Australian Government

Jobs and Skills Australia

Skills Priority List Methodology

September 2023

Contents

Overview

Introduction

The Skills Priority List (SPL), produced by Jobs and Skills Australia, provides a detailed view of occupations in shortage and the future demand for occupations in Australia. The SPL is released annually as a point-in-time assessment of the labour market.

The purpose of this paper is to provide readers a deep understanding of the methodology used to create the 2023 SPL, particularly the occupation ratings. The paper describes the scope of the SPL, the definition used for occupation shortages listed in the SPL, the sources used in the occupation assessments and how that body of evidence is used to produce occupation ratings.

The sources used to assess occupation shortages are diverse. These include data modelling, statistical analysis of the labour market, employer surveys and broad stakeholder engagement with various groups. These groups include peak bodies, industry groups, professional associations, unions and regional representative bodies in the Australian labour market. Input and feedback are also sought from with federal and state and territory governments and Jobs and Skills Councils.

The 2023 SPL has been produced by the Jobs and Skills Australia. The previous 2021 and 2022 SPLs were produced by the National Skills Commission (NSC), which has been abolished with the passage of the Jobs and Skills Australia (National Skills Commissioner Repeal) Act 2022. As of 16 November 2022, Jobs and Skills Australia commenced as an Australian Government statutory body. Jobs and Skills Australia will continue to produce the annual SPL.

How SPL is used

The SPL is a key source of labour market information and – along with other sources of intelligence produced by Jobs and Skills Australia – helps inform advice on a range of Australian Government policy and program initiatives. As more years of SPL outcomes become available, researchers and policy makers will be able to clearly identify occupations that experience persistent shortages, relative to those where the likelihood of a shortage may depend more on the prevailing economic conditions. This insight may assist policy makers target longer-term responses to occupation shortages.

Some current initiatives that the SPL helps inform include the Australian Apprenticeship Priority List and the extension of post-study working rights for international students. The SPL may also be used as part of future analysis to support the Government's migration strategy.

Future updates

The SPL methodology will be revised and updated as further data sources and information become available. This will ensure the methodology continues to provide the most accurate assessment of occupations possible.

The SPL will be published on the Jobs and Skills Australia website along with additional reports developed from the analysis of occupations.

Occupation shortage definition

An occupation is defined as in shortage when employers are unable to fill, or have considerable difficulty filling, vacancies for an occupation or cannot meet significant specialised skill needs within that occupation, at current levels of remuneration and conditions of employment, and in reasonably accessible locations.

Based on this definition, the primary measure of an occupational shortage is the ability of employers to fill vacancies or the proportion of vacancies that are filled (the fill rate).

The analysis demonstrates that the fill rate is a sound measure of occupation shortages in the labour market. There is a high likelihood of an occupation to be in shortage when:

- estimated fill rates are below 67%

- a large proportion of potential fill rates (within an 80% confidence interval) falls below 67%.

Lower fill rates imply greater employer difficulty with filling vacant positions, indicating a shortfall in suitably skilled workers and a higher likelihood of occupations in shortage. Higher fill rates imply fewer challenges with filling vacancies and a lower likelihood of shortages.

Another advantage of using fill rates is that the metric accounts for both employer demand for skilled workers and the supply of those workers. Analysis of shortages is not based on demand or supply alone.

To ensure assessments of occupations are comprehensive and accurate, the SPL methodology considers a broader set of evidence beyond fill rates and confidence intervals.

SPL Categorisation

Occupation ratings in the SPL fall into either Shortage (S), No Shortage (NS) or Regional Shortage only (R).

The future demand categories include Above economy-wide average, At economy-wide average or Below economy-wide average. For example, an occupation with Above economy-wide average rating means that its future demand growth is predicted to be above the average future demand growth of all occupations in the SPL. An occupation with Below economy-wide average future demand rating means that its future demand growth is below the average of all SPL occupations.

The ratings are summarised in Table 1 and a detailed explanation of the ratings is available in Appendix A. All occupations are allocated to one of these categories but are not further ranked.

Table 1: SPL Categorisation

Current Labour Market Rating	Future Demand Rating (Compared to economy-wide average)
Shortage	Above economy-wide average
Shortage	At economy-wide average
Shortage	Below economy-wide average
No Shortage	Above economy-wide average
No Shortage	At economy-wide average
No Shortage	Below economy-wide average
Regional Shortage	Above economy-wide average
Regional Shortage	At economy-wide average
Regional Shortage	Below economy-wide average

Scope and granularity

The SPL covers over 900 occupations, defined in the 2022 Australian and New Zealand Standard Classification of Occupations (ANZSCO) for skill levels from 1 to 4. Occupations defined at six-digit ANZSCO are also included to provide the most granular view of developments in the labour market.

Several occupation groups are excluded from the SPL, including skill level 5 occupations,[1] New Zealand occupations,[2] and occupations where the labour market is not open and contestable.[3] The full list of excluded occupations is in Appendix B.

The exclusions imply that the SPL covers those occupations that tend to require post-school qualifications and where there is a competitive process for selecting suitably skilled applicants for vacant positions. Emphasis is placed on Skill Level 1 to 4 occupations due to their link to education and training. Occupations in shortage for several years, particularly those where qualifications are mandatory, therefore have implications for the education and training sector in Australia.

Occupations are first assessed using various sources of input at the national level for 6-digit occupations defined in the 2013 ANZSCO. This is because most Australian Bureau of Statistics (ABS) data are currently based on 2013 ANZSCO and, therefore, enables greater usage of ABS data sources alongside other evidence to support a thorough assessment of

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[1] The Australian Bureau of Statistics defines skill level 5 occupations as having a level of skill commensurate with AQF Certificate I or compulsory secondary education. For some occupations a short period of on-the-job training may be required in addition to or instead of the formal qualification. The skill level 5 occupations have fewer barriers to entry and unlike other in-scope occupations, they generally do not require significant post-school education and training.
[2] Maori specific occupations are examples of New Zealand occupations only.
[3] For example, defence force roles, judges and detectives will not be covered as recruitment is mainly conducted internally.

occupations. As the ABS publishes more occupation-specific labour market data that reflects subsequent updates to the ANZSCO framework, the data used for the initial SPL assessments will shift accordingly.

Evidence base for occupation assessments

Some key quantitative and qualitative sources used in occupation assessments are listed in Table 2.

Table 2: Quantitative and qualitative evidence for occupation assessment

Quantitative	Qualitative
Model Indicating Skills Shortages in Occupations Nationally (MISSION)	Australian and New Zealand Standard Classification of Occupations task descriptions
Survey of Employers who have Recently Advertised	Survey of Employers who have Recently Advertised
Survey of peak and representative bodies	Survey of peak and representative bodies
JSA five-year employment projections	Federal Government inputs and feedback
Australian Bureau of Statistics Labour Force Statistics	State and territory government inputs and feedback
Australian Bureau of Statistics 2021 Census	Jobs and Skills Councils inputs and feedback
Australian Bureau of Statistics Participation, Job Search and Mobility	Intelligence gathered from meetings with various stakeholders
Other data sources	Media and industry reports

Further information on the occupation assessment process and how the sources are used is detailed in the relevant sections of this paper.

SPL assessment framework

A new approach is implemented to produce the 2023 SPL. This is done to enhance the consistency, reliability and speed of assessing occupations going forward. The approach consists of 3 phases. These phases are shown in Figure 1 and explained in greater detail in the subsequent section of the paper.

Figure 1: Three-phase occupation assessment process

Phase 1: Initial indicative ratings via an algorithm

The algorithm produces an initial indicative rating of whether an occupation is in shortage or not in shortage. It is a set of decision rules that are applied to the various primary and secondary inputs (Table 3). The paper describes the key decision rules and how the algorithm operates conceptually and does not detail every step undertaken by the algorithm.

Over time, the algorithm will continue to be refined so that it can more accurately predict occupation shortages. Additional data sources with strong predictive links to occupation shortages will be added as inputs where feasible.

Table 3: Inputs to the algorithm

Primary inputs	Secondary inputs
Model Indicating Skills Shortages in Occupations Nationally (MISSION)	**ABS Labour Force Statistics**
• Modelled fill rate (point estimate). • Confidence intervals (CIs) of estimated fill rate. • Change in the CI from previous year. • Proportion of the CI that is below 67%. • Change in the proportion of the CI that is below 67% from previous year.	• Current and five-year historical growth.
Survey of Employers of have Recently Advertised	**ABS 2021 Census**
• Observed fill rate based on survey responses. • Number of employer contacts. • Change in the observed fill rate from previous year.	• Employment level.
Representative body survey	**Jobs and Skills Australia data assets**
• Weighted numbers of stakeholder submission. • Weighted proportion of submissions proposing shortage. • Weighted proportion of responses proposing no shortage.	• Five-year employment projections.

The algorithm first generates up to three ratings based on each of the primary inputs:

- Survey of Employers who have Recently Advertised (SERA)
- Model Indicating Skills Shortages in Occupations Nationally (MISSION)
- Peak and representative body survey
  (referred to as stakeholder survey in the rest of the report).

The ratings are then combined into an indicative rating as illustrated in Figure 2. The inputs into the algorithm and how they are used to generate indicative occupation ratings are described in the subsequent sections of this paper.

Figure 2: How the algorithm determines an initial indicative rating

Green occupations

Amber occupations
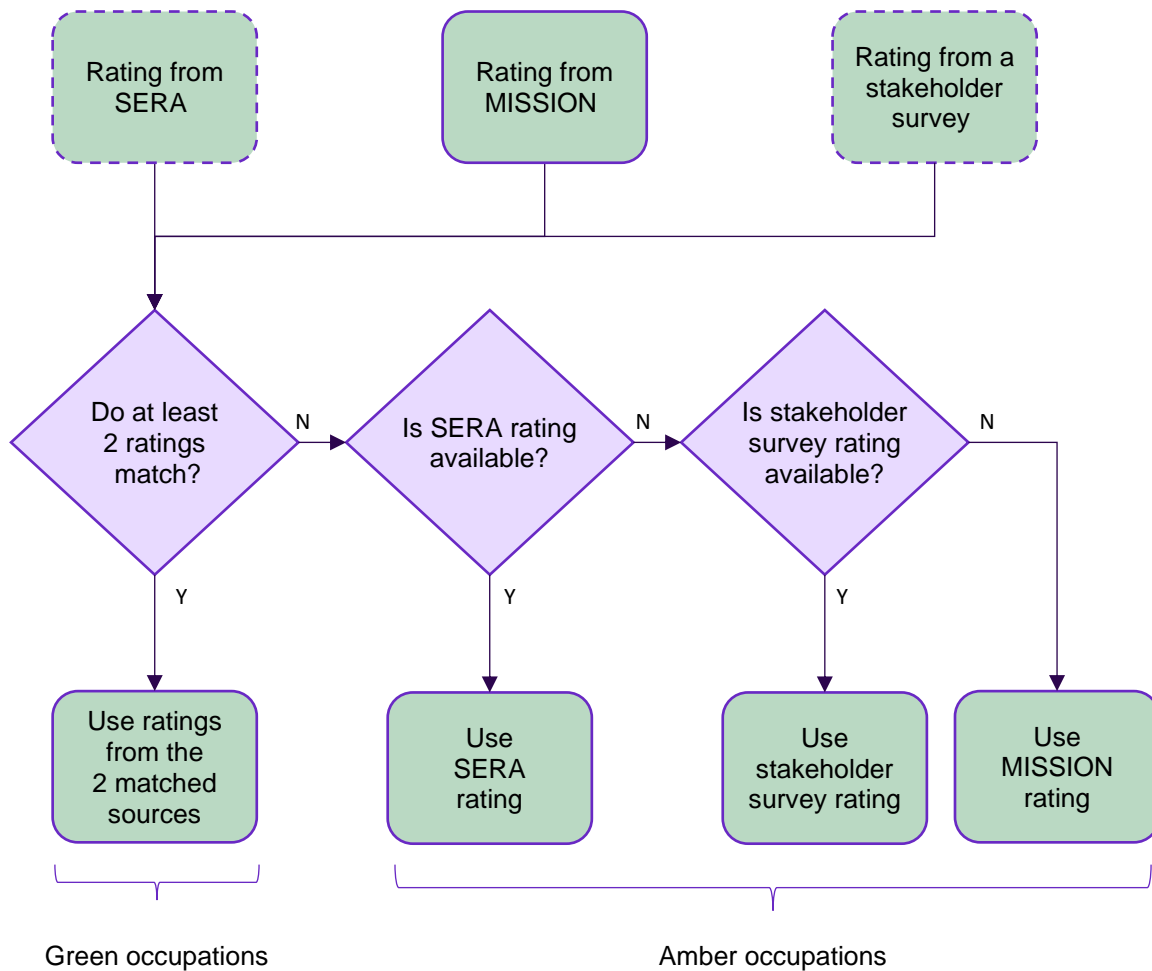
Overall occupation rating from primary sources

The algorithm produces an overall rating of shortage or no shortage for an occupation if at least two of the three primary inputs suggest shortage or no shortage, respectively.

Green occupations are those whose overall indicative rating is supported by at least two primary sources from which their ratings match. The primary sources must also have a sufficient number of observations. These are categorised as high-confidence indicative ratings.

Amber occupations have only either one source of evidence or two sources of evidence, but the ratings from each source contradict. These are categorised as inconclusive or low-confidence indicative ratings.

The various scenarios that lead to green occupations or amber are summarised in Table 4.

Table 4: Scenarios of green and amber occupation ratings

Primary inputs	Green occupations						Amber occupations		
MISSION	Y	Y	Y	Y*	Y	Y	Y*	Y*	Y
SERA	Y	Y	Y*	Y	Y	N	Y	N	N
Stakeholder	Y	Y*	Y	Y	N	Y	N	Y	N
Possible scenarios	YYY	YYY*	YY*Y	Y*YY	YYN	YNY	Y*YN	Y*NY	YNN
Indicative rating	High-confidence						Low-confidence		

Note:
1. **Y** stands for Yes when one primary input is available with sufficient observations to determine a rating.
2. **N** stands for No when one primary input is not available or available but with small samples sizes to determine a rating.
3. * Implies a case when an evidence input is available for a rating, but it contradicts the rating of another input.
4. For example, scenario YYY* says 3 individual ratings from the 3 evidence sources are available. Mission and SERA state the same rating of Shortage (or No Shortage), while Stakeholder states an opposite rating of No Shortage (or Shortage).

Two years of evidence from the mentioned sources are used to capture time trend effects and changes in labour market conditions. A weight of 75% is applied to current year sources, with 25% to previous year sources. This weighting smooths the changes in ratings year to year and reflects the fact that any skills shortage pressures that employers are facing do not 'reset to zero' at the start of each SPL assessment period.

Primary inputs for algorithm

Survey of Employers who have Recently Advertised (SERA)

The SERA is designed for assessing occupational shortages and provides direct measures of employer experiences when recruiting.

The SERA is a telephone-based survey of employers who have advertised vacancies. These employers have had recent interactions with the labour market and are, therefore, able to provide information on current recruitment conditions and identify issues for selected occupations. The survey asks employers a range of questions regarding their recruitment experience for an advertised vacancy, collecting both quantitative and qualitative data.

Examples of the quantitative data collected include the proportion of vacancies filled, the number of applicants, qualified and suitable applicants.

Qualitative questions are asked to identify key labour market issues and include questions relating to reasons why vacancies are not filled, why applicants are considered unsuitable and the impact of recruitment challenges on employers.

The SERA collects data on the recruitment experiences on around 9,000 employers annually, spread over approximately 350 occupations. Data is collected for 6-digit ANZSCO defined occupations and focuses on relatively large occupations (national employment of at least 1,500 people), where enough job advertisements are available each year to conduct employer surveys.[4]

Most occupations covered require at least 3 years of post-school education and training. These are generally Professionals and Technician and Trades occupations encompassing

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[4] From the most recent Census of Population and Housing

skill levels 1 to 3. A subset of skill level 4 occupations that have a strong link to training are also prioritised in the SERA. Due to the focus on skilled occupations in the SERA, the fill rates can be used to determine whether there is adequate skilled supply to meet demand.

More information on SERA is provided in Appendix C.

Usage in the algorithm

The algorithm selects SERA data for occupations with at least 20 contacts (different employers surveyed) to indicate the occupation rating. Jobs and Skills Australia testing has found that 20 or more employer contacts will typically produce representative and reliable fill rates, including the other SERA variables used in the assessment.

In the next step, the algorithm rates the occupation in shortage if:

1. less than two thirds of vacancies (67%) are filled in an occupation and

2. the change in the fill rate exceeds 20 percentage points from the previous year (if the previous year's rating was no shortage)

or

1. close but NOT less than two thirds of vacancies (67%) are filled in an occupation and

2. the change in the fill rate less than 20 percentage points from the previous year (if the previous year's rating was that the occupation was in shortage).

The 67% threshold used in this algorithm is based on historical average fill rate data. Jobs and Skills Australia testing has found this threshold produces stable results over time. Occupations with fill rates below 67% tend to be in shortage. The change in the fill rate from the previous year is considered to ensure a gradual and reliable transition and avoid any sudden shift in rating, particularly in cases where the change in estimated fill rate was relatively small (for example, from 65% in one year to 70% the following year or vice versa). Conversely, a significant difference in fill rates may indicate a strong labour market change and suggest that a change in the rating for that occupation is appropriate.

The decision process of the algorithm on SERA data is illustrated in Figure 3.

Figure 3: Process flow to determine initial SERA rating
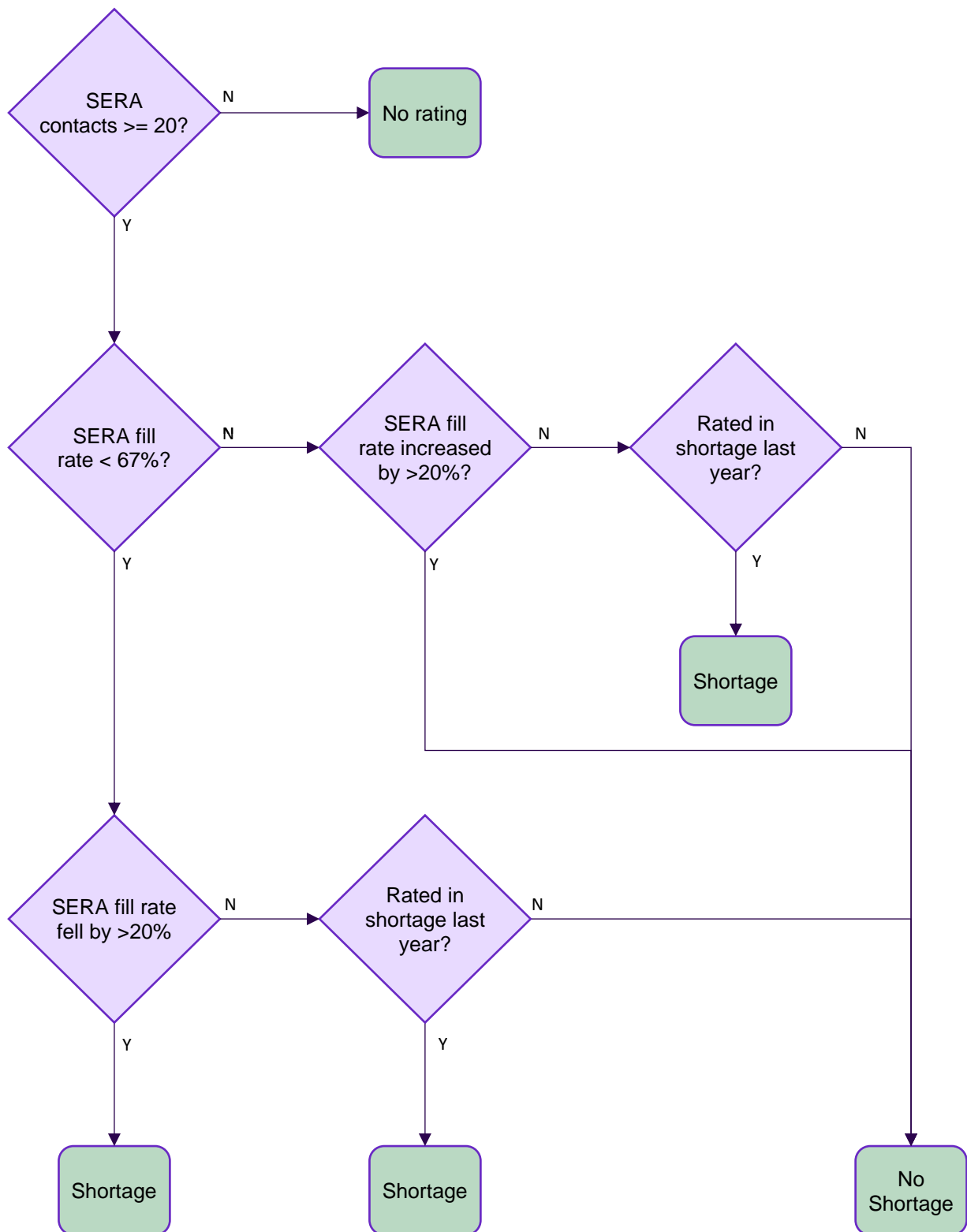
Model Indicating Skills Shortages in Occupations Nationally (MISSION)

The MISSION is a logistic regression model that estimates fill rates over a 12-month period for over 900 occupations at the 2013 ANZSCO six-digit level.[5] The model also produces an estimated level of certainty around the estimate (which is used to derive a confidence interval for the estimated fill rate), for all in-scope occupations at both the national and state and territory levels.

Data inputs to the model include the change in the number of average weeks spent looking for work for unemployed persons, internet job vacancies, size of occupational employment, unemployment rates, change in average salaries, job qualification requirements, and visas granted relative to occupation size.

MISSION fill rates provide a useful comparison to SERA data, including estimates of fill rates for occupations that are low employing and difficult to survey.

A decision tree-based[6] machine learning algorithm was applied to create a shortlist[7] of labour market indicators that were most predictive of vacancy fill rates. The final list of indicators used in the model are those that are predictive of vacancy fill rates, with an interpretable modelled relationship with fill rates[8] that contribute most to improvement in model performance.

The MISSION will continue to be refined and tested further as additional or improved datasets become available. For example, Jobs and Skills Australia will consider the use of labour market nowcasting (monitoring of recent past) inputs or other additional data where available and relevant.

Where indicators are available at lower geographical levels, a credibility approach has been used. For example, the adopted state-level indicator is a weighted average of the state and national values.

Finally, the MISSION fill rate is blended back to the SERA fill rate. This is done because the model, while accurate for most occupations, can have errors for some occupations. In those cases using the SERA fill rate may be more appropriate. To determine how much weight should be placed on MISSION and SERA results, a credibility approach was employed, using the total vacancies of the SERA data as weights.[9] If the count of SERA vacancies is low, the MISSION result has nearly full weight and vice versa.

More detailed explanation of the variables used in the model and other related information is provided in Appendix D.

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[5] A GLM is a model that relates the target variable to a linear response via a transformation known as a link function. The target variable in this case is the fill rate, which is a probability ranging from 0 to 1. Therefore, the link function used is the logit function, meaning the specific GLM used is called a logistic regression model. More details are in Appendix D.

[6] The algorithm used was gradient-boosted trees. This is a method that captures complex interactions among variables in a way that deals with correlations. It does this by creating many simple models which predict the error left over by the preceding one and then combines them to create a very accurate estimate.

[7] The shortlist was created by ranking a measure known as variable importance, which is a proxy for how much the aforementioned tree-based model relies on a given variable to create the estimate.

[8] Indicators used in the model have an intuitively understandable modelled relationship to fill rates. This allows for a degree of interpretability of the model results.

[9] Credibility theory provides a way of combining estimates (some reliable and some less reliable) to form a more accurate and relevant estimate.

Usage in the algorithm

MISSION outputs that are utilised in the algorithm are as follows:

- The estimated fill rates

- The 80%[10] confidence intervals of the fill rates (a range of values the estimate could take because of uncertainty)

- Change in the fill rates and confidence intervals from the previous year

- The proportion of fill rates within the confidence interval that fall below the 67% threshold

- The change in the proportion fill rates within the confidence interval below 67% from the previous year.

A rule of 90% is used for the percentage of fill rates within the confidence interval that falls below the 67% threshold to determine a likely shortage for MISSION, which is so-called, in short, a proportion below 67%.

Figure 4 demonstrates how to calculate a proportion below 67% and use it to determine an initial MISSION occupation rating.

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[10] The 80% confidence interval defines a range of values where there is an 80% chance the interval contains the true value. Jobs and Skills Australia's estimated fill rates are imperfect and the true fill rate may be higher (or lower) than is estimated. For this purpose, Jobs and Skills Australia focuses on an 80% confidence interval.

Figure 4: Examples of calculating a percentage of fill rates below 67% threshold
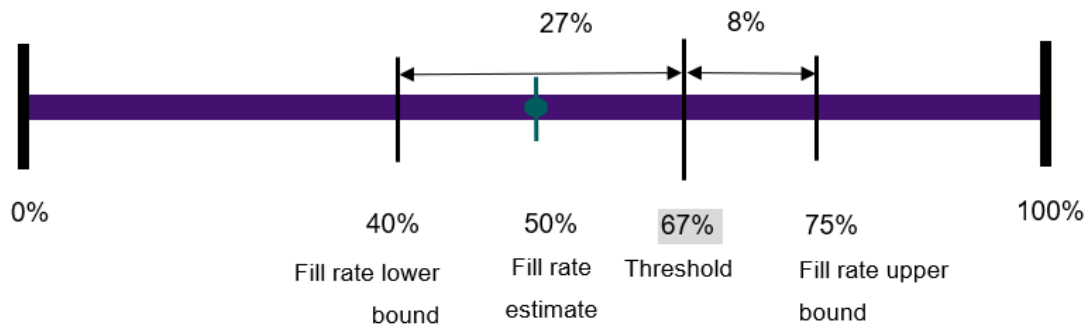
$$\text{Proportion below } 67\% = \frac{27\%}{27\%+8\%} = 77\% \quad \text{(No shortage)}$$
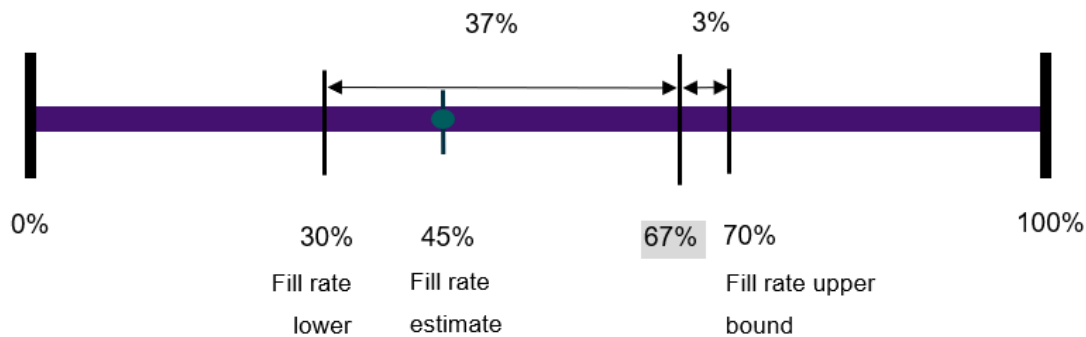
$$\text{Proportion below } 67\% = \frac{37\%}{37\%+3\%} = 93\% \quad \text{(Shortage)}$$

The decision rule underpinning the algorithm is as follows:

1. If the percentage of the fill rate's confidence interval that is below the 67% threshold is 90% or more, then the occupation is likely in shortage.

2. if the percentage of the fill rate's confidence interval that is below the 67% threshold is less than 90%, then

    a. if the previous year was rated as shortage and there is only a slight change in percentage of the confidence interval that is below 67% (a drop by less than 20 percentage points), then last year's rating is likely to still be correct and the occupation is likely to still be in shortage.

    b. If the previous year was rated as no shortage and there is a significant change in the percentage of the confidence interval that is below 67% (an increase by more than 20 percentage points), then the occupation is likely to be newly in shortage.

Otherwise, an occupation is likely to not be in shortage.

The change in the fill rates and confidence intervals from the previous year is considered to ensure a reliable transition and avoid any sudden shift using MISSION data. A large shift in the confidence interval leads to a significant rise in the percentage of potential fill rates that

are below the 67% threshold. This could indicate a significant shift towards an occupational shortage, especially when that occurs alongside strengthening labour market conditions.

With analysis conducted on survey data, an occupation's fill rate can vary throughout a year, as labour demand and supply fluctuate over time. A significant improvement in the percentage of those fill rates falling above 67% indicates a high likelihood of an occupation no longer being in shortage.

Figure 5 illustrates the algorithm decision rules relating to MISSION outputs and calculations underpinning the likelihood of an occupation being in shortage using confidence intervals.

Figure 5: MISSION and how initial ratings are calculated
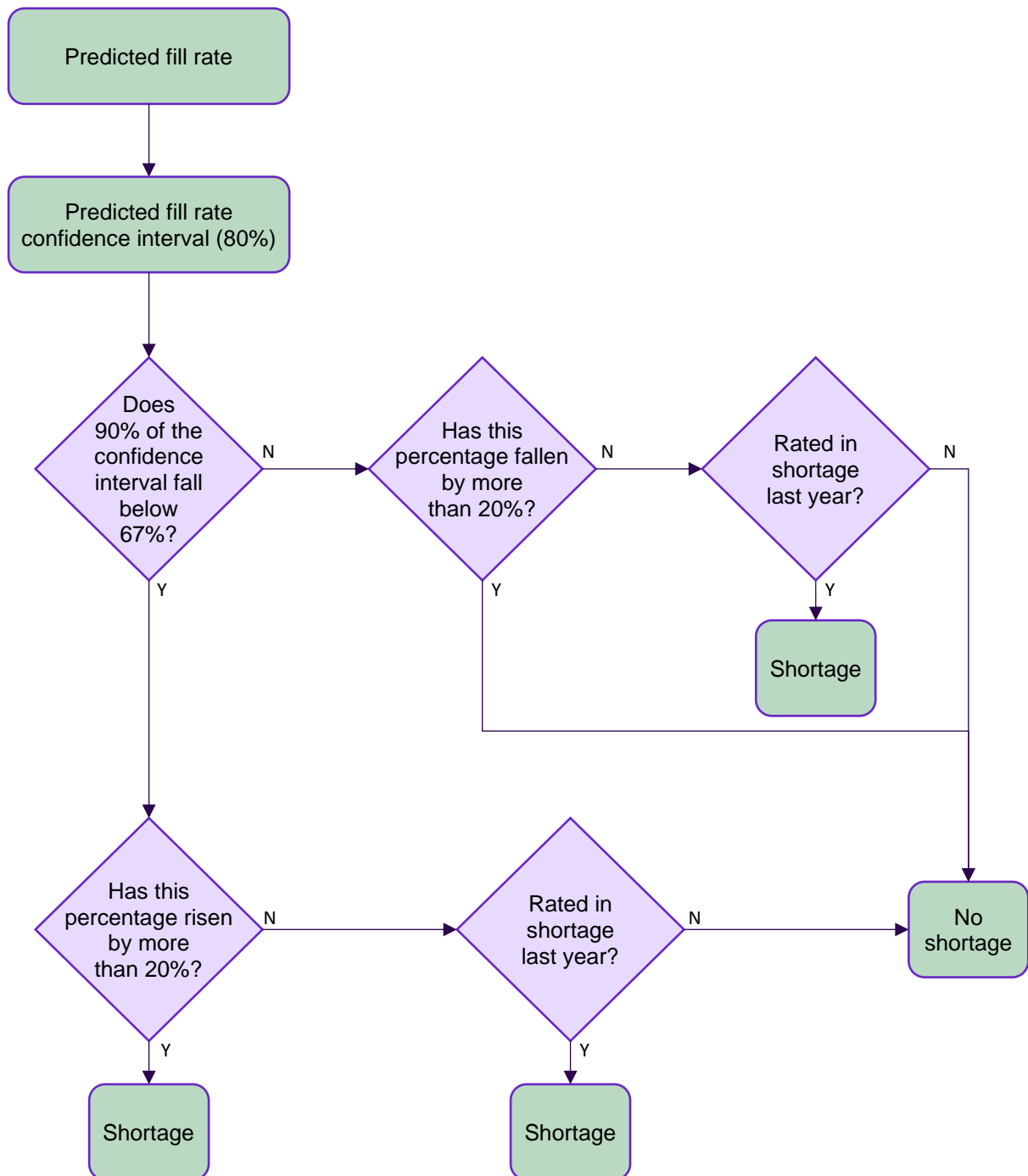
Stakeholder survey

Jobs and Skills Australia's stakeholder survey captures information from stakeholders on recruitment challenges and skills needs across a wide range of occupations and industries. The stakeholders surveyed encompass peak bodies and industry groups, regional bodies, professional associations and unions.

Stakeholders provide explanations and evidence on occupations that are difficult to recruit for in their experience or that their members have difficulty recruiting. Stakeholders also comment on issues regarding access to skills to indicate the shortage or supply adequacy level for an occupation and why any labour market challenges are occurring. These responses support Jobs and Skills Australia's understanding of skills needs across industries, occupations and regions.

Further detail about the stakeholder survey and other related information is provided in Appendix E.

Usage in the algorithm

The primary sources used are:

- Numbers of stakeholder submissions

- Proportion of submissions proposing shortage

- Proportion of responses proposing no shortage.

The number of submissions is calculated subject to the submission strength or whether the provided evidence is compelling. Different factors are considered when determining the strength of the submission, including the quality of the quantitative and qualitative evidence provided, the employment size of the occupation the submission relates to and the membership base of the survey respondent. The latter factor is considered to gauge the representativeness of the survey response.

Stakeholder submissions are also benchmarked against other information pertaining to sectoral and overall labour market developments.

A submission with compelling evidence is weighted twice as much as a submission without. Three variables are derived to feed in the algorithms as follows:

- Weighted numbers of stakeholder submissions

- Weighted proportion of submissions proposing shortage

- Weighted proportion of responses proposing no shortage.

Figures 6 and 7 demonstrates the stakeholder survey outputs that are inputs to the algorithm and the decisions rules applied by the algorithm.

Details of how the three weighted metrics are calculated are in Appendix E.

Figure 6: Stakeholder survey outputs

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                    ┌─────────────────────┐
                    │  Stakeholder survey │
                    └─────────────────────┘
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            ▼              ▼              ▼
   ┌──────────────┐ ┌──────────────┐ ┌──────────────┐
   │ Count of     │ │ Proportion of│ │ Proportion of│
   │ stakeholder  │ │ submissions  │ │ submissions  │
   │ submissions  │ │ proposing    │ │ proposing no │
   │              │ │ shortage     │ │ shortage     │
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            ▼              ▼              ▼
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   │ Weighted     │ │ Weighted     │ │ Weighted     │
   │ count of the │ │ proportion   │ │ proportion of│
   │ submissions  │ │ of submissions│ │ submissions │
   │              │ │ proposing    │ │ proposing no │
   │              │ │ shortage     │ │ shortage     │
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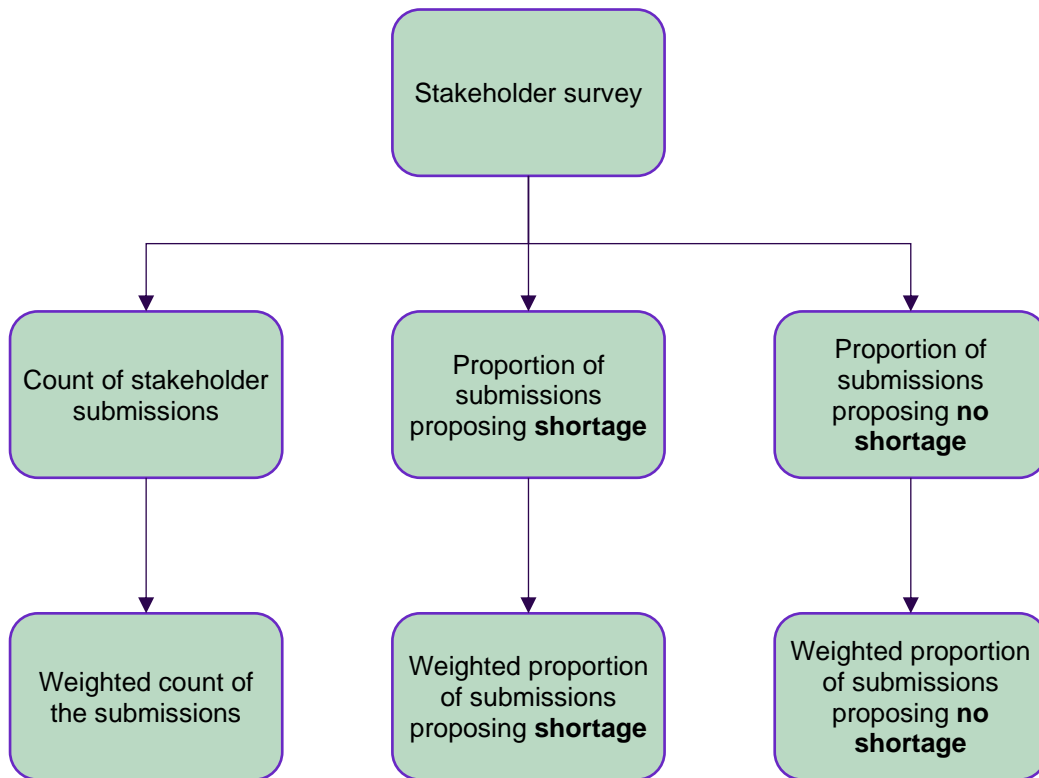
The algorithm only produces a rating for an occupation if its weighted count of submissions relating to that occupation is at or above the historical average, otherwise no rating is provided. This criterion ensures a reliable rating using the stakeholder survey.

Based on the stakeholder survey inputs the algorithm will rate an occupation as:

- being in shortage if at least 75% of stakeholder submissions relevant to that occupation propose that there is a shortage

- no shortage if at least 75% of stakeholder submissions propose no shortage.

If stakeholder responses are more mixed (for example only 60% of stakeholder submissions suggest a shortage or only 60% proposes that there is no shortage), the algorithm will not provide an initial rating for the stakeholder survey results.

Figure 7: Ratings calculated from stakeholder survey
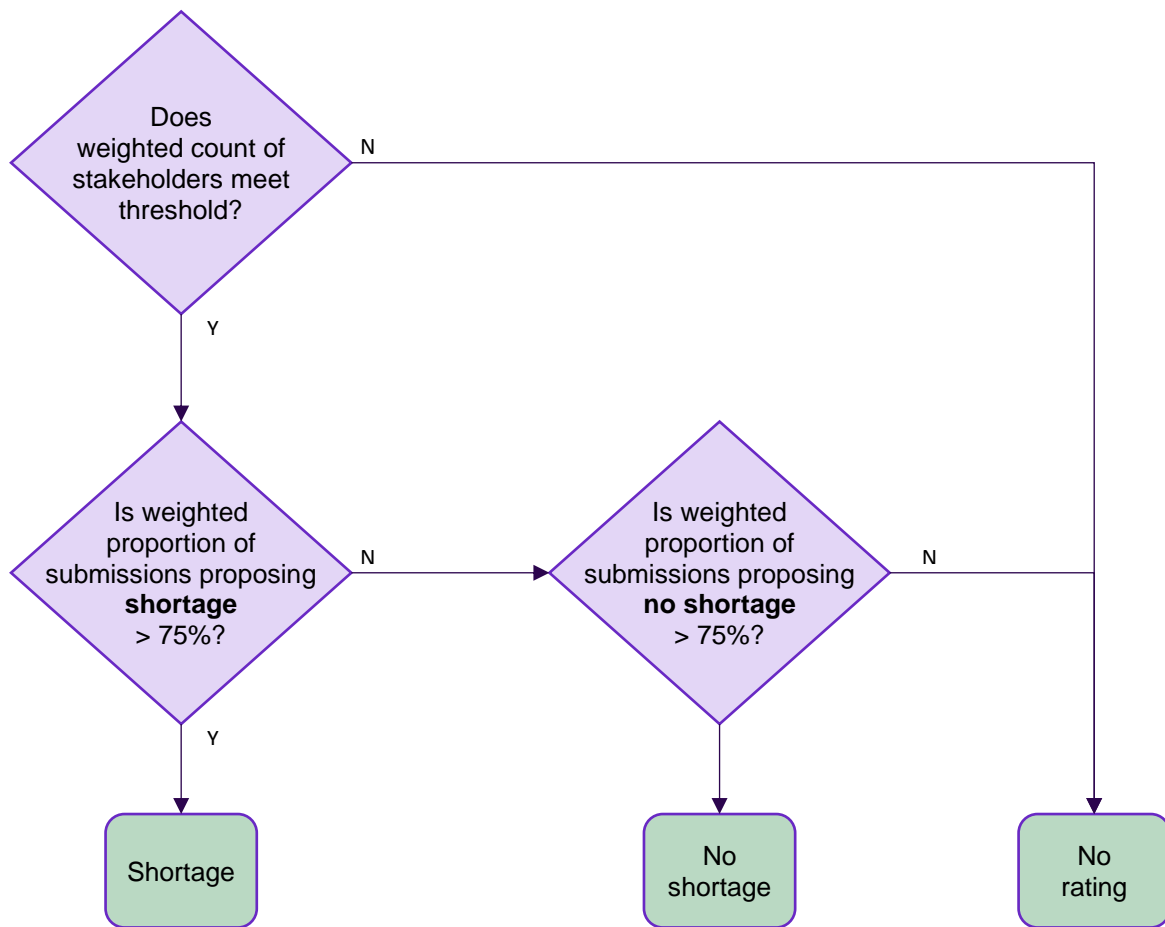
Secondary inputs for algorithm

The algorithm draws on a historical and five-year projected employment growth[11] and current employment level as a secondary source of inputs.

These inputs are used when occupation ratings from the primary sources are:

- low-confidence or inconclusive and

- a change from the previous year, or

- a large occupation.

As mentioned previously inconclusive occupation ratings are those with either one source of evidence or two sources of evidence where the ratings from each source contradict. In such cases the secondary inputs are employed to provide a clearer understanding of the current situation for an occupation when that cannot be ascertained from the primary inputs. The

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[11] The five-year projected employment growth from 2023 to 2028 are based on unpublished Jobs and Skills Australia employment projections, which serve as a guide for future labour market trends. More detailed information on employment projections can be found in Appendix E. The sources for historical employment growth and current employment level are the Australian Bureau of Statistics (ABS) Labour Force Survey and 2021 Census

past and future employment growth are used to shed light on the likelihood of an occupation to be in shortage in the present.

The secondary inputs serve as a check on the reasonableness of the change in ratings from the previous year.

A rating change occurs when an occupation changes from:

- shortage the previous year to no shortage in the current year or

- no shortage the previous year to shortage in the current year.

The algorithm checks whether occupations with inconclusive ratings or where the initial indicative ratings have changed from the previous year are high-growth, low-growth, small or large employing. These categorisations assist the algorithm with determining whether the occupation should initially be rated in shortage or no shortage.

Definitions of high- and low-growth and employment size are shown in Table 5.

Table 5: Classifying occupations based on employment size and employment growth

Occupation categories	Definition
Small employing occupation	• employment size is less than **500**, representing the 10th percentile of employment size.
Large employing occupation	• employment size is greater than **100,000.**
High-growth occupation	• if either the 1-year historical employment growth rate or the 5-year projected future growth rate exceeds the corresponding average growth rate across its corresponding skill level[12] and • neither the historical nor projected employment growth rate is negative.
Low-growth occupation	• both the 1-year historical and 5-year projected future growth rates are positive but are less than average employment growth rate across its corresponding skill level or • either its historical or projected employment growth rate is negative.

Table 6 demonstrates how the algorithm adjusts the primary input occupation ratings after analysing the secondary inputs for the situation where occupation ratings change from the previous year.

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[12] The 5-year averages are calculated by aggregating the total employment size (current and projected) across each skill level 1-4 and determining the growth rate for each of them. The corresponding 1-year averages are calculated by reversing the compound growth rate with the formula $1 \text{ year growth} = (1 + 5 \text{ year growth})^{1/5} - 1$. The 1-year historical growth is not used for calculating the average rate due to its volatility.

Table 6: Changes made by the algorithm after consideration of secondary inputs

Rating change from previous year to current year	Small occupation	Large occupation	High-growth occupation	Low-growth occupation	Final Rating
Shortage to No shortage (S to NS)	✓			✓	**NS**
			✓		**S (*)**
		✓			**S**
No shortage to Shortage (NS to S)	✓			✓	**NS**
			✓		**S**
				✓	**S (**)**

Note: The criteria are also considered together with the primary inputs.
(*) The rating is only changed to S after consideration of secondary inputs from that of the initial primary input rating of NS if the primary input evidence was weak or borderline.
(**) The rating of S is retained after consideration of the secondary inputs if initial primary input rating of S was underpinned by strong primary input evidence.

Phase 2: Human check and benchmarking

In phase 2, the algorithm's indicative ratings are tested and validated through a rigorous human review and assessment process. This iterative process ensures that the ratings generated by the algorithm are sensible and reliable.

A human check is needed as the algorithm:

- is not 100% accurate[13]

- does not consider all important sources of information, particularly qualitative information

- relies on primary data sources that can be limited for some occupations, increasing the uncertainty around the indicative ratings

- cannot ascertain the implications of sectoral and broader labour market trends on skill shortages.

In this phase of occupation assessments, the indicative ratings from phase 1 are benchmarked against various sources of information. All ratings are checked regardless of data quality but checks of inconclusive ratings are prioritised.

Each Jobs and Skills Australia assessor is provided with a check list of additional quantitative and qualitative information to compare the phase 1 indicative ratings against. These are summarised in Table 7.

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[13] Testing on past year SPL outcomes shows that, on average, there is an 85% match rate between the algorithm-based ratings and human-based occupation assessments.

Table 7: Phase 2 occupation rating benchmarking checklist

Quantitative	Qualitative
Ensuring validity of indicative shortage rating	Ensuring occupation shortage rating is valid
Benchmark against SERA data (when available): • number of qualified and suitable applicants per vacancy • average years of experience required by employers • reasons an applicant was unsuitable. Benchmark against ABS data sources: • occupation job turnover.	Benchmark against ANZSCO: • occupation tasks and required qualification. Benchmark against stakeholder survey data: • additional context on reason for shortage. Benchmark against intelligence gathered from face-to-face stakeholder engagements: • anecdotal reasons employers experience recruitment challenges and attrition rates.
Ensuring if occupation shortages are widespread or limited to regions	Ensuring if occupation shortages are widespread or limited to regions
Benchmark against SERA data (when available): • occupation fill rates in regions and metro areas. Benchmark against Nowcast of Employment by Region and Occupation: • SA4 (Statistical Area Level 4) level employment and employment to vacancy ratio.	Benchmark against media and industry reports: • information on regional and metro area recruiting difficulties.
Ensuring occupation ratings are aligned with industry and labour market trends	Ensuring occupation ratings are aligned with industry and labour market trends
Benchmark against ABS sources: • Industry and macro-level unemployment rate • Employment to population ratio • Participation rate • occupation earnings growth.	
Further verifications	Further verifications
Benchmark against Jobs and Skills Australia Skills Transitions dataset: • comparing occupation ratings of occupations with high similarity scores and similar underlying skills.	Benchmark against Jobs and Skills Australia sources: • comparing occupation ratings to trending and emerging skills in demand.

This benchmarking exercise tends to result in 10 to 15% of occupation ratings from phase 1 being changed. Such changes occur most frequently for the occupations where ratings were considered low-confidence or inconclusive in phase 1.

Each assessors' occupation assessments are peer-reviewed to ensure consistency and accuracy. This also involves collaborative discussions to reach a consensus on ambiguous cases.

When all available sources of information are exhausted and no strong evidence of shortages is found in either phase 1 or phase 2 assessments, the occupation is rated as not in shortage.

Mapping to 2022 ANZSCO

Assessments and occupation ratings are initially based on the 2013 version of ANZSCO. This is because many data sources currently published at Jobs and Skills Australia (such as the Internet Vacancy Index) are still published on a 2013 ANZSCO basis.

The 2013 ANZSCO occupation ratings are then mapped 2022 ANZSCO to produce the SPL in a way that reflects the newest occupational framework. To facilitate this the ABS has published a mapping file from 2013 to 2021 and from 2021 to 2022. Text mining algorithms are used to then create a mapping file from 2013 to 2022. There can be complex interactions between each basis, but they can be reduced to one of the three following cases.

Case 1: One-to-one (Full) occupation match

This is when there is no difference between an occupation on the 2013 basis and the 2022 basis which is the case for most occupations. In this case the rating from the Phase 2 assessment based on 2013 ANZSCO is carried across.

Case 2: One-to-multiple (Partial) occupation match

This is when an occupation on the 2013 basis branches out into many occupations on the 2022 basis. In this case the rating from the Phase 2 assessment based on 2013 ANZSCO is carried across for all matches found.
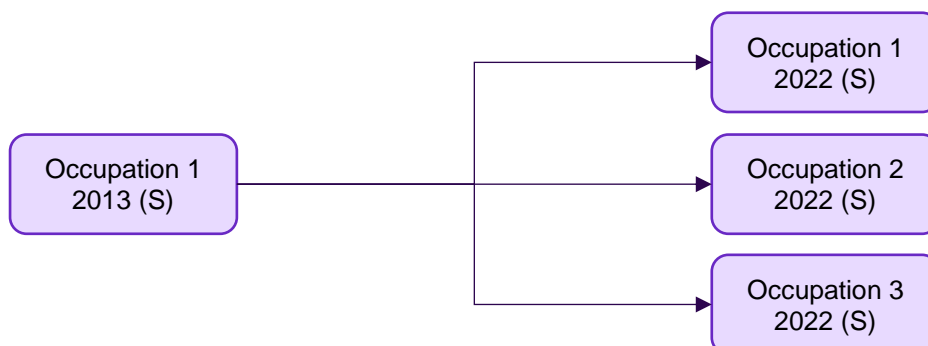
Case 3: Multiple-to-one (Mixed) occupation match
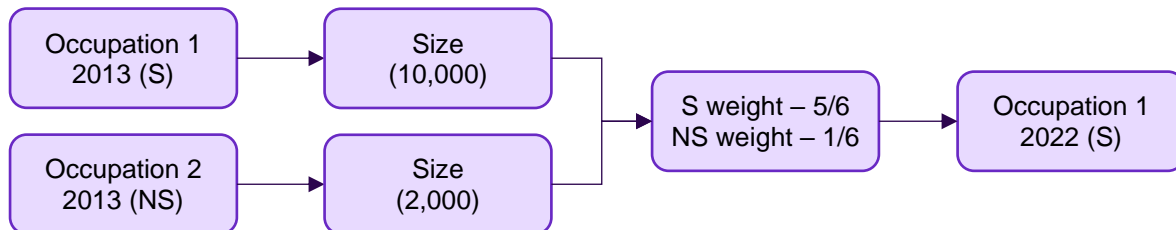
This is when multiple occupations on the 2013 basis branches map to the same occupation on the 2022 basis. This is the most difficult case, as the constituent ratings may disagree with each other. In this case the employment size for each 2013 occupation is used as a weight. The rating with the highest weight becomes the 2022 occupation rating.

```
Occupation 1         Size
2013 (S)    ──►    (10,000)  ──┐
                               ├──►  S weight – 5/6    Occupation 1
                               │     NS weight – 1/6 ──► 2022 (S)
Occupation 2         Size      │
2013 (NS)   ──►    (2,000)  ───┘
```

Phase 3: Incorporate stakeholder feedback

Consultation with government agencies

Jobs and Skills Australia consults with government stakeholders on the development of the SPL, including through working groups where appropriate.

A draft SPL (based on indicative ratings from phases 1 and 2 of Jobs and Skills Australia's internal analysis) is tested with Federal Government and with state and territory government agencies as well as with Jobs and Skills Councils (JSC's). The aim is to seek any additional context or evidence that may not have been considered under phase 1 and 2 occupation assessments.

Feedback is sought from:

- Federal Government agencies on the national level occupation ratings

- JSCs on national level occupation ratings for occupations that relate to each JSC's areas of industry expertise

- State and territory government agencies on where national occupation ratings do not apply to the state or territory, reflecting the unique labour market characteristics that are observed in each state and territory.

Criteria is tailored for each stakeholder is applied to the feedback received to assist with incorporating the feedback. The principles underpinning the criteria are shown in Table 8.

Table 8: Criteria for accepting stakeholder suggested occupation ratings

Criterion	Description
1	Occupations ratings differ from suggested stakeholder occupation ratings
2	Occupation ratings from phase 1 were in the low confidence category (i.e., where Jobs and Skills Australia evidence is lacking)
3	Jobs and Skills Australia methodology scope aligns with stakeholder methodology scope
4	Information provided by stakeholders was not previously considered by Jobs and Skills Australia
5	Stakeholder modelling and their stakeholder feedback overlap; or
6	Additional justifications are sound and underpinned by evidence.

Additional rules are applied when state and territory-specific feedback is provided.

If feedback is received on state and territory level occupation ratings and they are accepted, rules are run to check whether the accepted feedback impacts the national level rating.

Rule: for each occupation whose state and territory level ratings of shortage were accepted, if the sum of the employment share of states and territories where a shortage exists exceeds two-thirds of national employment, then the national rating is also shortage. This ensures that the national ratings in the 2023 SPL reflects the cumulative impact of the state and territory ratings.

If feedback is not received from a state or territory, additional rules are applied to ascertain the occupation rating for that state or territory.

Rule: for each occupation, the state or territory is given a no shortage rating if they:

- have fewer than 25 workers and less than 3% of the total national workers as per the ABS Census 2021
- were not in shortage in the previous year for that jurisdiction
- state feedback was not considered sufficiently robust to accept the proposed rating.

If these rules are not satisfied, the state or territory is given the national level occupation rating.

Appendices

Appendix A – Occupation Ratings

Taking account of all available information a labour market rating is determined for each occupation. Ratings are provided nationally and for each state and territory where sufficient evidence is available. Where there is evidence suggesting variation between metropolitan and regional locations, this is reflected in the rating. The term metropolitan area refers to state and territory capital cities and regional refers to the remainder of the state or territory. The Australian Capital Territory (ACT) is not considered to have a regional area.

An occupation may be assessed as being in shortage even though not all specialisations or industries are in shortage and a rating of national shortage does not mean that employers in every geographical location or industry have difficulty recruiting. While an occupation can be considered in shortage, it is still possible that job seekers can face significant competition for positions (due to the level of experience or specialisations required). Employers can still have difficulty recruiting for occupations that are not in shortage.

The SPL provides the following ratings of the current labour market for occupations where sufficient data are available to make an assessment.

Shortage (S)

Shortages exist when employers are unable to fill or have considerable difficulty filling vacancies for an occupation or significant specialised skill needs within that occupation, at current levels of remuneration and conditions of employment and in reasonably accessible locations.

Shortages may be apparent in particular specialisations within an occupation, but otherwise shortages are not apparent. In such cases provided there is sufficient evidence, the occupation will still be considered in shortage.

Regional Shortage (R)

Shortages (as defined previously) are restricted to regional areas.

No Shortage (NS)

Research has not identified any significant difficulty filling vacancies.

For some occupations a lack of evidence overall will by default result in an occupation being rated as 'No Shortage.'

Appendix B – Occupations out of SPL scope

There are several occupations that are excluded from the SPL, including skill level 5 occupations, occupations only present in New Zealand and occupations where the labour market is not open and contestable.

Skill level 5 occupations

There are 156 Australian skill level 5 occupations that are excluded from the SPL scope. Skill levels are published on the Australian Bureau of Statistics (ABS) website.

The ABS defines skill level 5 occupations as having a level of skill commensurate with AQF (Australian Qualifications Framework) Certificate I or compulsory secondary education. For some occupations a short period of on-the-job training may be required in addition to or instead of the formal qualification. The skill level occupations have fewer barriers to entry and unlike other in-scope occupations, they generally do not require significant post-school education and training.

New Zealand occupations

There are seven Maori specific occupations that are excluded from the SPL. Maori specific occupations are examples of New Zealand occupations only.

List of New Zealand occupations

ANZSCO	Description
241112	Kaiako Kohanga Reo (Māori Language Nest Teacher)
241211	Kaiako Kura Kaupapa Māori (Māori-medium Primary School Teacher)
241212	Pouako Kura Kaupapa Māori (Māori-medium Primary School Senior Teacher)
252215	Traditional Māori Health Practitioner
411512	Kaiāwhina (Hauora) (Māori Health Assistant)
422113	Kaiāwhina Kohanga Reo (Māori Language Nest Assistant)
422114	Kaiāwhina Kura Kaupapa Māori (Māori-medium School Assistant)

Occupations where the labour market is not open and contestable

There are 16 occupations where the labour market is not open and contestable. For example, defence force roles, judges and detectives will not be covered as recruitment/appointment is mainly conducted internally.

List of not open and contestable occupations

ANZSCO	Description
111212	Defence Force Senior Officer
111311	Local Government Legislator
111312	Member of Parliament
111399	Legislators nec
139111	Commissioned Defence Force Officer
139112	Commissioned Fire Officer
139113	Commissioned Police Officer
139211	Senior Non-commissioned Defence Force Member
271211	Judge
271212	Magistrate
271213	Tribunal Member
441111	Defence Force Member – Other Ranks
441311	Detective
452411	Footballer
452412	Golfer
452499	Sportspersons nec

Appendix C – SERA Methodology

C.1 Sampling Methodology

A sample of employers for selected occupations are surveyed through a structured, telephone-based survey. Employers are asked about their experiences recruiting for specific advertised vacancies in particular occupations (see Appendix C.2 for the SERA questionnaire).

Surveyed vacancies are for specific positions offered for paid work of 15 hours or more per week and at least three months' duration.[14] Advertisements for self-employment or partnerships are generally excluded. However in industries where there is significant sub-contracting (for example, construction), such positions may be included. Vacancies advertised by recruitment agencies are included in SERA if they are for an actual vacancy with an employer rather than a general 'canvassing' advertisement.

Vacancies are surveyed across all states and territories. The sampling method used is a blended fixed and proportional approach. Samples are based on employment levels in the regions such that they proportionally match the population, but to have sufficient data to draw conclusions from smaller jurisdictions and occupations, more data than what would be proportionally accurate is collected. For example, given the number of employers that can realistically be surveyed, a given occupation may only have a small proportion of the labour market such that 10 vacancies would be collected. However, 10 survey responses is not enough for robust analysis to be conducted, so a target of 40 vacancies for many occupations (and 20 vacancies in limited circumstances) is set instead.

Attempts are made to survey an appropriate number of employers from both metropolitan and regional areas. The proportion of vacancies outside metropolitan areas depends on the state or territory's employment profile, as well as the profile for the particular occupations. The term metropolitan area refers to state and territory capital cities and regional refers to the rest of the state or territory.

SERA occupation coverage within the SPL has expanded considerably. SERA data is now collected for over 350 occupations (more than four times the number covered previously). Over half of the occupations covered by SERA are Professionals (ANZSCO major group 2) and Technicians and Trades Workers (ANZSCO major group 3), noting though that the program also includes Manager (major group 1) and Community and Personal Service Workers (major group 4) occupations, as well as a number of targeted occupations within the remaining ANZSCO major groups 5 to 8.

The majority of the occupations covered by the SERA are skill levels 1–3, as these occupations have longer lead times for training and/or greater required experience. A number of skill level 4 occupations are also surveyed, with occupations that have strong links to training and employ many workers, being prioritised for inclusion in the SERA research.

Occupations included in the SERA program are reviewed annually. The method to determine which occupations are included in the SERA research each year balances flexibility and consistency of research, with a set of occupations surveyed annually, along with a variable subset. The occupations included in the subset are chosen based on several factors, including whether they are suitable for inclusion (as outlined earlier in the Survey of

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[14] The thresholds used are to ensure consistency with past approaches.

Employers who have Recently Advertised (SERA) section), results from MISSION, indications of change in the occupational labour market and stakeholder interest in a particular occupation.

Employers are surveyed over the course of a year for all occupations, to reduce the impact of seasonal factors and to ensure research can be drawn on at any point in time for an occupation. Employers are contacted one to two months after advertising a vacancy.

C.2 SERA Questionnaire

- What is the postcode where the vacancy is located?
- How many positions for [target occupation] were you attempting to fill?
- How many of these positions were filled?
- How many people applied for the position(s)?
- Are formal qualifications required for the position?
  - (If yes) what qualification are required?
  - (If yes) how many applicants had the required qualification?
  - (If no) how many applicants held a relevant, formal qualification?
- Is relevant experience required for the position?
  - (If yes) what is the minimum length of experience required for the position?
- Are any specific skills or specialised experience required for the position?
  - (If yes) what specific skills or specialised experience are required?

- How many applicants were suitable – that is, they had the qualifications, skills and experience to do the job?

- What were the main reasons applicants were considered unsuitable for the position?

- How long have you been trying to fill the vacancy/ies? or
  How long did it take you to fill the vacancy/ies?

- (If insufficient suitable applicants were attracted) why?

- (If suitable applicants were attracted, but the vacancy was not filled) why?

- (If vacancy unfilled) what will be done now?

- What are the main tasks and duties of the position(s)?

- Is the position full-time, part-time or casual?
  - (If part-time or casual) for how many hours per week, on average, is the position?

- Is the position permanent (ongoing) or a contract (fixed term)?
  - (If contract) what is the length of the contract?

- What goods or services does your organisation mainly produce or supply (what industry is your organisation in)?

- How many staff are currently employed in this organisation in Australia?

- Do you have any other comments in relation to this recruitment round or the labour market for this occupation?

- Would you like to receive a copy of the report once it is published?

Appendix D – MISSION details

D.1 Logistic Regression

Jobs and Skills Australia's Model Indicating Skills Shortages in Occupations Nationally (MISSION) is a logistic regression model. The link function for this kind of model is:

$$f(x) = \log\left(\frac{x}{1-x}\right)$$

A link function is a function that transforms the dependent variable (the one being estimated) to more easily allow modelling to take place. The link function is applied to the dependent variable, in this case the fill rate. Then a multiple linear regression model is fit using the variables listed in section C.2. A multiple linear regression tries to relate the target variable to multiple independent variables.

The data is also separated into training and prediction sets. The training set is the historic variable data used to examine the relationship between fill rates and the model variables and the prediction set is from the most recent data that is used to predict current fill rates using the relationships obtained with the training set data.

The general formula is:

$$\log\left(\frac{fill\,rate}{1-fill\,rate}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p = \beta_0 + \sum_{i=1}^{p} \beta_i x_i$$

Where *fill rate* is taken from historical SERA data, p is the number of modelled variables, x_i are the values of the modelled variables in the training set, β_0 is the intercept (the value taken if all the variables take a zero value) and each β_i is a coefficient for each of the modelled variables (how reactive and in which direction the target variable relates to each independent variable).

Once the intercept and coefficients are determined, they are then applied to the prediction set to find the linear predictor (LP) for each occupation.

$$\log\left(\frac{fill\,rate}{1-fill\,rate}\right) = LP = \beta_0 + \sum_{i=1}^{p} \beta_i X_i$$

Where X_i are the values from the prediction set. The fill rate is then calculated by algebraic rearranging.

$$fill\,rate = \frac{1}{1+\exp(-LP)}$$

As the linear predictor approaches negative infinity, the fill rate approaches 0 and for positive infinity approaches 1. It can never go beyond those bounds and so has the desired functional form to predict fill rates.

D.2 Confidence Intervals

The confidence value can be interpreted as how sure one would like to be of a result. For the purpose of SPL analysis, Jobs and Skills Australia focuses on the 80% confidence value. This means that if similar samples were to be taken at random, it is expected that the fill rates calculated from these samples would fall within the confidence interval 80% of the time. If a greater level of certainty is required, the confidence interval would need to widen, in order to accommodate the extra potential fill rates that would have fallen outside of the previous confidence interval. A small confidence interval implies a low level of uncertainty while a wide confidence interval implies a high level of uncertainty.

In addition to the value of the linear predictor, the variance of the linear predictor is also an output of the model. The variance can be interpreted as the level of uncertainty of the estimate and so is the main driver of the confidence interval width. The formula to calculate the upper and lower bounds of the confidence interval is:

$$LP \ Upper/Lower \ CI = LP \ \pm \ Z_{\alpha/2}\sqrt{Var(LP)}$$

Where $Z_{\alpha/2}$ is the two-sided critical value of the standard normal distribution for a $100(1-\alpha)\%$ confidence. Taking the positive branch gives the upper bound of the confidence interval and taking the negative branch gives the lower bound. The upper and lower bounds of the fill rate are found by simply substituting the previous formula into the final fill rate formula derived in Appendix C.1.

$$Fill \ Rate \ Upper/Lower \ CI = \frac{1}{1 + \exp\left(-\left(LP \ \pm \ Z_{\alpha/2}\sqrt{Var(LP)}\right)\right)}$$

D.3 Model Production

During development, performance of the indicator model was tested by fitting the model using a random 70% of the modelling data and comparing model predictions for the remaining 30% ('test data') to what was observed. Figure 8 shows the range of predicted values from the indicator model for observations corresponding to historical SERA estimates. The chart orders predictions from low to high and divides into 20 equally sized groups. It shows the 5% lowest-ranked occupations have a predicted fill rate of 43% and the highest 5% have a predicted rate of 83%, a significant spread. SERA results have then been overlaid to show the strong alignment with the models predicted results.

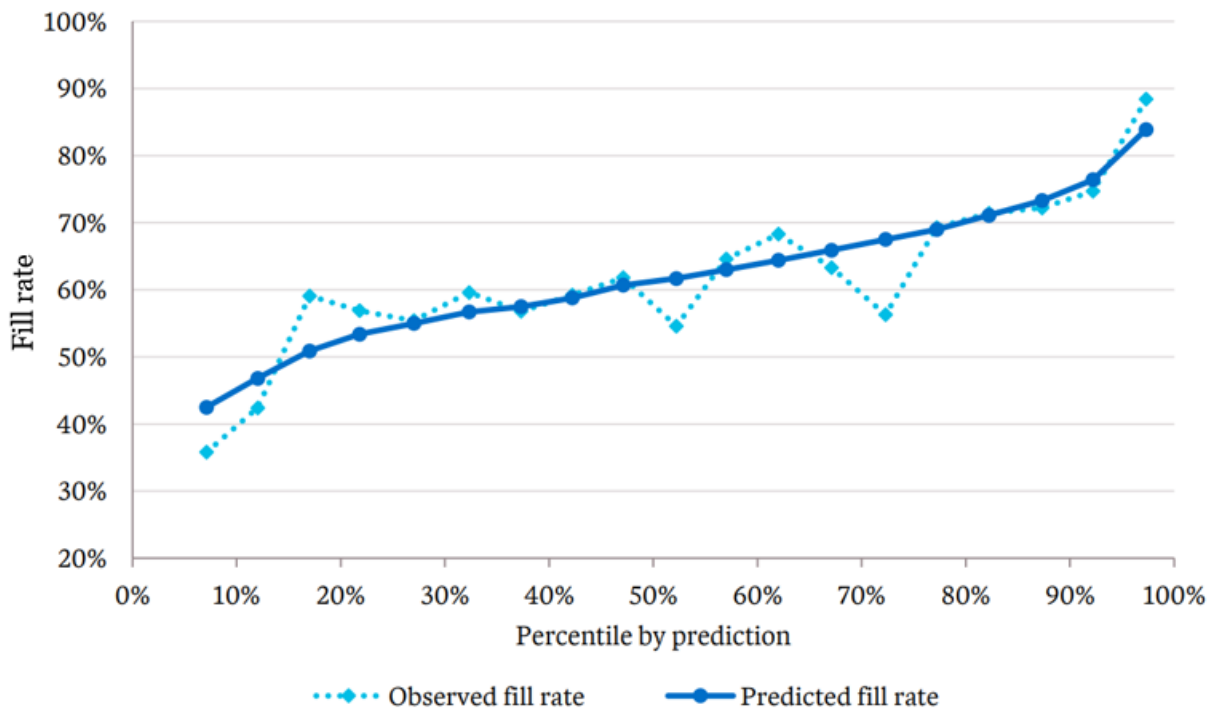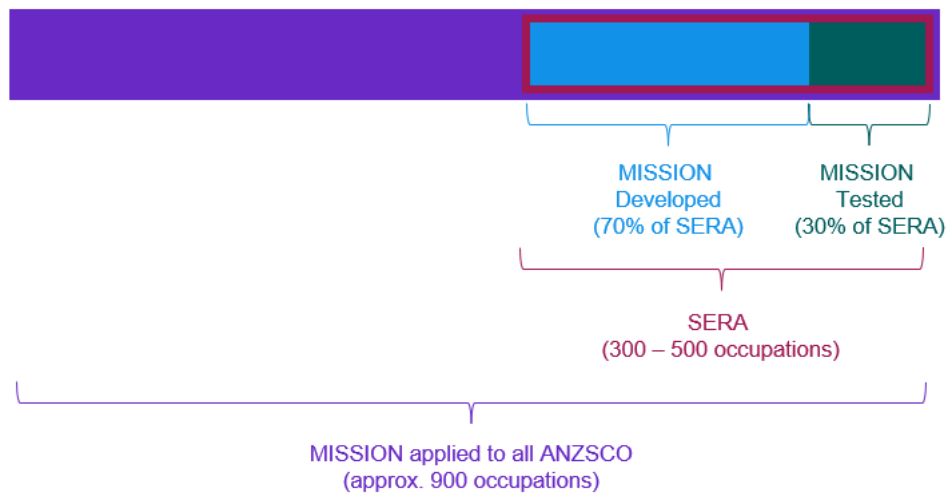**Figure 8: Observed (SERA) versus predicted fill rate, by predicted value (data as at early 2020)**

Figure 9: MISSION is modelled and tested on SERA outcomes, then applied to all occupations

D.4 Model Blending and Credibility Theory

Estimates of the fill rate for occupations are available from two sources:

- MISSION, which is available for all occupations, but may not recognise occupation-specific factors that affect vacancies and how they get filled.
- SERA, which directly measure fill rates, but are available only for a subset of occupations. These results may be subject to volatility if the survey sample size is small.

Credibility theory is used when there is one reliable estimate and another less reliable estimate. The goal is to create a combined estimate which should ideally be better than either estimate on its own. The combined estimate takes the form of a weighted average:

$$x_{combined} = zx_1 + (1 - z)x_2$$

Where x_1 and x_2 are the two estimates in question and z is the weight or credibility placed on the first estimate.

The credibility factor is calculated by taking the ratio of the variance of the estimate to the total variance:

$$z_{SERA} = \frac{Var(Model)}{Var(SERA) + Var(Model)}$$

The estimate of the model is simply the model fill rate. The SERA estimate is calculated by taking a weighted average of the current year as well as the previous three years, with decreasing weights the further back in time the SERA data is.

The variance of the model is another output of the model code and is easily obtained. The variance of the SERA estimate is a function of the four-year weighted number of vacancies (i.e., the higher the vacancies, the smaller the variance and vice versa).

At the state and territory level, a similar approach is applied, except first a 'hybrid SERA' score is created, that mixes the national results and the state results.

D.5 Model Variables

The following table outlines the indicators used in the model. Detail of how the indicators were determined is included in the MISSION Model section. The indicators used in the model are subject to review and change.

Table D1: MISSION Indicator variables

Indicator	Source	Definition
Seek weeks 3-year change	ABS Labour Force Survey	Change in the number of average weeks spent looking for work for unemployed person, relative to the average over the last three years. Indicator is cupped and capped at −10% and +10%.
IVI (Internet Vacancy Index) vacancies	Internet Vacancy Index	Number of job vacancies reported online, standardised by size of occupation according to number employed. Different coefficients for when the indicator is less than or greater than 1%.
IVI vacancies per employed 3-year change	Internet Vacancy Index	Change in the number of IVI vacancies per person employed, relative to the average over the last three years. Indicator is cupped and capped at −30% and +30%.
Employed	ABS Labour Force Survey	Number of persons employed, capped at 50,000.
Unemployment rate 1-year change	ABS Labour Force Survey	Change in the unemployment rate from the previous year. Indicator is cupped and capped at −10% and +10%.
Mean salary 1-year change	ATO (Australian Taxation Office)	Change in mean annual salaries, inflated to current values, from the previous year. Indicator is cupped and capped at −5% and +5%.
Bachelor	Burning Glass	Proportion of Burning Glass job listings that specify at least a bachelor degree as a minimum education requirement. Indicator is capped at 15%.
Temporary skilled visas granted	Home Affairs	Number of temporary skilled visas granted as a proportion of number of persons employed, capped at 2%.
Study diversity	Census of Population and Housing 2021	Entropy of the education background of those in the occupation. A higher entropy means employees come from a more diverse range of backgrounds.
Employed 3-year change	ABS Labour Force Survey	Change in the number of persons employed, relative to the average over the last three years. Indicator is cupped and capped at −10% and +20%.

Appendix E – Stakeholder consultation

Overview

Jobs and Skills Australia engages with employers, peak bodies, industry groups, professional organisations, unions, regional representative bodies, education and training advisory organisations and Federal government and state and territory government agencies on the development of the SPL. This ensures that Jobs and Skills Australia has visibility of Australia's skills needs for the widest range of occupations.

Consultation process

Formal SPL consultation involves an online survey, engagement with Federal Government and state and territory government agencies and Jobs and Skills Councils (JSCs) for feedback. Face-to-face (or online) engagement with all stakeholders year-round are also a key part of the consultation process.

An indicative annual timeline for ongoing consultation is shown in Table E1.

Table E1: Indicative annual timeline for consultation

Timing	Activity
November to February	Initial stakeholder survey
June to July	Draft SPL tested with state and territory and federal agencies and JSCs
Continuous	Face-to-face or digital engagement with stakeholders as appropriate
Continuous	Engage with Federal Government and state and territory government agencies and JSCs, including through working groups, as appropriate

Survey program

Jobs and Skills Australia's stakeholder survey seeks to capture information from stakeholders on recruitment challenges and skills needs across a wide range of occupations and industries.

Survey respondents can provide additional documentation to support their claims, such as member surveys, industry reports or their own internal modelling or data. Respondents are also given the opportunity to provide information on new and emerging occupations, including occupations not currently categorised in ANZSCO. Information gathered through the surveys is then considered during the assessment process.

In addition to the SPL surveys, stakeholders can contact Jobs and Skills Australia at any time to provide advice (including submissions on occupations and meetings to discuss inputs with Jobs and Skills Australia). Any stakeholders who wish to provide input can contact Jobs and Skills Australia at skillsprioritylist@jobsandskills.gov.au.

Peak body stakeholder survey program

Peak body stakeholder surveys are conducted twice yearly and target industry bodies, unions and regional bodies. Targeted surveys have been developed to collect information from these different groups. The same group of core questions are used to ensure consistency across the surveys. Targeting the surveys enables Jobs and Skills Australia to tailor the language and phrasing of questions in acknowledgement of the different roles these representative bodies play in the Australian labour market.

In each of the surveys, stakeholders are asked to identify occupations that, in their experience, are difficult to recruit for or that their members have difficulty recruiting for. Stakeholders are asked to comment on issues regarding access to skills, to provide an indication of the level of shortage or adequacy of supply that exists for an occupation and why. This provides an understanding of skills needs across industries, occupations and regions.

Appendix F – Stakeholder weighting method

Approach

There are three main considerations which inform the weighting process. They are:

- Submission strength. This is a measure for how compelling a stakeholder submission is. This is considered to get an accurate picture of the cumulative evidence available.

- Region. Some stakeholders only give feedback specific to a particular state or region. This must be weighted to get an accurate assessment of the national picture.

- ANZSCO mapping. Stakeholders have the choice of using any ANZSCO basis they wish for submissions. They must be mapped onto a common basis (2013 ANZSCO) before being used as an input in the algorithm.

A weight for each of these is determined, then are combined by taking the product of the individual weights to give a final weight per occupational submission.

Submission Strength

Compelling stakeholder feedback is given full weight (1), whereas stakeholder feedback of a moderate quality is given half weight (0.5).

Region

The employment size of the occupation in the region in question is used. The weight is simply this employment size divided by the total national occupation size.
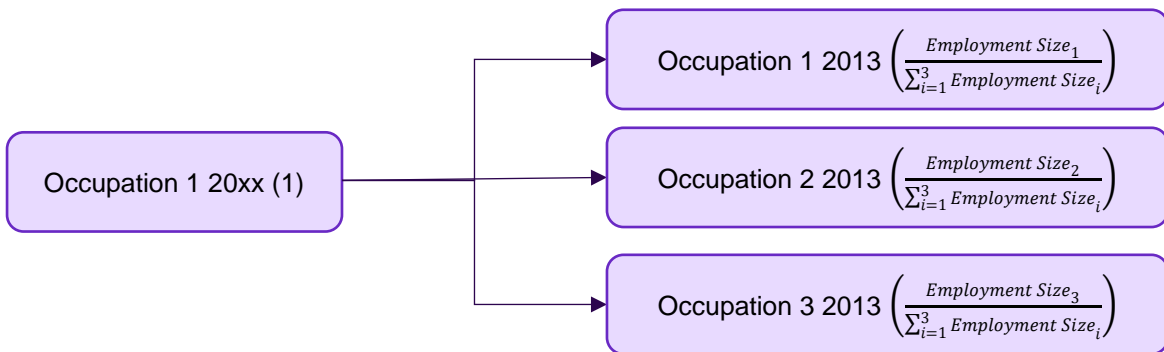
ANZSCO Mapping

Employment size is used. Similar to the method outlined in the mapping to ANZSCO 2022 section, the national employment size is taken for each underlying occupation. A full match or mixed match is given full weighting (1). Whereas with a partial match, new records are created for each matched occupation, with a weighting equal to the national employment size of each occupation divided by the total employment size across all matched occupations. Where employment size is not available (as is the case with some occupations on the 2022 basis), the weight is simply 1 divided by the number of matched occupations.
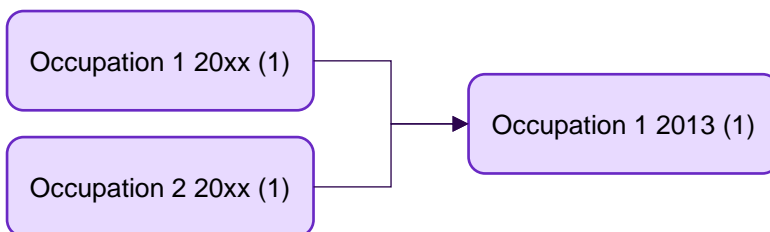
Case 1: One-to-one (Full) match

Occupation 1 20xx (1) $\longrightarrow$ Occupation 1 2013 (1)

Case 2: One-to-multiple (Partial) match

Occupation 1 20xx (1) $\longrightarrow$

Occupation 1 2013 $\left(\dfrac{Employment\ Size_1}{\sum_{i=1}^{3} Employment\ Size_i} \right)$

Occupation 2 2013 $\left(\dfrac{Employment\ Size_2}{\sum_{i=1}^{3} Employment\ Size_i} \right)$

Occupation 3 2013 $\left(\dfrac{Employment\ Size_3}{\sum_{i=1}^{3} Employment\ Size_i} \right)$

Case 3: Multiple-to-one (Mixed) match

Occupation 1 20xx (1)

Occupation 2 20xx (1)

$\longrightarrow$ Occupation 1 2013 (1)

Appendix G – Future Demand Rating

Future Demand Rating

The future demand for each occupation is based on combining the projected future employment growth (from the five-year employment projections produced by Jobs and Skills Australia) and the replacement rate.

Each occupation receives a Future Demand Rating of either Above economy-wide average, At economy-wide average, Below economy-wide average. Occupations are categorised based on whether their future demand ratio (future demand divided by number employed in the occupation) is outside one standard deviation from the mean (weighted by occupation size, based on 2018 figures; a year that is judged to be a moderate labour market useful for comparisons).

A proportional, rather than absolute, measure of future demand is used to assign ratings to each occupation. A proportional measure is used as it puts all occupations on a comparable scale. A small occupation doubling in size should be classified as having above economy-wide average demand, even if a larger occupation with 10% growth will add more jobs in absolute terms.

The projected employment growth and replacement rate provide the Future Demand Rating at the 4-digit ANZSCO level, which is apportioned to the 6-digit ANZSCO level by allocating it proportionately to occupation size. This approach assumes the same Future Demand Rating ratio for all 6-digit level occupations within the same 4-digit level occupation. The size of the 6-digit occupation can be used to multiply the proportion to obtain the corresponding absolute predicted demand.

The Future Demand Rating is only available at the national level due to limitations in the availability of more granular data used in this assessment. Where required national ratings can be used as a proxy for state/territory ratings.

Five Year Employment Projections

Jobs and Skills Australia produces employment projections by industry, occupation, skill level and region for the following five years. These projections are designed to provide a guide to the future direction of the labour market. Like all such exercises, they are subject to an inherent degree of uncertainty.

The projections that have been used to inform the 2023 SPL Future Demand ratings have been derived by using a blend of two techniques:

- best practice time series models that summarise the information that is in a time series and convert it into a forecast. The time series projections are made by combining forecasts from autoregressive integrated moving average (ARIMA) and exponential smoothing with damped trend (ESWDT) models, with some adjustments made to take account of research undertaken by Jobs and Skills Australia and known future industry developments.

The projection for total employment growth that has been used to inform the 2023 SPL Future Demand ratings is consistent with employment growth from May 2023 to May 2028 and the Government's forecasts and projections for total employment growth from 2023–24 onwards, as published in the 2023–24 Budget.

Replacement Rates

Jobs and Skills Australia produces replacement rates by occupation at the national level, to provide an estimate of the total replacement demand resulting from flows of workers exiting a job irrespective of the inflows to employment over the same period. This information represents an indication of job opportunities in the occupation, from people leaving their occupation to take up a new job, leaving an occupation because of retrenchment, moving into retirement or otherwise leaving the labour force.

The replacement rate method is based on data from the ABS Participation, Job Search and Mobility supplementary survey, which is conducted throughout Australia in February of each year as a component of the monthly Labour Force Survey and employment data from the Labour Force Survey. The survey provides a comprehensive and consistent dataset on a person's experiences relating to job search, job change and labour market participation and enables insights to be gained on detailed occupations in the ANZSCO classification of occupations.

For a growing occupation, all the people who leave the occupation need to be replaced and replacement is equal to the number of people who were employed in the occupation at the end of the reference year, minus the number who did not change occupation during the reference year, as well as the employment growth over the year.

The labour market is underpinned by significant dynamism. ABS Labour Force data show that over 4 million jobs are created through turnover each year.

Replacement rates are an indicative measure that should be used and interpreted with caution.