Australian Government
Department of Health, Disability and Ageing

Midwifery Supply and Demand Model - Methodology Paper

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List of Acronyms and Abbreviations

ABS	Australian Bureau of Statistics
AFHW	Australia's Future Health Workforce
Ahpra	Australian Health Practitioner Regulation Agency
FTE	Full-Time Equivalent
IQMs	Internationally qualified midwives
NHWDS	National Health Workforce Datasets
NMBA	Nursing and Midwifery Board of Australia
NPDC	National Perinatal Data Collection
SA4	Statistical Area 4

1.0 Introduction

This paper provides the methodology used for the midwifery workforce supply and demand model. It aims to quantify the supply of and demand for midwives between 2025 and 2038, using data collected from several sources between 2014 and 2024.[1] This work builds upon previous study prepared by the Department of Health, Disability and Ageing (the Department), the *Australia's Future Health Workforce Report – Midwives 2019*.[2]

2.0 Modelling Overview

2.1 Scope

In Australia, midwives must be registered with the Nursing and Midwifery Board of Australia (NMBA) to practise. There are different registration types corresponding to different levels of training and experience:

- general registration
- limited registration
- non-practising registration
- student registration and
- provisional registration.

The details of programs of study approved by the NMBA that lead to different types of registration as Midwife can be found here: Nursing and Midwifery Board of Australia - Approved programs of study.

Internationally qualified midwives (IQMs) seeking registration in Australia have two available streams, depending on their overseas qualifications:

- **Stream A** – For IQMs with qualifications that are substantially equivalent to, or based on similar competencies as, an approved Australian qualification. These candidates only need to complete an orientation course to be eligible for registration.
- **Stream B** - For IQMs with relevant qualifications that do not meet the criteria for substantial equivalence, or similar competencies. These candidates must complete both an orientation course and an outcomes-based assessment process to be eligible for registration.

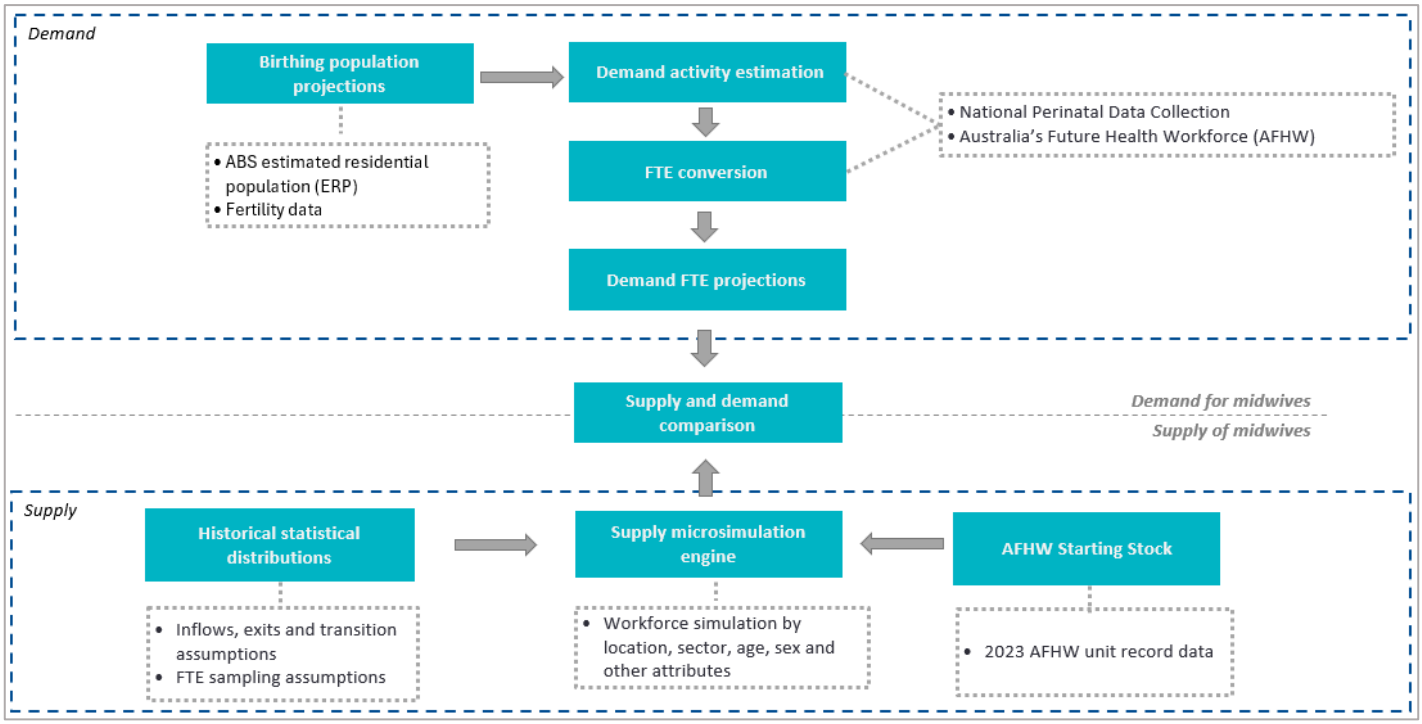
IQMs whose qualifications are not substantially equivalent or relevant to an approved Australian qualification must complete additional studies to upgrade their qualifications.

In this study, modelling has been undertaken at the Statistical Area 4 (SA4) geography where data availability permitted. However, results will be published at state and territory level, with their aggregation used to produce the national results.

[1] The workforce projections have been estimated over a 14-year period, rather than the 25-year horizon used in medical supply and demand studies, due to the relatively shorter training pipeline for midwives.
[2] Department of Health, Disability and Ageing, Midwives – Australia's Future Health Workforce report, 2019, accessed 17 January 2025

Figure 1 provides an overview of the modelling process, outlining key data inputs.

Figure 1: Overview of the Midwifery modelling process



3.0 Midwifery Supply

The 2014 to 2024 Australia's Future Health Workforce (AFHW) data on midwives is used to model supply. The model uses a microsimulation approach where attributes such as entries and exits to the workforce and midwife Full-Time-Equivalent (FTE) are modelled distinctly. The supply methodology begins by identifying the current stock of midwives, analysing their demographic profile and historically observed work patterns. Statistically significant predictors of future midwifery workforce supply are then selected, and their historical distributions are measured to allow the development of a microsimulation model.

The microsimulation works at a yearly time-step, tracking the progression of midwives throughout their career. Each year, it accounts for entries, removes midwives who take temporary or permanent leave, and simulates transitions of midwives between geographic locations. The following sections describe how each component is defined and modelled.

The baseline projections assume an initial equilibrium between supply and demand in the base year, ***2024***.

3.1 Key data inputs

The key dataset used for the supply model is extracted from the following sources:

#	Source	Description and use in model
1	Australia's Future Health Workforce (AFHW) dataset	The AFHW datasets are created from the National Health Workforce Datasets (NHWDS) for modelling purposes. A sequence of rules (supply criteria) is applied to each NHWDS to determine which practitioners meet the definition of supply for each profession (and sub-groups where applicable). The headcount and workload of these practitioners, along with other variables required for modelling, are included, derived or imputed in the AFHW datasets. The AFHW dataset contains unit record data on midwifery practitioners, including demographic variables and information on their career (such as hours worked which is converted to FTE).

3.2 Historic and starting stock

The AFHW data is a unit record longitudinal dataset, where each respondent is assigned a unique identifier that can be linked across multiple years. To be in scope, midwives must be:

1. registered as a midwife (including dual registration as midwife and nurse (Registered Nurse/Enrolled Nurse)) with Australian Health Practitioner Regulation Agency (Ahpra)/NMBA
2. working in midwifery in Australia, including those on extended leave; and
3. working clinical hours in midwifery.

3.2.1 Total Hours (Full-Time Equivalent)

Midwifery total hours (clinical and non-clinical) are used in modelling supply and nursing hours are excluded. If a midwife is employed but on extended leave (defined as a period of over 3 months), their hours are halved for simplicity, assuming they worked an average of 6 months during the year.

One FTE is defined as 38 self-reported weekly average hours in the AFHW dataset (across 46 weeks in the year).

3.3 Measuring entries, exits and transitions

The AFHW dataset enables tracking of individuals as they age, relocate, progress in their careers and transition in and out of the workforce. Historical data relating to entries, exits

and transitions is used to determine future trends based on analysis of historical demographic probabilities and distributions.

The demographic probabilities and distributions are sampled to understand the effects of age, sex, state of primary workplace and place of initial qualification on workforce patterns.

3.3.1 New entries

New entries into the midwifery workforce include individuals entering as domestic graduates and IQMs. A new entry is defined as a midwife who is within the scope of 'supply' in the base year (2024), but not within 'supply' in previous 4 years.[3]

There is no publicly available data on the number of domestic graduates and IQMs entering the midwifery workforce, therefore the AFHW dataset is used to identify new entries.

The supply model assumes a constant number of new entries over the projection period based on the average number of new entries observed between 2020–24 (5-years), for both domestic graduates and IQMs.

3.3.2 Exits and re-entries

Exits from the midwifery workforce are determined using historical AFHW data by tracking individual midwife's participation in the workforce over time. Midwives who appear in the AFHW data in one year but not the next are classified as having exited the workforce. Exits are modelled by age, place of initial qualification and state of primary workplace as covariates.

These one-period exits are further classified as temporary or permanent exits.

- **Temporary exits or re-entries:** refer to midwives who leave the workforce after working for at least one reporting period (i.e. one year) but returns to the midwifery profession within a 4-year period.[4] The point of re-entry is estimated based on the rate at which midwives who leave the workforce return in subsequent years. The modelling of re-entry probabilities includes the same covariates as exits i.e. age, place of initial qualification and state of primary workplace.
- **Permanent exits**: refer to midwives who, after working for at least one reporting period (i.e. one year), leaves the workforce and does not return within a 4-year period.

3.3.3 Interstate transitions

Interstate movement of midwives is estimated based on the probability of midwives changing their primary place of work from one state/territory to another. Covariates used to determine

[3] The 4-year period is used because scope of practice considerations become less relevant beyond that timeframe. This approach is applied to both entries and exits.
[4] The 4-year period is used because practice considerations become less relevant beyond that timeframe. This approach is used for both historical and future workforce exits.

transition rates and destinations are the midwife's initial state, age, sex and place of initial qualification.

3.3.4 Estimating Full-Time Equivalent (FTE) of entries, re-entries and transitions

The number of FTE each midwife works is a central component of the model. FTE is a measure which can vary significantly between individuals and years. One FTE is defined as 38 self-reported weekly average hours worked.

To account for the variations in FTE by various demographics of midwives, the simulated midwifery workforce FTE distribution is estimated based on age, sex and state of primary workplace. This is done by:

1. Re-sampling an existing midwife's FTE annually to reflect their demographic attributes, as it may change from year to year. Additionally, their FTE is adjusted by a time-dependent modifier based on changes to the average FTE observed over the past 5 years.
2. Additional FTE adjustments, in the form of a series of multipliers, are then applied to a midwife's FTE, following one of the workforce status changes below:
    - a workforce exit or entry, or
    - a change in state of workplace.

These adjustments are applied after any of the FTE re-sampling has been applied. This is because the adjustments effectively adjust for breaks in regular employment.

3.4 Supply Modelling

A microsimulation process is used to project supply of midwives. An overview of this process is shown in Figure 2. The supply model uses the following attributes:

1. FTE based on 38 hours per week
2. sex
3. age
4. place of initial qualification (domestic or international)
5. primary work location (state/territory, SA4).

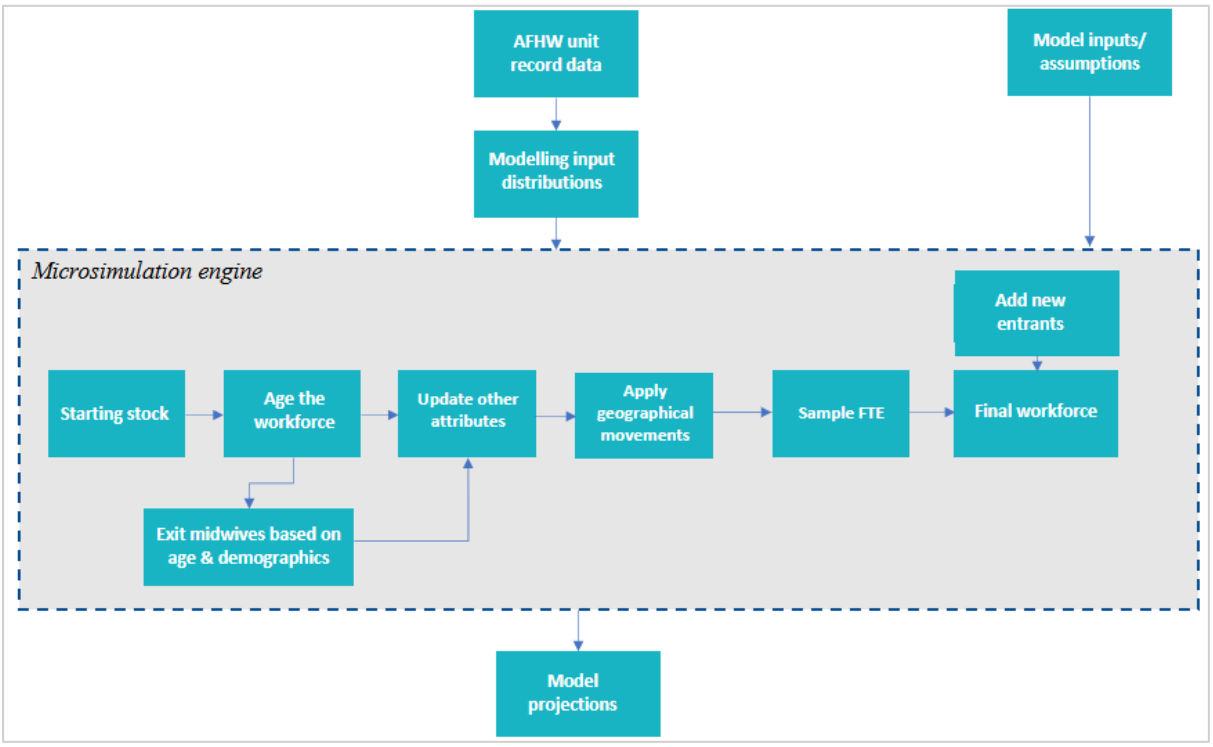
In each iteration of the microsimulation:

1. The workforce is aged, and some midwives exit the workforce based on their age, sex, place of initial qualification and state of primary workplace.
    a) Exits are sampled to determine if the exit is permanent or temporary.
    b) Midwives that temporarily exit will re-enter the workforce during a subsequent period of up to 4 years, in accordance with the historical distribution of re-entries following up to 4 periods of absence.

2. Geographical movements are applied to midwives based on historic state/territory migration patterns broken down by sex, place of initial qualification and state/territory of primary workplace.
3. FTE is updated based on smoothed historical FTE year-on-year changes by age, unless a midwife:
    a. geographically transitions to a different state/territory and/or
    b. returns from a temporary exit.
4. Midwives flagged for re-entry are brought back into the workforce based on a re-entry probability, which is determined by factors such as age, place of initial qualification and state/territory of primary workplace. The FTE for re-entering midwives is sampled from a distribution modelled on historical AFHW data.
5. New midwives are added to the workforce either as:
    a. a domestic graduate or
    b. an internationally qualified midwife.
6. The modelling process iterates annually, where the number of midwives in the following year is calculated as the number of midwives in the current year, minus the number of midwives exiting and transitioning-out, plus those entering the workforce and transitioning-in in the new year. In other words:

$$\text{Supply}_{(t+1)} = \text{Supply}_{(t)} - \text{Exits}_{(t+1)} + \text{Entries}_{(t+1)} + \text{Net transitions while staying employed}_{(t+1)}$$

Figure 2: The supply microsimulation process



3.5 Assumptions

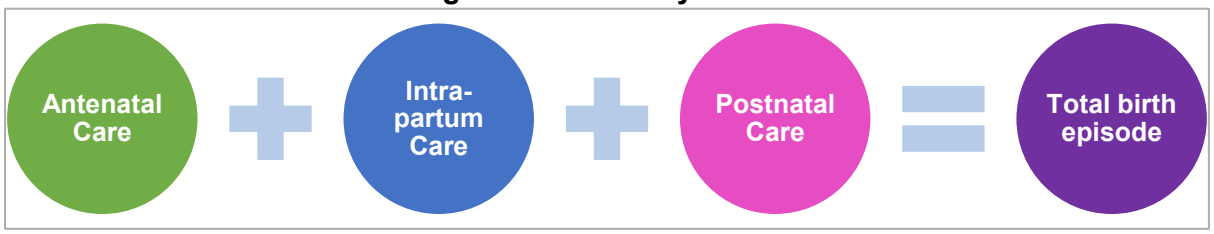
#	Caveat/Limitation	Description and implications
1	Static sampling assumptions	The microsimulation module applies static sampling distributions based on historical data from 2019 to 2024 to simulate projected behaviour except for average FTE distribution, which is adjusted based on historical trends.
2	New entries	The supply model assumes the number of newly qualified domestic and international midwives entering the workforce will remain constant throughout the projection period. The average number of new entries observed between 2020 to 2024 is used.
3	COVID-19 impact	The effects of the COVID-19 pandemic on the affected years (2020-2021) remains unclear and will be clarified through further analysis of updated data. The potential impact of the pandemic on workforce supply is still unknown.
4	Technological change	Technological improvements during the projection period that may affect workforce FTE in providing care are not considered.

4.0 Midwifery Demand

Demand is measured in terms of observed utilisation of midwifery services which captures expressed (observed) service demand for midwifery services across the whole continuum of care for women from pregnancy and childbirth through to postnatal care. The method utilises the number of births which are projected based on the Australian Bureau of Statistics (ABS) Population Projections of women aged 15–49 years and fertility rates. It also incorporates antenatal and postnatal care to cover the full breadth of midwifery care.

Historical patterns of utilisation of full continuum of midwifery care from 2012 to 2022 are examined and used to estimate the future demand for midwives. Figure 3 shows the continuity of care for midwifery.

Figure 3: Continuity of care



4.1 Key data inputs

The key datasets used for the demand model are extracted from the following sources:

#	Source	Description and use in model
1	National Perinatal Data Collection (NPDC) 2012 - 2022[5]	• **Intrapartum care**: Data on number of births by maternal age and SA4 of mother's usual residence. • **Antenatal care**: Women who gave birth by number of antenatal visits and SA4 of mother's usual residence. • **Postnatal care**: Women who gave birth in hospital by length of postnatal stay and SA4 of mother's usual residence.
2	Population and household projections based on ABS data	Population and household projections developed by the Department based on ABS Series B population projections and the ABS Census household distribution type. This study uses projections for the birthing population (15–49 years). Population projections are by age group, sex, geography and year.
3	Fertility rates based on ABS Births Australia data	Statistics about fertility rates for Australia by states and territories.

4.2 Estimating demand activity

The demand for the full continuum of care for midwifery services is estimated by combining the demand for the three components of the continuity of care for midwifery: Antenatal, intrapartum and postnatal care.

For each component of care, the demand is estimated independently as the number of women who gave birth multiplied by the demand measure for each component (see Table 1) by SA4, age group and year. The study uses female population within birthing age of 15–49 years. Five-year age groups are used and defined as:

- 15–19 years
- 20–24 years
- 25–29 years
- 30–34 years
- 35–39 years

[5] Australian Institute of Health and Welfare, Australia's mothers and babies. Data source: National Perinatal Data Collection, 2024, accessed 15 February 2025.

- 40–44 years
- 45–49 years.

Table 1: Demand measure for each component of continuum of care

Demand component	Data used	Demand variable	Demand measure[6]
Antenatal Care	Women who gave birth by number of antenatal visits	Number of visits: 1 2 3 4 5 or more	Measure: 1 2 3 4 5
Intra-partum Care	Births	Number of births	
Postnatal Care	Women who gave birth in hospital by length of postnatal stay	Length of postnatal stay (days): Less than 1 1 2 3 4 5 6 7-13 14 or more	Measure: 1 1 2 3 4 5 6 7 8

Antenatal care

Antenatal care is defined as a planned visit between a pregnant woman and a midwife or a clinician to assess and improve the wellbeing of the mother and baby throughout pregnancy. Antenatal care is associated with positive maternal and child health outcomes as the likelihood of receiving effective health interventions is increased through attending antenatal care.

An antenatal care visit may occur in the following clinical settings: antenatal outpatient clinic, specialist outpatient clinic, general practitioner surgery, obstetrician private room, community health centre, rural and remote health clinic and independent midwife practice setting including home of pregnant female. It does not include visits where the sole purpose is to confirm the pregnancy.[7]

[6] Demand measure is the numeric value assigned to the demand variable.
[7] For further details, refer to Female—number of antenatal care visits, total N[N].

This study uses the number of antenatal visits for women who gave birth by SA4 of mother's usual residence. Antenatal demand is estimated by multiplying the number (count) of women who gave birth by measure of antenatal visits (Table 1) for each SA4, age-group and year.

The antenatal visits are recorded in the birth year which may differ from when the antenatal services were delivered. Further, as the NPDC is an annual data collection, it does not capture information on the specific month in which births occur. Therefore, the study assumes that:

- births occur uniformly across each quarter of the year
- a birth occurs in the middle of the quarter[8]
- 25% of antenatal visits occur in the first trimester, and
- of the remaining antenatal visits, 50% occur in second trimester and 50% in third trimester.

This means that the proportion of demand in the birth year can be calculated as:

$$\begin{aligned}\text{Proportion of demand in the birth year} &= (Proportion\ of\ 1st\ trimester\ in\ same\ year\ x\ 0.25)\\ &+ (Proportion\ of\ 2nd\ trimester\ in\ same\ year\ x\ 0.375)\\ &+ (Proportion\ of\ 3rd\ trimester\ in\ same\ year\ x\ 0.375)\end{aligned}$$

Based on the above assumptions, percentage of antenatal demand that is attributed to the previous year rather than the birth year is 34.4% as shown in Table 2 below.

For 2022 which is the last year of available data, 34.4% of the antenatal demand is attributed to the previous year (2021) but not removed from the 2022 year to avoid missing data since there is no data for the next year (2023) which could be attributed to 2022.

Table 2: Estimation of proportion of antenatal demand attributable to birth year and previous year

Quarter of birth	Proportion of 1st trimester in same year	Proportion of 2nd trimester in same year	Proportion of 3rd trimester in same year	Proportion of demand in birth year[9]	Proportion of demand in previous year[10]
Birth in Oct–Dec	1	1	1	1	0
Birth in July–Sept	0.5	1	1	0.875	0.125
Birth in April–June	0	0.5	1	0.563	0.437
Birth in Jan–March	0	0	0.5	0.188	0.812
				Average:	0.344

[8] A birth is assumed to occur in the middle of a quarter. For example, if a birth takes place between Jan and March, it is assumed that half of the third trimester antenatal visits occurred in the same year, while the other half took place in the previous year.

[9] Calculated using the 'Proportion of demand in the birth year' equation (blue box).

[10] Calculated as *1 – Proportion of demand in the birth year*.

Intrapartum care

Intrapartum care includes labour and birthing process. There are several different models of care available to women which vary both among and within jurisdictions. There may also be variations within the implementation and delivery of each model which consider factors such as the available infrastructure, workforce, and geographic distribution of either the woman or care provider.

In terms of birth settings, in 2022, almost all births in Australia took place in hospitals (97.0%). Of mothers who gave birth in hospital, nearly 3 in 4 (74.0%) did so in a public hospital. A small proportion of mothers gave birth elsewhere, including birth centres (1.6%), at home (0.6%), or in other settings such as before arrival at hospital (0.9%).[11] This study includes births in all settings including hospital, birth centre, home or other.[12]

The study uses number of births by maternal age group and SA4 of mother's usual residence to capture the demand for intrapartum care. The number of births is projected using the population projections and fertility rates (ABS) by maternal age-group, SA4 and year.

Postnatal care

Postnatal care is measured by the postnatal length of stay which refers to the number of days between giving birth and date of discharge or transfer from the hospital where birth occurred, or death. Data on postnatal length of stay are based on mothers who were discharged to home.[13]

A mother's postnatal length of stay is related to maternal factors, such as recovery after birth, management of obstetric and maternal health conditions, management of conditions related to the baby and health system factors such as resourcing pressures.

The study uses data on women who gave birth in hospital by length of postnatal stay and SA4 of mother's usual residence. Postnatal demand is estimated by multiplying the number (count) of women by measure of postnatal care (Table 1) by SA4, age-group and year.

4.3 Projection of Demand Activity

The process of projecting the demand activity over the forecast period consists of the following key steps:

Antenatal and postnatal demand projections

The process is as follows:

1. Estimate the antenatal and postnatal demand rates for female population for each year and SA4. For each SA4, estimate the average rates over previous five years (2018 to

[11] Australian Institute of Health and Welfare, Australia's mothers and babies, Report published 13 December 2024, accessed 10 January 2025
[12] For further details, refer to Birth event—actual setting of birth, code N.
[13] Excludes data from Western Australia.

2022).[14] The formula for estimating the average antenatal rate is presented below. Similar formula is used for average postnatal rate.

$$\text{Average antenatal demand rate}_{SA4} = \frac{1}{5}\sum_{t=2022}^{t=2018}\frac{\text{Antenatal demand}_{SA4,year}}{\text{Female population}_{SA4,year}}$$

2. Multiply the average antenatal rate and postnatal rate by the female population projections by year and SA4 to estimate antenatal and postnatal demand projections.

   Given that the antenatal and postnatal demand data is not available by maternal age, the antenatal and postnatal demand projections are disaggregated by age groups using the population projections.

Intrapartum demand

3. Estimate the five-year average fertility rate for each SA4 and age-group using ABS fertility rates for female population by year, SA4 and age-group over 2018–22.
4. Multiply average fertility rate by the female population projections by age-group, SA4 and year to estimate intrapartum demand.

Total demand

5. The demand projections for the three components (antenatal, intrapartum and postnatal care) are combined using a weighted sum to estimate total midwifery demand by year, SA4, and age group.

   The applied weights are: **33%** for antenatal care, **38%** for intrapartum care, and **29%** for postnatal care. These weightings were originally informed by stakeholder feedback during consultations for the previous *Australia's Future Health Workforce Report – Midwives 2019* [15] and their continued use in this study has been endorsed by chief nursing and midwifery officers from all states and territories.

$$\text{Total Demand} = (\text{Antenatal demand} \times 0.33) + (\text{Intrapartum demand} \times 0.38) + (\text{Postnatal demand} \times 0.29)$$

Converting demand activity to FTE

6. Demand activity projections are then converted to FTE by comparing the demand values against the supply FTE from AFHW dataset for a specified reference year (2024). Specifically, the base year supply FTE is divided by the base year demand activity to yield an FTE-to-activity ratio, which is then multiplied by the demand projections for each forecast year to generate the baseline demand projection.

[14] Antenatal/Postnatal rate is defined as antenatal/postnatal demand per female. For states that have missing data, the average is calculated using the past 5 years of available data or all available years if fewer than 5 years is present.

[15] Department of Health, Disability and Ageing, Midwives – Australia's Future Health Workforce report, 2019, accessed 11 February 2025.

4.4 Assumptions

#	Caveat/Limitation	Description and implications
1	COVID-19 impact	The effects of COVID-19 are not explicitly accounted for but are implicitly captured. Perinatal demand data available up to 2022, will reflect changes in demand caused by the pandemic, which will, in turn, influence predictions for future years. Nonetheless, the model may not fully capture long-term changes in demand patterns resulting from the pandemic.
2	Demand measure for each component of demand	Demand measure is the numeric value assigned to each component of the demand variable i.e. antenatal, intrapartum and postnatal. For example, for postnatal demand, if the length of postnatal stay (demand variable) is 7 to 13 days, it is assigned a numeric value of 7 (demand measure). Assigning a single numeric value may introduce bias if it doesn't accurately reflect typical usage patterns. For instance, if most postnatal stays are closer to 13 days, using a value like 7 could lead to an underestimation of actual demand.
3	Attribution of antenatal demand across years	To account for the fact that antenatal visits are recorded in the birth year which may differ from when the antenatal services were delivered, 34.4% of antenatal demand is attributed to the previous year rather than the birth year.
4	Postnatal care	The data on postnatal care does not capture the postnatal care that is provided in addition to the postnatal stay in the hospital after birth.
5	Model of care	It is assumed that all antenatal, intrapartum and postnatal care is provided by midwives working within a care model that may occur in the women's home, birth centre or hospital setting (public or private).
6	Demand weightings	The assumed weightings for the three components of demand are: antenatal care at 33%, intrapartum care at 38% and postnatal care at 29%. By using these aggregate level weights, the method does not explicitly account for complexity of births in measuring demand.

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All information in this publication is correct as at April 2026