IVI, NERO	
Estimated vacancies are rounded to the nearest whole number in the occupations tab. For the summary on the overview tab if the value is greater than 1000 the number is rounded to the nearest 100. Otherwise it is rounded to the nearest 10.	Rounding

Business Rule	Rule Type
Vacancy rate is rounded to one decimal place.	Rounding
If the employment (nowcast) is less than 100, then values are shown as <100. For the employment (nowcast) time series, if any data point in the series is less than 100, then the entire time series chart is suppressed.	Data suppression
If the estimated vacancies are fewer than 5, then values are suppressed for the sake of data privacy. For the estimated vacancies time series, if any data point in the series is less than 5, then the entire time series chart is suppressed.	Data suppression
The vacancy rate is suppressed if either of the instances of data used to derive it are suppressed. Concretely, this means that the vacancy rate is suppressed if the: • employment (nowcast) is less than 100 • estimated vacancies are fewer than 5. The time series chart is suppressed if any data point in the: • NERO series is less than 100 • estimated vacancies series is less than 5.	Data suppression
CENSUS	
Perturbation is applied to preserve anonymity in the data obtained from the Census.	Data suppression
ALL DATASETS	
Any value in the millions is abbreviated to with an M (for example 3,500,000 becomes 3.5M), but thousands remain unchanged (EG: 770,000 remains as 770,000).	Display