Australian Government
Australian Institute of Health and Welfare

Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic

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About

This report explores maternal and perinatal characteristics and outcomes during the COVID-19 pandemic in 2020 and 2021, in comparison with years prior to 2020. This includes information on demographics, antenatal health behaviours, labour and birth trends and baby outcomes. It is important to note that this report describes the changes observed between pre-pandemic and pandemic years but is not able to determine the cause of these changes.

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Findings from this report:

- During 2020 and 2021, fewer than expected babies were born pre-term
- During 2020 and 2021, fewer women had induced labour than expected
- During 2020 and 2021, fewer first-time mothers attended the recommended 10 or more antenatal visits
- During 2020 and 2021, both mothers and babies had shorter hospital stays after birth than expected

Summary

Outcomes during the first two years of the COVID-19 pandemic in Australia (2020 and 2021 combined) were compared with what would have been expected based on trends in the years prior to the pandemic (2015 to 2019).

In 2020 and 2021 combined, there were:

- 2,390 fewer babies being born at a low birthweight
- 1,050 more women giving birth at home
- 4,260 fewer babies requiring specialised care (that is, fewer babies admitted to a special care nursery or neonatal intensive care unit)
- 2,330 fewer babies born pre-term
- 15,380 more women giving birth without labour being induced.

These years, however, were also associated with:

- less than expected use of pregnancy care services by first-time mothers, with 4,670 fewer first-time mothers attending the recommended 10 or more antenatal visits
- 880 more women than expected experiencing high blood pressure during pregnancy (gestational hypertension).

In terms of the characteristics and risk factors of birthing mothers (such as age and weight), there didn't appear to be a change in these years.

There was also no clear change in the stillbirth rate, which fluctuated between 6.7 and 7.7 per 1,000 births during the period of 2015 to 2021.

A trend towards shorter postnatal stays continued during 2020 and 2021; but at a greater than expected rate, with 21,840 more mothers and 19,890 more babies staying in hospital for one day or less following a hospital birth.

It is important to note that this report describes the changes observed between pre-pandemic and pandemic years but is not able to determine the cause of these changes, for example, COVID-19 infection, other pandemic-related factors such as individual and societal responses to the pandemic, public health measures, or other factors (events or initiatives) unrelated to the COVID-19 pandemic. See Limitations for more information.

Introduction

The COVID-19 pandemic was a challenging time in recent Australian and world history. The direct effects of the virus itself – and indirect effects related to individual and societal responses and public health measures – resulted in changes to the experience of pregnancy and childbirth for many women and their families.

This report compares COVID-19 pandemic years 2020 and 2021 with pre-pandemic years to explore changes in maternal and perinatal characteristics and selected outcomes during this time. The topics explored in this report are supported by Australian research (where available) and international research, with a focus on the impacts of the COVID-19 infection, stay at home orders and other pandemic-related public health measures.

The report uses modelling to determine whether the changes observed in 2020 and 2021 were similar or different to those predicted by recent trends in the years prior. See Methods for more information.

Box 1: Data sources, definitions and terminology

This report is predominantly based on the National Perinatal Data Collection (NPDC), a national population-based cross-sectional collection of data on pregnancy and childbirth.

The section on perinatal deaths is based on the National Perinatal Mortality Data Collection (NPMDC), a population-based cross-sectional collection of data regarding the deaths of babies in hospitals and in the community.

The section on Telehealth services is based on data from the Medicare Benefits Schedule (MBS).

This report presents data by multiple geographies including:

- Primary Health Network (PHN) - external site opens in new window: established by the Department of Health and Aged Care to increase the efficiency and effectiveness of medical services and improve the coordination of care for patients
- Remoteness area: developed by the Australian Bureau of Statistics (ABS) as part of the Australian Statistical Geography Standard (ASGS) Remoteness Structure, 2016 - external site opens in new window and determined according to the Accessibility/ Remoteness Index of Australia, which is a measure of relative access to services based upon population and distance to services
- Statistical Area Level 3 (SA3) - external site opens in new window: developed by the ABS as part of the 2016 ASGS and comprises geographical areas built from whole Statistical Areas Level 2 (SA2) - external site opens in new window.

Geographic data are reported from 2017 onwards due to changes in geographical borders prior to 2017. Due to small numbers, detailed geographic data were not available for certain topics (see Methods for more information).

This report uses the terms ‘woman’ and ‘women’ to mean ‘female' when referring to data collected in the National Perinatal Data Collection (NPDC) and the National Maternal Mortality Data Collection (NMMDC) as these data sources are based on sex. Information on gender is not recorded in these data collections. ‘Woman’ and ‘women’ typically refers to groups of people aged 18 years and over; however, in this report, people who were pregnant or gave birth aged less than 18 are included. The terms ‘mother’ and ‘mothers’ refers to females who were pregnant and within the scope of these data collections. It is acknowledged that this report includes people who do not identify as women or mothers, and that individual parents and families may use different words to those used in this report. This may include women, transgender men, intersex people, non-binary and gender diverse people.

Limitations

This report is focused on maternal and perinatal characteristics and outcomes during the early years of the COVID-19 pandemic. The data sources used (predominantly the National Perinatal Data Collection) do not include information on COVID-19 infection, vaccination or other pandemic-related factors. Therefore, the report describes the changes during the early years of the pandemic but is not able to attribute these changes to the pandemic.

Changes in expected trends during the pandemic years – when compared with the trend for pre-pandemic years – may be related to a combination of factors including those related to the pandemic such as maternal COVID-19 infection or individual, societal, public health or health service factors, or other events and effects unrelated to the COVID-19 pandemic.

The pandemic followed events such as the severe bushfires in Australia during end-2019 and early-2020. During the pandemic period, there were also a number of severe floods across Australia. As such, it is not possible to distinguish between the effects of these and other events and the impact of the pandemic.

Information on the COVID-19 vaccination and infection status of women included in this report are not collected as part of the National Perinatal Data Collection (NPDC) or National Perinatal Mortality Data Collection (NPMDC). Consequently, direct links cannot be made between COVID-19 vaccination and infection and their impact on maternal and perinatal outcomes.

Data linkage between the NPDC and NPMDC and other national data assets such as the National Health Data Hub, which is integrating data from the COVID-19 Register and Australian Immunisation Register, may be able to explore these interactions and impacts on maternal and perinatal outcomes in future.

This report does not include a breakdown of the data by specific population groups, such as First Nations and diverse populations. Please see *Australia's mothers and babies* for information on specific population groups during the years covered by this report.

COVID-19 in Australia

COVID-19 first emerged in late 2019 and the World Health Organization (WHO) declared it a pandemic in March 2020. In the early stages of the pandemic, there was less of an impact on morbidity and mortality in Australia than in many other countries (AIHW 2022a; OECD 2021).

The first case in Australia was confirmed on 25 January 2020 (Department of Health and Aged Care 2020). Up until early October 2021, Australia had the second lowest total number of confirmed cases per head of population of all Organisation of Economic Co-operation and Development (OECD) countries (with only New Zealand lower) and the third lowest death rate (with South Korea and New Zealand lower) (OECD 2021).

By December 2021, in Australia there were:

- 5 variants of concern which had been detected in Australia (Alpha, Beta, Gamma, Delta and Omicron)
- 395,504 cases of COVID-19 (including recovered cases)
- 2,239 deaths from COVID-19
- 137,752 active cases (AIHW 2022b).

References

AIHW (Australian Institute of Health and Welfare) (2022a*)* *Australia's health 2022: Data insights*, AIHW, Australian Government, accessed 27 March 2024.

AIHW (Australian Institute of Health and Welfare) (2022b) *The impact of a new disease: COVID-19 from 2020, 2021 and into 2022*, AIHW, Australian Government, accessed 9 April 2024.

Department of Health and Aged Care (2020) *First confirmed case of novel coronavirus in Australia* - external site opens in new window, Department of Health and Aged Care website, accessed 27 March 2024.

OECD (Organisation for Economic Co-operation and Development) (2021) *The health impact of COVID-19* - external site opens in new window, Health at a Glance 2021, OECD Publishing.

Impacts of the COVID-19 pandemic during pregnancy

The direct effects of the virus itself – and indirect effects related to individual and societal responses and public health measures – resulted in changes to the experience of pregnancy and childbirth for many women and their families.

Studies suggest that the COVID-19 pandemic resulted in both positive and negative experiences for mothers and their babies, noting that the same event may be experienced differently by different women.

In one Australian study, midwives and pregnant women reported that having fewer visitors in hospital, increased access to telehealth services, midwifery continuity of care models, home births and their partner working from home were positive benefits associated with the pandemic (Kluwgant et al. 2022).

Other research found that in the early stages of the pandemic, pregnant women experienced high levels of distress, which negatively impacted their mental health and led to pregnant women experiencing heightened depression, anxiety and stress (Frankham et al. 2023; Schweizer et al. 2023; Lequertier et al. 2022; Wilson et al. 2022). Distress and mental health impacts were related to changes to antenatal care and health services, not being able to have their chosen support people with them during care episodes, social distancing, and pandemic-related news exposure (Lequertier et al. 2022; Wilson et al. 2022).

The National Perinatal Data Collection (NPDC) began collecting data on mental health in 2020 for some jurisdictions; however, because data are not available prior to 2020 and the date of perinatal mental health screening is not collected, the impact of the COVID-19 pandemic on maternal mental health cannot be examined using this collection.

References

Frankham LJ, Thorsteinsson EB and Bartik W (2023) 'The impact of COVID-19 related distress on antenatal depression in Australia' - external site opens in new window, *Int J Environ Res Public Health*, 20(6): 4783, doi:10.3390/ijerph20064783.

Kluwgant D, Homer C and Dahlen H (2022) 'Never let a good crisis go to waste: Positives from disrupted maternity care in Australia during COVID-19' - external site opens in new window, *Midwifery*, 110(2022):103340.

Lequertier B, McLean MA, Kildea S, King S, Keedle H, Gao Y, Boyle JA, Agho K and Dahlen HG (2022) 'Perinatal depression in Australian women during the COVID-19 pandemic: The birth in the time of COVID-19 (BITTOC) study' - external site opens in new window, *Int. J. Environ. Res. Public Health*, 19(9):5062, doi:10.3390/ijerph19095062.

Schweizer S, Andrews JL, Grunewald K and Kumle L (2023) 'Association of antenatal COVID-19–related stress with postpartum maternal mental health and negative affectivity in infants' - external site opens in new window, *JAMA Netw Open*, 6(3):e232969, doi:10.1001/jamanetworkopen.2023.2969

Wilson NW, Sweet L, Vasilevski V, Hauck Y, Wynter K, Kuliukas L, Szabo RA, Homer CSE and Bradfield Z (2022) 'Australian women's experiences of receiving maternity care during the COVID-19 pandemic: A cross-sectional national survey', - external site opens in new window *Birth*, 49(1): 30–39, doi:10.1111/birt.12569.

Impacts of COVID-19 infection during pregnancy

Pregnant women have a higher risk of severe illness from COVID-19 and maternal infection with COVID-19 during pregnancy can also affect the health of their unborn baby (RANZCOG 2023).

COVID-19 infection can increase the risk of pregnant women requiring admission to hospital, admission to an intensive care unit and invasive ventilation (RANZCOG 2023). Maternal COVID-19 infection can also increase the risk of complications for the unborn baby including premature birth and stillbirth (RANZCOG 2023).

COVID-19 infection rates were relatively low in Australia compared with other countries and it is expected that rates were also low among pregnant women during 2020 and 2021; however, the COVID-19 infection status of women is not collected in the National Perinatal Data Collection.

Data from the National Maternal Mortality Data Collection show that in 2020 and 2021 there were no maternal deaths directly related to COVID-19 infection. However, there were a small number of deaths where measures to limit the spread of COVID-19, such as stay at home orders and COVID-19 screening requirements and associated clinical management, were listed as contributory factors for a maternal death.

The national vaccination program against COVID-19 commenced in Australia on 22 February 2021, starting with priority groups, such as frontline workers and at-risk populations (Department of Health and Aged Care 2021a). The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) - external site opens in new window and Australian Technical Advisory Group on Immunisation (ATAGI) - external site opens in new window released a joint statement on 9 June 2021 - external site opens in new window to support the safety and efficacy of COVID-19 vaccination for pregnant women and their babies (Department of Health and Aged Care 2021b).

The COVID-19 vaccination status of women included in this report is not known, as this information is not collected in the National Perinatal Data Collection. Data linkage could enable this to be explored in future.

References

Department of Health and Aged Care (2021a) *First COVID-19 vaccinations in Australia* - external site opens in new window, Department of Health and Aged Care website, accessed 21 December 2023.

Department of Health and Aged Care (2021b) *Joint statement between RANZCOG and ATAGI about COVID-19 vaccination for pregnant women* - external site opens in new window, Department of Health and Aged Care website, accessed 21 December 2023.

RANZCOG (Royal Australian and New Zealand College of Obstetricians and Gynaecologists) (2023) *COVID-19 vaccination in pregnant and breastfeeding women and those planning pregnancy* - external site opens in new window, RANZCOG website, accessed 28 December 2023.

Timeline

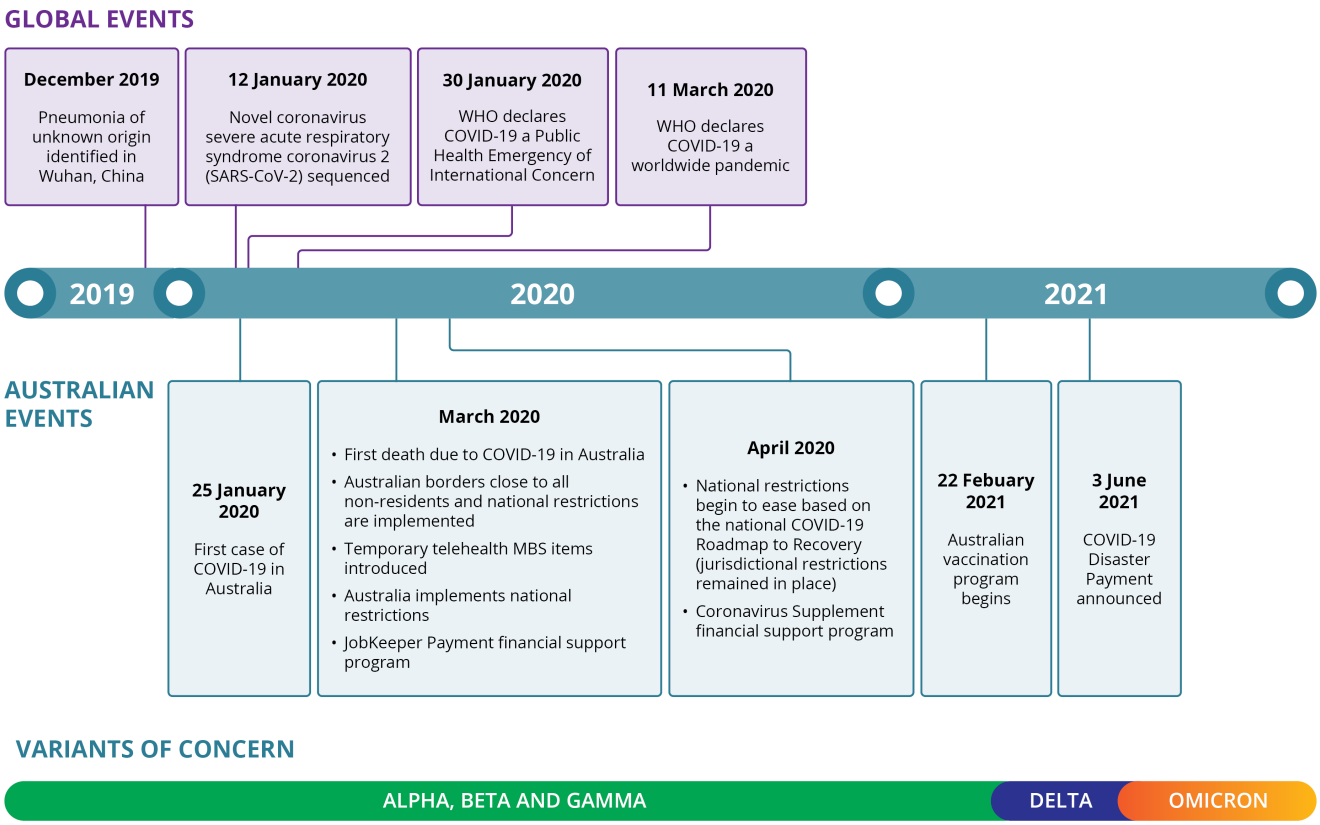
Due to the complex nature of the pandemic, there were differences in key events and responses at the global, national and jurisdictional level.

A range of public health protection measures were used in Australia to manage the spread of COVID-19 and protect the healthcare system. These included:

- measures to reduce movement of the population, such as border closures
- measures to promote physical distancing and hygiene
- suspension of non-urgent elective surgery and some cancer screening
- public communication and education programmes
- quarantine and isolation rules
- mask mandates
- vaccination programs (AIHW 2020, 2021, 2022; COVID-19 NIRST 2021).

Figure 1 presents a timeline showing key global and national events from the emergence of the virus.

Figure 1: Timeline of key global and national events related to the COVID-19 pandemic, 2019 to 2021

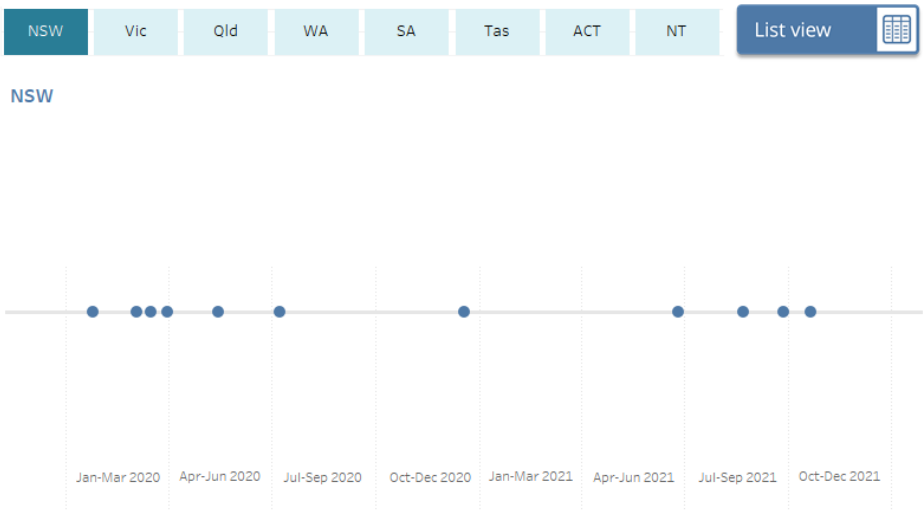


Each state and territory had a different experience of the COVID-19 pandemic, which can be explored in the figure below (Figure 2). The timelines presented are based on multiple sources including jurisdictional government websites and media releases and mainstream media reports and include information on initial COVID-19 cases and deaths, border closures and the implementation and easing of restrictions.

The timeline does not include all potential events related to the pandemic including, but not limited to, changes to businesses, schools, health service provision or economic support and stimulus measures. This is due to variability in availability of this information for each state and territory.

Timeline shows key events for state and territories during the COVID-19 pandemic.

Timeline showing key events for selected state or territory, 2020 and 2021



Notes:
1. The events presented are based on multiple sources including jurisdictional government websites and media releases and mainstream media reports and include information on initial COVID-19 cases and deaths, border closures and the implementation and easing of restrictions.
2. The timeline does not include all potential events related to the pandemic including, but not limited to, changes to businesses, schools, health service provision or economic support and stimulus measures. This is due to variability in availability of this information for each state and territory.

See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 5.1 for sources.
https://www.aihw.gov.au

References

AIHW (Australian Institute of Health and Welfare) (2020) *Cancer screening and COVID-19 in Australia*, AIHW, Australian Government, accessed 9 April 2024.

AIHW (Australian Institute of Health and Welfare) (2021) *The first year of COVID-19 in Australia: Direct and indirect health effects*, AIHW, Australian Government, accessed 9 April 2024.

AIHW (Australian Institute of Health and Welfare) (2022c) *Health promotion and health protection*, AIHW, Australian Government, accessed 9 April 2024.

COVID-19 NIRST (COVID-19 National Incident Room Surveillance Team) (2021) *COVID-19 Australia: epidemiology report 50: reporting period ending 12 September 2021*, Communicable Diseases Intelligence, 45, doi:10.33321/ cdi.2021.45.50.

Risk factors for severe COVID-19

Adverse outcomes in pregnancy due to COVID-19 infection can be exacerbated by known maternal risk factors for severe COVID-19, including women who:

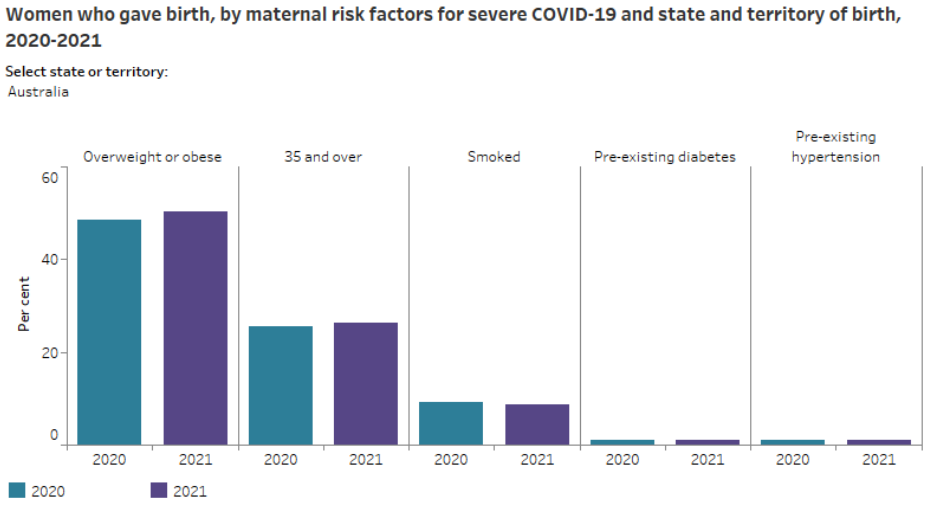
- are older than 35 years
- were living with overweight or obesity
- smoke (see Smoking during pregnancy)
- have pre-existing diabetes or hypertension (see Maternal medical conditions) (the Royal Women's Hospital 2023; Western Australian Department of Health 2022).

Figure 3 presents the proportion pregnant women who had selected risk factors for severe COVID-19 during 2020 and 2021.

While Australia had relatively low rates of COVID-19 infection in 2020 and 2021 compared with other countries, this shows the population of pregnant women who were at greatest risk of poor outcomes.

Figure 3: Proportion of women who gave birth, by maternal risk factors for severe COVID-19 and state and territory of birth, 2020 to 2021

Bar chart shows maternal risk factors for COVID-19 by state and territory of birth between 2020 and 2021.



Notes:
1. In 2020 and 2021, about 15% of women who gave birth in the ACT were non-ACT residents. Care must be taken when interpreting percentages.
2. Percentages calculated after excluding records with 'Not stated' values. Care must be taken when interpreting percentages.
Smoking during pregnancy
1. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
2. For WA, 'Smoked' includes occasional smoking. 'Did not smoke' includes 'Not determined' average number of tobacco cigarettes smoked per day in first 20 weeks of pregnancy and after 20 weeks of pregnancy. Smoking status was determined at multiple locations and times and is therefore difficult to report accurately at time of birth.
3. Mother's tobacco smoking status during pregnancy is self-reported.
Body mass index
1. BMI source data and methods used for data collection in states and territories is not uniform. Care must be taken when comparing across jurisdictions.
2. For Qld and Tas, mother's height and weight at conception were self-reported.
3. For SA and NT, BMI was calculated from mother's height and weight measured at the first antenatal visit.
Diabetes
1. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
Hypertension
1. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 1.1
https://www.aihw.gov.au/

References

RANZCOG (2023) *COVID-19 vaccination in pregnant and breastfeeding women and those planning pregnancy* - external site opens in new window, RANZCOG website, accessed 28 December 2023.

The Royal Women's Hospital (2023) *Advice for pregnant and breastfeeding women* - external site opens in new window, The Royal Women's Hospital website, accessed 28 November 2023.

Western Australian Department of Health (2022) *COVID-19 in pregnancy and birth* - external site opens in new window, Western Australian Department of Health website, accessed 28 November 2023.

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Antenatal period

The antenatal period covers the time from conception until birth. This section looks at the duration of pregnancy at the mother's first antenatal visit, the number of antenatal visits, telehealth services (based on Medicare Benefits Schedule data), smoking status, alcohol consumption status, diabetes and hypertension.

Antenatal care

The National Perinatal Data Collection defines antenatal care as a planned visit between a pregnant woman and a midwife or doctor to assess and improve the wellbeing of the mother and baby throughout pregnancy. Antenatal care is associated with positive maternal and child health outcomes – the likelihood of receiving effective health interventions is increased through attending antenatal care. It does not include visits where the sole purpose is to confirm the pregnancy (AIHW 2023).

For more information on antenatal care, see Antenatal care in *Australia's mothers and babies*.

During 2020, there were rapid changes to the way antenatal care was delivered in Australia – with the purpose of reducing the spread of COVID-19 – through the introduction of telehealth (Woods et al. 2023).

Reports on the changes to antenatal care provision have been mixed. A 2020 Australian study found that changes to antenatal care provision did not affect maternal mental health but may have increased overall neonatal morbidity (Woods et al. 2023). Whereas a 2020 survey of Australian midwives and pregnant women reported positive effects from the introduction of telehealth due to the pandemic, with convenience and increased accessibility for women who lived in remote settings or had caregiving responsibilities (Kluwgant et al. 2022).

The type of antenatal care visit (face-to-face or telehealth) is not available in the National Perinatal Data Collection (NPDC). Therefore, data presented for Telehealth services is from the Medicare Benefits Schedule (MBS). Future data linkage between the NPDC and MBS would allow this to be explored in more depth.

Data presented for Duration of pregnancy at first antenatal care visit and Number of antenatal care visits are from the NPDC.

Telehealth services

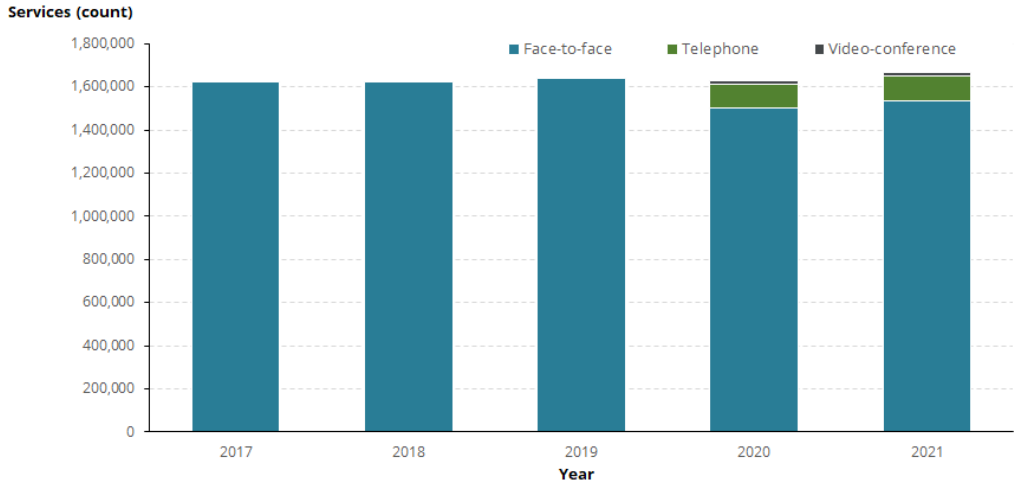
In response to the COVID-19 pandemic, the Australian Government expanded telehealth items to the Medicare Benefits Schedule (MBS) in March 2020, including antenatal care items. These temporary items included antenatal attendances and services provided by video-conference or telephone, which became permanent from 1 January 2022. Note that the MBS items used for analysis in this report may not capture all items that health providers use when providing antenatal care.

Overall, telehealth-integrated antenatal care can be a viable alternative to in-person consultations without compromising pregnancy outcomes (Atkinson et al. 2023; Thirugnanasundralingam et al. 2023). However, uncertainty remains around whether telehealth during the pandemic led to underdiagnosis of maternal conditions such as gestational diabetes and hypertension (Abelman et al. 2023; Thirugnanasundralingam et al. 2023).

In a recent survey of Australian midwives and pregnant women, respondents stated that they positively valued the integration of telehealth services into their maternity care (Kluwgant et al. 2022).

Figure 4 presents MBS data on the types of antenatal care services in Australia.

Figure 4: Number of MBS antenatal care services in Australia, by type of service, 2017 to 2021



Notes:

1. Face-to-face (antenatal care) services includes MBS items 16400, 16500, 16590, 16591, 82100, 82105 and 82110.
2. Telehealth (antenatal care) services delivered by video-conference includes MBS items 91211, 91212, 91850 and 91853. These items were added to the MBS on 13 March 2020, therefore no data is available prior to this date.
3. Telehealth (antenatal care) services delivered by telephone includes MBS items 91218, 91219, 91855 and 91858. These items were added to the MBS on 13 March 2020, therefore no data is available prior to this date.
4. State/Territory is determined according to the address (at time of claiming) of the individual to whom the service was rendered.
5. The MBS is a billing scheme and the data are subject to provider's clinical judgement and billing discretion. This means that services may not be billed with 100% accuracy, and they could also be billed outside of the MBS.
6. Due to the nature of the MBS, the use of general time-tiered items, and lack of antenatal subspeciality items for some professions, not all services will be clearly represented. For example, currently there are no specific telehealth antenatal items available for Nurse Practitioners to claim. As such, any antenatal services provided by Nurse Practitioners would be claimed under broader telehealth items available.

Source: AIHW analysis of Medicare Benefits Schedule item reports on the Services Australia website on 15 February 2024.

Overall, there were a similar number of antenatal services provided between 2017 and 2020 (ranging from 1.62 million to 1.64 million) and a higher number of services delivered in 2021 (1.67 million).

Between 2017 and 2019, face-to-face delivery was the only type of antenatal care available, with over 1.6 million services provided each year.

In 2020 – after the introduction of MBS telephone and videoconference antenatal care services – face-to-face visits decreased to below 1.5 million visits, or 92% of antenatal care services. Telephone and video-conference accounted for 6.8% and 1.0% of antenatal care services, respectively.

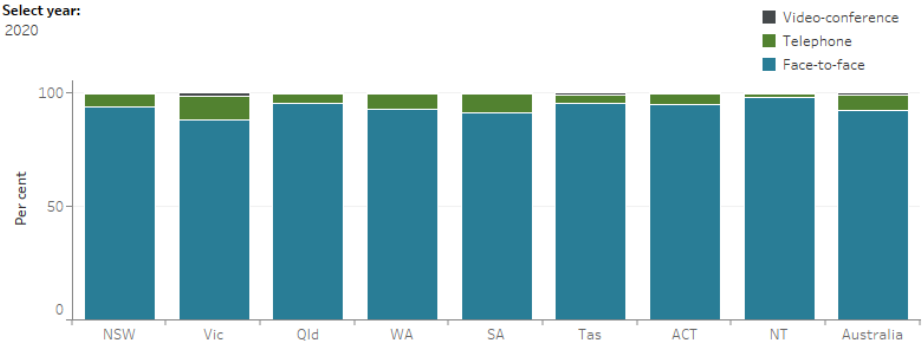
In 2021, face-to-face visits increased to above 1.5 million visits. The type of antenatal care service was mostly face-to-face (92%), followed by telephone (7.1%) and video-conference (0.9%) antenatal care services.

Figure 5 presents data on the type of antenatal care services for states and territories.

Figure 5: Proportion of antenatal care services, by type of service and state or territory of usual residence, 2020 and 2021

Bar chart shows proportion of type of antenatal care delivery between 2020 and 2021.

Proportion of antenatal care services, by type of service and state and territory of usual residence, 2020



Notes:
1. Face-to-face (antenatal care) services includes MBS items 16400, 16500, 16590, 16591, 82100, 82105, 82110, and 82115.
2. Telehealth (antenatal care) services delivered by video-conference includes MBS items 91211, 91212, 91850 and 91853. These items were added to the MBS on 13 March 2020, therefore no data is available prior to this date.
3. Telehealth (antenatal care) services delivered by telephone includes MBS items 91218, 91219, 91855 and 91858. These items were added to the MBS on 13 March 2020, therefore no data is available prior to this date.
4. State/Territory is determined according to the address (at time of claiming) of the individual to whom the service was rendered.
5. The MBS is a billing scheme and the data are subject to provider's clinical judgment and billing discretion. This means that services may not be billed with 100% accuracy, and they could also be billed outside of the MBS.
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Source: AIHW analysis of Medicare Benefits Schedule item reports on the Services Australia website on 15 February 2024. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 2.5.
https://www.aihw.gov.au/

In 2020, all jurisdictions used a mixed type of antenatal care service delivery ranging from 88% to 98% for face-to-face, 2.0% to 10.3% for telephone and 0.2% to 1.9% for video-conference. This was true regardless of the degree to which outbreaks and lockdowns were occurring. However, Victoria experienced the greatest shift to telehealth, which coincided with the nation's most widespread and sustained lockdowns.

In 2021, there was an increase in face-to-face antenatal service delivery across jurisdictions (ranging from 89% to 98%) and a corresponding decrease in telephone and video-conference antenatal care service delivery (ranging from 1.6% to 9.3% and 0.1% to 1.4%, respectively).

Duration of pregnancy at first antenatal visit

The Australian Pregnancy Care Guidelines (Department of Health and Aged Care 2020) recommend that a woman has her first antenatal visit within the first 10 weeks of pregnancy.

The proportion of women receiving antenatal care in the first trimester (before 14 weeks' gestational age) is a widely reported indicator of antenatal care. Regular antenatal care in the first trimester is associated with better maternal health in pregnancy, fewer interventions in late pregnancy and positive child health outcomes (AIHW 2023).

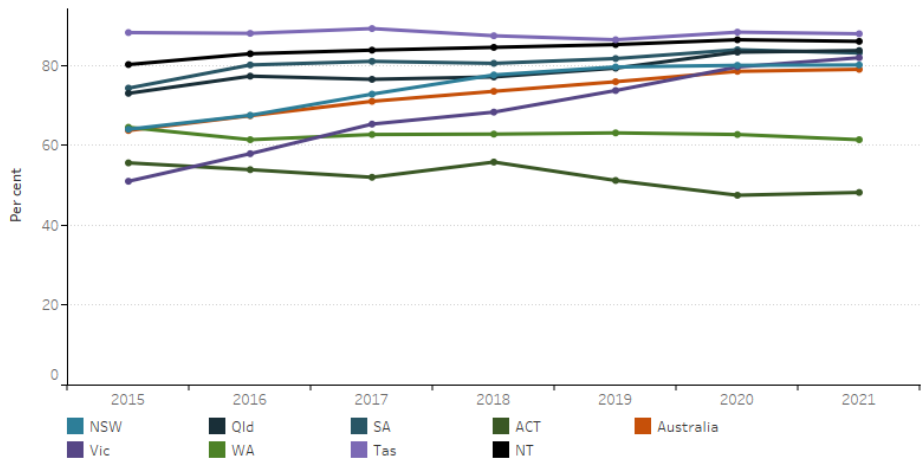
Figure 6 presents data on duration of pregnancy at first antenatal visit.

Figure 6: Proportion of women who gave birth, by duration of pregnancy at first antenatal visit and state and territory of birth, 2015 to 2021

Line graph shows duration of pregnancy at first antenatal visits by state and territory of birth between 2015 and 2021.

Women who gave birth, by duration of pregnancy at first antenatal visit and state and territory of birth, 2015 to 2021

Select duration of pregnancy at first antenatal visit:
Less than 14 weeks



Notes:
1. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
2. For WA, gestational age at first antenatal visit is reported by birth hospital; therefore, data may not be available for women who attend their first antenatal visit outside the birth hospital. This particularly affects hospitals without antenatal care services onsite.
3. For ACT, first antenatal visit is often the first hospital antenatal clinic visit. In many cases, earlier antenatal care provided by the woman's general practitioner is not reported.
4. Includes women with no antenatal care.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 2.1.
https://www.aihw.gov.au/

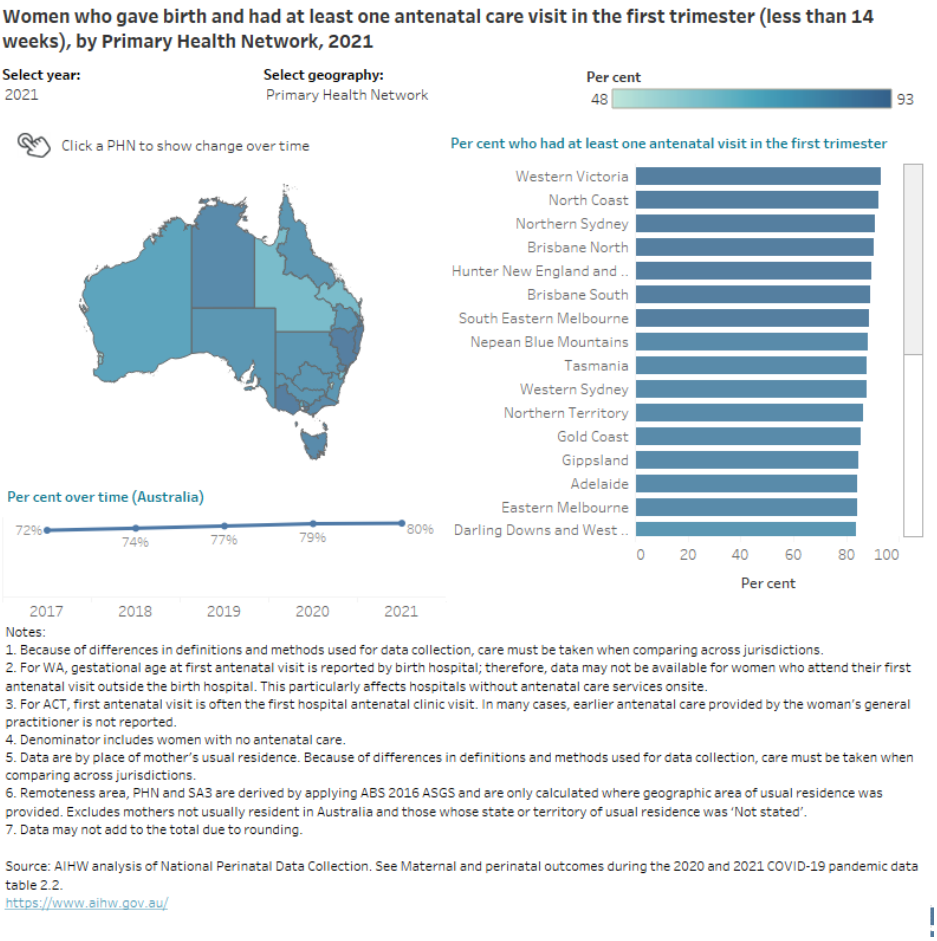
Between 2015 and 2019, the proportion of women who had at least one antenatal visit in the first trimester increased across Australia, from 64.6% in 2015 to 76.6% in 2019. Modelling showed that this was an annual increase of 3.0 percentage points. The observed proportion of women who had at least one antenatal visit in the first trimester was 79.1% in 2020 and 79.6% in 2021, which was similar to the predicted proportions based on the modelling (80.0% in 2020 and 83.0% in 2021).

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Women who lived in some geographical locations were more likely to have at least one antenatal visit in the first trimester. Explore the map below (Figure 7) to view data on the number and proportion of women who had at least one antenatal visit in the first trimester by PHN, remoteness and SA3.

Figure 7: Proportion of women who gave birth and had at least one antenatal visit in the first trimester, by selected geography, 2017 to 2021

Line graph shows primiparous and multiparous women by number of antenatal visits by state and territory of birth between 2016 and 2021.



Number of antenatal visits

Ongoing antenatal visits are required for specific activities as pregnancy progresses, including assessing fetal growth, testing for pregnancy-related conditions, and preparing for labour and birth (Department of Health and Aged Care 2020).

For first-time mothers (primiparous), at least 10 antenatal visits are recommended during pregnancy, for mothers who have previously given birth (multiparous) and for subsequent uncomplicated pregnancies, 7 visits are recommended (Department of Health and Aged Care 2020).

Figure 8 presents data on number of antenatal visits. Data exclude Victoria for data quality reasons. This may have an impact on the results in this section, as Victoria was significantly impacted by the COVID-19 pandemic relative to most Australian jurisdictions.

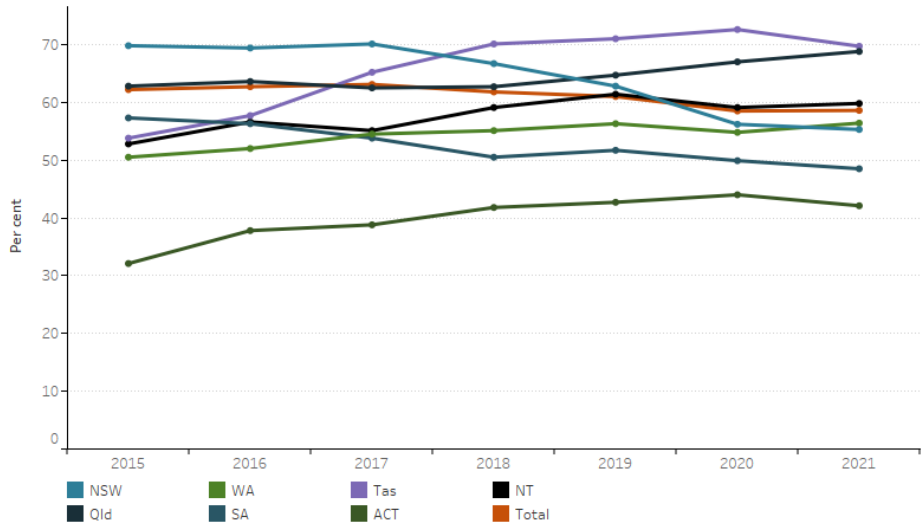
Figure 8: Proportion of primiparous and multiparous women who gave birth, by whether they met the Australian Pregnancy Care Guidelines and state and territory of birth, 2015 to 2021

Line graph shows primiparous and multiparous women by number of antenatal visits by state and territory of birth between 2015 and 2021.

Primiparous women who gave birth and met the Australian Pregnancy Care Guidelines, by state and territory of birth, 2015 to 2021

Select group:
Primiparous women

Select whether met the Australian Pregnancy Care Guidelines:
Met guidelines



Notes:
1. Based on women who gave birth at 32 weeks or more gestation (excluding unknown gestation).
2. For the ACT, in many cases, early antenatal care provided by the woman's general practitioner is not reported.
3. For NT, 'Not stated' includes antenatal care where attendance is evident by the availability of antenatal screening results, but the total number of antenatal visits is unknown.
4. Data excludes Vic.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 2.3.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of first-time mothers who had 10 or more antenatal visits decreased (from 63.3% in 2015 to 61.8% in 2019) (data exclude Victoria). Modelling showed that this was an annual decrease of 0.4 percentage points. The observed proportion of first-time mothers who had 10 or more antenatal visits was 59.1% in 2020 and 59.3% in 2021, which was lower than the predicted proportions based on the modelling (61.9% in 2020 and 61.5% in 2021). This equated to around 4,670 fewer first-time mothers attending the recommended 10 or more antenatal visits than predicted in 2020 and 2021 combined.

In 2020 and 2021, despite the increase in the proportion of first-time mothers who had less than 10 antenatal care visits, there was no increase in the proportion of babies with adverse outcomes among first-time mothers such as pre-term birth, low birthweight, Apgar score of less than 7 or admission to SCN or NICU, compared with previous years.

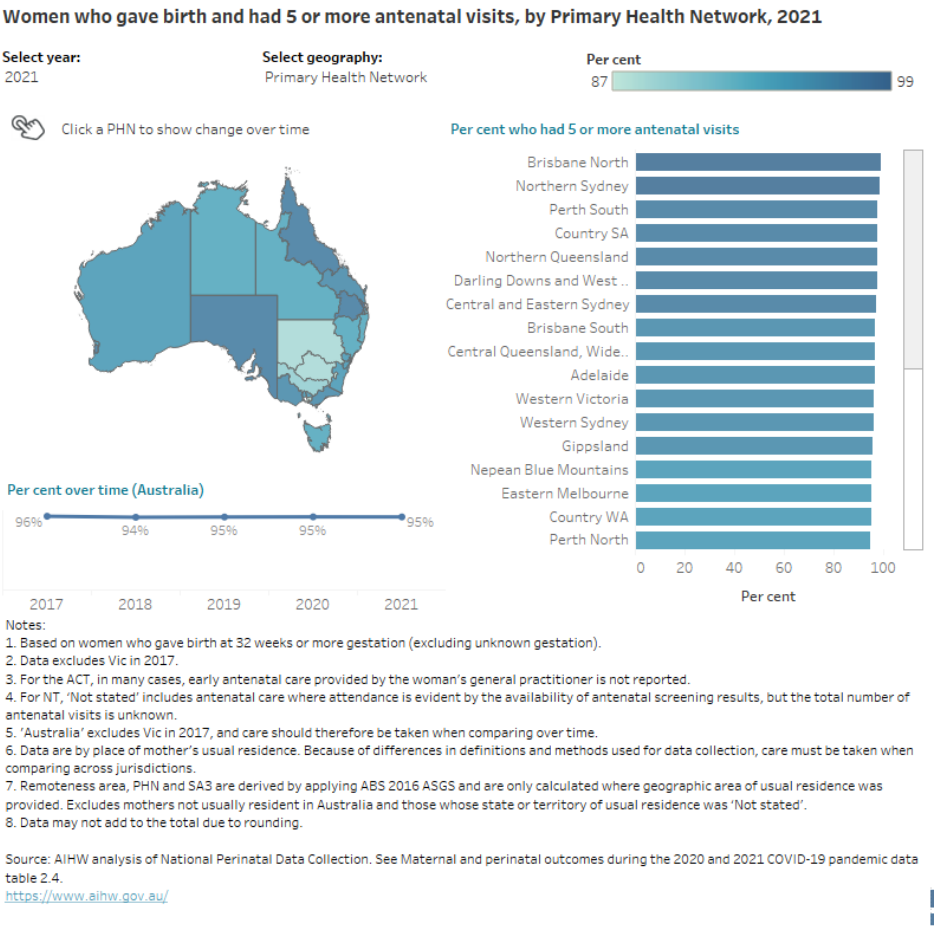
Between 2015 and 2019, the proportion of mothers who had previously given birth and who had 7 or more antenatal visits decreased (from 85.9% in 2015 to 85.2% in 2019) (data exclude Victoria). Modelling showed that this was an annual decrease of 0.2 percentage points. The observed proportion of mothers who had previously given birth and who had 7 or more antenatal visits was 83.6% in 2020 and 84.8% in 2021, which was similar to the predicted proportions based on the modelling (84.8% in 2020 and 84.5% in 2021).

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Women who lived in some geographical locations were more likely to have 5 or more antenatal visits. Explore the map below (Figure 9) to view data on the number and proportion of women who had 5 or more antenatal visits by PHN, remoteness and SA3.

Figure 9: Proportion of women who gave birth and had 5 or more antenatal visits, by selected geography, 2017 to 2021

Map shows proportion of women who had 5 or more antenatal visits by selected geographies and years.



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Maternal health behaviours

Smoking and alcohol consumption during pregnancy are preventable risk factors for pregnancy complications. Supporting women to stop smoking and consuming alcohol can reduce the risk of adverse outcomes for mothers and their babies.

Smoking during pregnancy

Smoking during pregnancy is associated with poorer perinatal outcomes (AIHW 2023). For more information on smoking during pregnancy, see Smoking during pregnancy in *Australia's mothers and babies*.

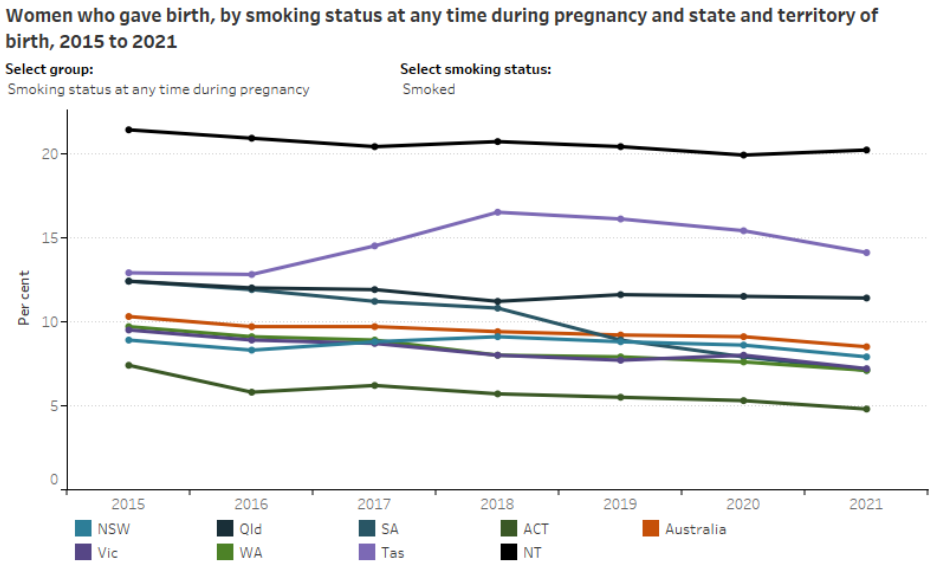
Smoking is a known risk factor of severe disease in pregnant women infected with COVID-19 (Limaye et al. 2022).

Smoking rates have reportedly decreased globally since the beginning of the COVID-19 pandemic (Almeda et al. 2022).

Figure 10 presents data on smoking during pregnancy.

Figure 10: Proportion of women who gave birth, by smoking status at any time during pregnancy, in the first 20 weeks of pregnancy and after 20 weeks of pregnancy and state and territory of birth, 2015 to 2021

Line graph shows maternal smoking status by state and territory of birth between 2015 and 2021.



Notes:
1. Mother's tobacco smoking status during pregnancy is self-reported.
2. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
3. For WA, 'Smoked' includes occasional smoking. 'Did not smoke' includes 'Not determined' average number of tobacco cigarettes smoked per day in first 20 weeks of pregnancy and after 20 weeks of pregnancy. For WA, smoking status was determined at multiple locations and times and is therefore difficult to report accurately at time of birth.
4. For Tas, a change in collections methods were implemented in the electronic system in 2018. Data for Tas from 2018 are therefore not comparable with previous years.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 2.6.
https://www.aihw.gov.au/

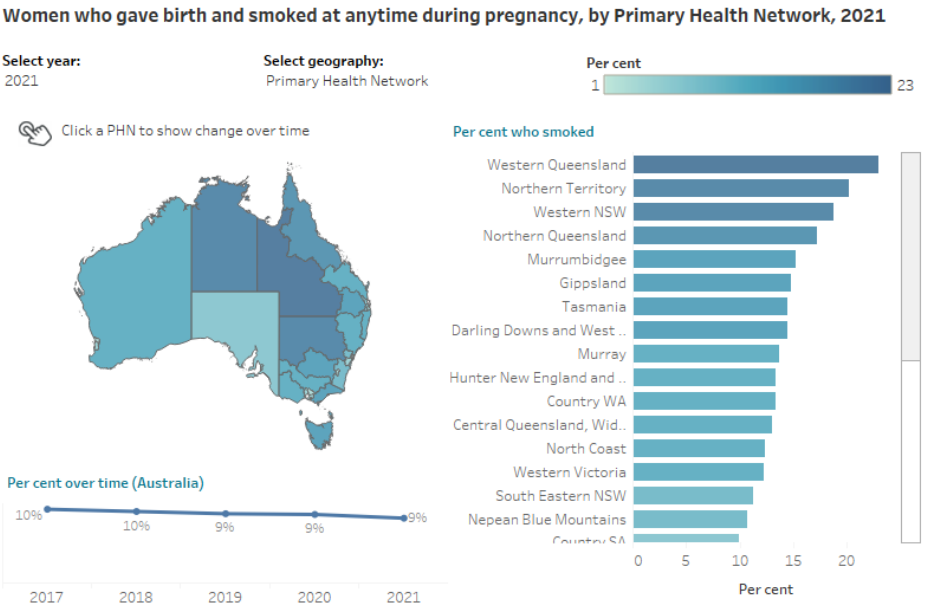
Between 2015 and 2019, the proportion of women who smoked at any time during pregnancy decreased (from 10.4% in 2015 to 9.3% in 2019). Modelling showed that this was an annual decrease of 0.3 percentage points. The observed proportion of women who smoked at any time during pregnancy was 9.2% in 2020 and 8.7% in 2021, which was similar to the predicted proportions based on the modelling (9.1% in 2020 and 8.8% in 2021).

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Women who lived in some geographical locations were more likely to smoke during pregnancy. Explore the map below (Figure 11) to view data on the number and proportion of women who smoked during pregnancy by PHN, remoteness and SA3.

Figure 11: Proportion of women who gave birth and smoked at any time during pregnancy, by selected geography, 2017 to 2021

Map shows proportion of women who smoked at anytime by selected geographies and years.



Notes:
1. Mother's tobacco smoking status during pregnancy is self-reported.
2. For WA, 'Smoked' includes occasional smoking. 'Did not smoke' includes 'Not determined' average number of tobacco cigarettes smoked per day in first 20 weeks of pregnancy and after 20 weeks of pregnancy. For WA, smoking status was determined at multiple locations and times and is therefore difficult to report accurately at time of birth.
3. For Tas, a change in data collection methods were implemented in the electronic system in 2018. Data for Tas from 2018 are therefore not comparable with previous years.
4. Data are by place of mother's usual residence. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
5. Remoteness area, PHN and SA3 are derived by applying ABS 2016 ASGS and are only calculated where geographic area of usual residence was provided. Excludes mothers not usually resident in Australia and those whose state or territory of usual residence was 'Not stated'.
6. Data may not add to the total due to rounding.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 2.7.
https://www.aihw.gov.au/

Alcohol consumption during pregnancy

Alcohol consumption in pregnancy can lead to poorer perinatal outcomes (AIHW 2023). For more information on alcohol consumption during pregnancy, see Alcohol consumption during pregnancy in *Australia's mothers and babies*.

There have been concerns that the impacts of the COVID-19 pandemic, and the policies implemented to contain it, might have increased the rate of alcohol use and misuse in Australia (Tran et al. 2020). There is currently limited and mixed research on how the pandemic has influenced alcohol consumption in pregnant women (Kar et al. 2021; Smith et al. 2022).

Figure 12 presents data on alcohol consumption during pregnancy. Data on maternal consumption of alcohol during pregnancy were available for the first time in 2019. Data exclude New South Wales (as data are not available) and South Australia (as data are not available for the entire trend period).

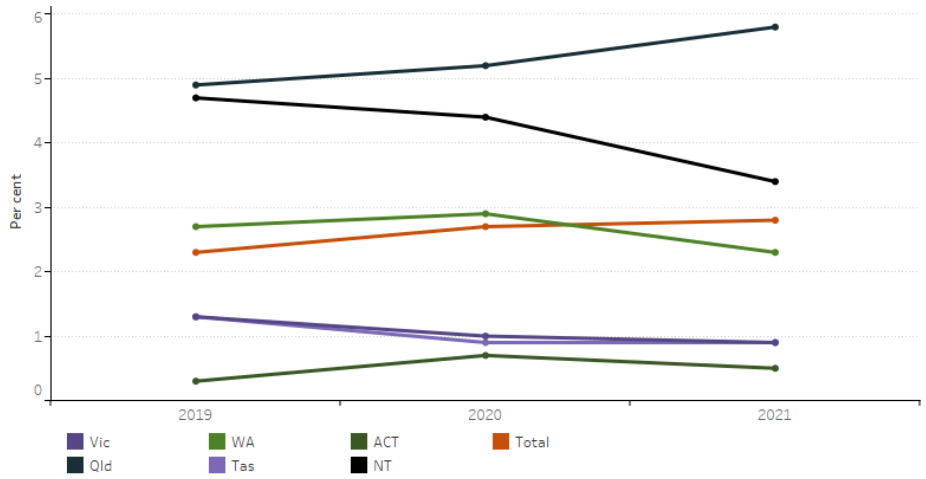
Figure 12: Proportion of women who gave birth, by alcohol consumption and state and territory of birth, 2019 to 2021

Line graph shows maternal alcohol consumption status by state and territory of birth between 2019 and 2021.

Women who gave birth and consumed alcohol in the first 20 weeks of pregnancy, by state and territory of birth, 2019 to 2021

Select group: Alcohol consumption in the first 20 weeks of pregnancy

Select alcohol consumption status: Alcohol consumed



Notes:
1. Mother's alcohol consumption status during pregnancy is self-reported.
2. Qld supplied data on alcohol consumption status before 20 weeks of pregnancy for births from 1 July 2019.
3. Qld and WA supplied data on alcohol consumption status after 20 weeks of pregnancy for births from 1 July 2019.
4. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
5. Data excludes NSW and SA.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 2.8.
https://www.aihw.gov.au/

The proportion of women who consumed alcohol in the first 20 weeks of pregnancy remained relatively stable between 2019 (2.3%), 2020 (2.8%) and 2021 (2.8%).

Over the same period, the proportion of women who consumed alcohol after 20 weeks of pregnancy remained stable (0.8% in 2019 and 2020, and 0.7% in 2021).

It was not possible to undertake linear regression modelling for alcohol consumption during pregnancy, as not enough years of data are available to establish a baseline trend. For more information on modelling the trend over time, see Methods.

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Maternal medical conditions

Diabetes and hypertension (high blood pressure) are significant sources of maternal illness and death. Pregnant women with pre-existing or gestational diabetes or pre-existing or gestational hypertension disorders have increased risk of developing adverse outcomes in pregnancy (AIHW 2023a).

Diabetes

Diabetes affecting pregnancy can be pre-existing (that is, type 1 or type 2) or may arise because of the pregnancy (gestational diabetes).

The type and severity of complications differs according to the type of diabetes experienced in pregnancy and can have both short-term and long-term implications (AIHW 2023a). For more information on diabetes in pregnancy, see Maternal medical conditions in *Australia's mothers and babies*.

International research suggests severe COVID-19 infection during pregnancy is related to an increased risk of gestational diabetes (Wei et al. 2021).

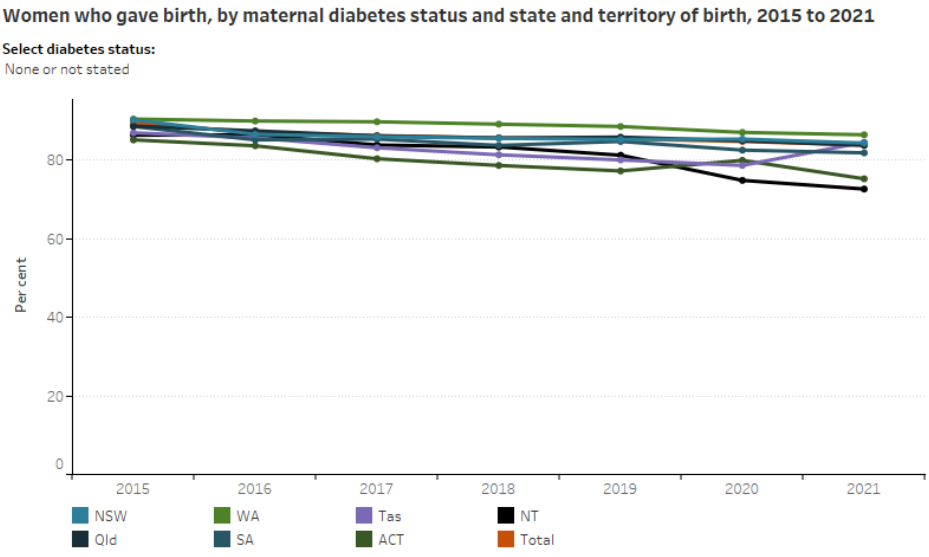
During March 2020, peak Australian diabetes organisations temporarily changed the recommended guidelines for the screening and diagnosis of gestational diabetes (AIHW 2023b), which may have led to underdiagnosed cases of gestational diabetes (Kevat 2023).

According to a preliminary study of pregnant women in Queensland, changes to guidelines were not associated with increased frequency of adverse perinatal outcomes, except for a potential increase in caesarean delivery (Meloncelli et al. 2023).

Figure 13 presents data on diabetes during pregnancy. Data exclude Victoria for data quality reasons. This may have an impact on the results in this section, as Victoria was significantly impacted by the COVID-19 pandemic relative to most Australian jurisdictions.

Figure 13: Proportion of women who gave birth, by maternal diabetes status and state and territory of birth, 2015 to 2021

Line graph shows maternal diabetes status by state and territory of birth between 2015 and 2021.



Notes:
1. Data excludes Vic.
2. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
3. For NSW, data for gestational diabetes and all diabetes from 2016 onwards are not comparable with earlier years due to the implementation of the Australasian Diabetes in Pregnancy Society (ADIPS) Consensus Guidelines during 2016.
4. Between 2015 and 2020, 13%–15% of women who gave birth in the ACT were non-ACT residents (proportion calculated after excluding records where state/territory of usual residence was 'Not stated'). Care must be taken when interpreting percentages. The ACT uses broader inclusion criteria for these conditions, and data are collected from multiple sources.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 2.9.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of women who had gestational diabetes increased year-on-year (from 9.4% in 2015 to 13.5% in 2019), with further increases in 2020 (14.3%) and 2021 (15.2%). Between 2015 and 2021, the proportion of women who had pre-existing diabetes remained relatively stable between 1.0% and 1.2%.

It was not possible to undertake linear regression modelling for diabetes status due to high variability between years of data. For more information on modelling the trend over time, see Methods.

Hypertension

Hypertension (high blood pressure) affecting pregnancy can be pre-existing (that is, chronic) or may arise or worsen because of the pregnancy (gestational hypertension or pre-eclampsia).

Complications of hypertension can affect the short-term and long-term health of both mother and baby (AIHW 2023a; Queensland Health 2021). For more information on hypertension during pregnancy, see Maternal medical conditions in *Australia's mothers and babies*.

International research is currently mixed on whether COVID-19 infection during pregnancy is related to an increased risk of pre-eclampsia and gestational hypertension (Örtqvist et al. 2023; Smith et al. 2023; Wei et al. 2021).

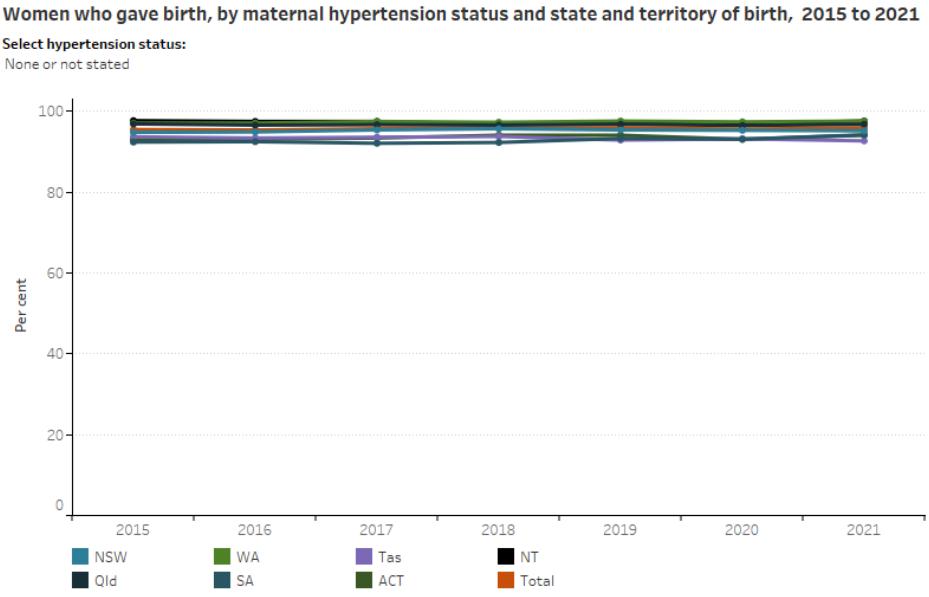
Uncertainty remains around whether the increased uptake of telehealth services led to underdiagnosis of hypertensive conditions (Thirugnanasundralingam et al. 2023).

In Australia, there is some research to suggest that the COVID-19 pandemic restrictions might have been associated with higher rates of gestational hypertension (Rolnik et al. 2021), but less is known about pre-existing hypertension.

Figure 14 presents data on hypertension during pregnancy. Data exclude Victoria for data quality reasons. This may have an impact on the results in this section, as Victoria was significantly impacted by the COVID-19 pandemic relative to most Australian jurisdictions.

Figure 14: Proportion of women who gave birth, by maternal hypertension status and state and territory of birth, 2015 to 2021

Line graph shows maternal hypertension status by state and territory of birth between 2015 and 2021.



Notes:
1. Data excludes Vic.
2. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
3. Between 2015 and 2021, 13–15% of women who gave birth in the ACT were non-ACT residents (proportion calculated after excluding records where state/territory of usual residence was 'Not stated'). Care must be taken when interpreting percentages. The ACT uses broader inclusion criteria for these conditions, and data are collected from multiple sources.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 2.10.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of women who had gestational hypertension decreased from 3.7% in 2015 to 3.3% in 2019. Modelling showed that this was an annual decrease of 0.1 percentage points. The observed proportion of women who had gestational hypertension was 3.4% in 2020 and 3.2% in 2021, which was higher than the predicted proportions based on the modelling (3.2% in

2020 and 3.1% in 2021). This equated to around 880 more women with gestational hypertension during pregnancy than predicted in 2020 and 2021 combined.

For more information on modelling the trend over time, see Methods.

In 2020 and 2021, despite the slightly higher than expected proportion of mothers with gestational hypertension, there was no increase in the proportion of babies with adverse outcomes among mothers with gestational hypertension such as pre-term birth, low birthweight, Apgar score of less than 7 or admission to SCN or NICU, compared with previous years.

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Australian Government
Australian Institute of Health and Welfare

Labour and birth

This section looks at key aspects of the labour and birthing process, including place of birth, onset of labour, method of birth, analgesia administration and maternal length of stay.

Place of birth

Place of birth refers to the setting that a baby was born in. For more information on place of birth, see Place of birth in *Australia's mothers and babies*.

The heightened risk of contracting COVID-19 in hospital, as well as the limits placed on the number of support people allowed during labour and delivery, were factors that contributed to mothers seeking out-of-hospital alternatives during 2020 and 2021 (Knox-Kazimierczuk et al. 2023).

Internationally, the interest in birthing at home has substantially increased with the onset of the COVID-19 pandemic and has remained high (Cheng et al. 2022; Verhoeven et al. 2022).

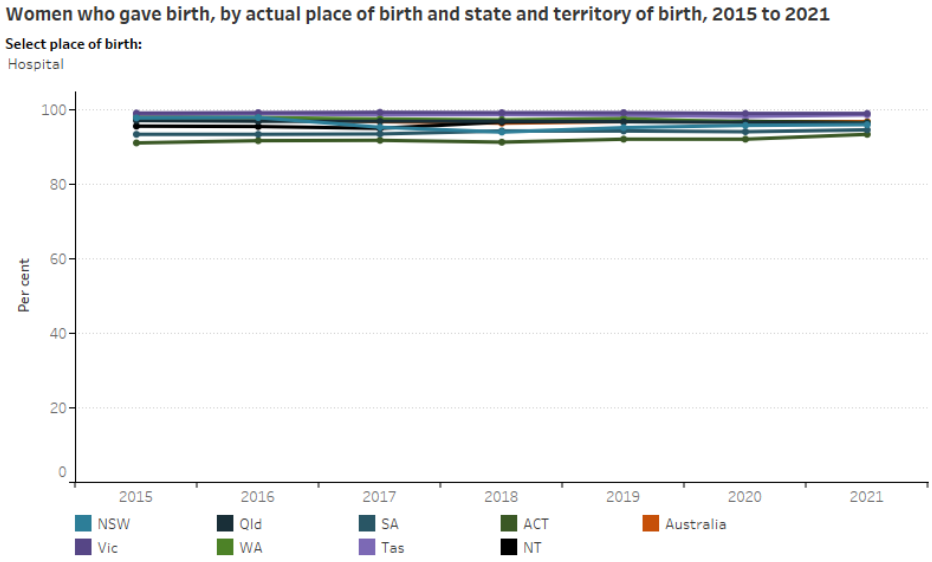
This is also the case for Australia, where a survey by the Australian College of Midwives (2020) found that about 30% of respondents reconsidered their care provider and/or birthing venue, with the major trend being towards a preference for home birth options.

Between 2015 and 2021, most births occurred in hospital (ranging from 96.3% to 97.5%), compared with birth centres (ranging from 2.4% to 3.7%) and home births (ranging from 0.2% to 0.5%).

Figure 15 presents data on place of birth.

Figure 15: Proportion of women who gave birth, by actual place of birth and state and territory of birth, 2015 to 2021

Line graph shows place of birth group by state and territory of birth between 2015 and 2021.



Notes:
1. The National Perinatal Data Collection defines a home birth as one that is planned to take place at a home and is attended by a midwife or other medical professional.
2. 'Other' place of birth includes births that occur at a home other than that intended (unplanned home births); home births without a midwife or other medical professional in attendance (free births); births at a community health centre or babies born before arrival at hospital.
3. Prior to 2021, place of birth data were collected at the mother level, rather than the baby level. In 2021, for multiple births, the place of birth of the first-born baby was used. Care should therefore be taken when comparing data over time.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 3.1.
https://www.aihw.gov.au/

The National Perinatal Data Collection defines a home birth as one that is planned to take place at a home and is attended by a midwife or other medical professional.

Between 2015 and 2019, the proportion of women who gave birth at home remained stable across Australia (0.3% in 2015 and 2019). Modelling showed that there was no annual change. The observed proportion of women who gave birth at home was 0.5% in 2020 and 0.5% in 2021, which was higher than the predicted proportions based on the modelling (0.3% in 2020 and 0.3% in 2021). This equated

to around 1,050 more women giving birth at home than predicted in 2020 and 2021 combined.

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

References

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Onset of labour

Labour can occur spontaneously or may be induced by medical or surgical intervention. If there is no labour, a caesarean section is performed. For more information on onset of labour, see Onset of labour in *Australia's mothers and babies*.

In Australia, clinical advice early in the pandemic was to consider delaying induction of labour for women with suspected or confirmed COVID-19 infection (RANZCOG 2020).

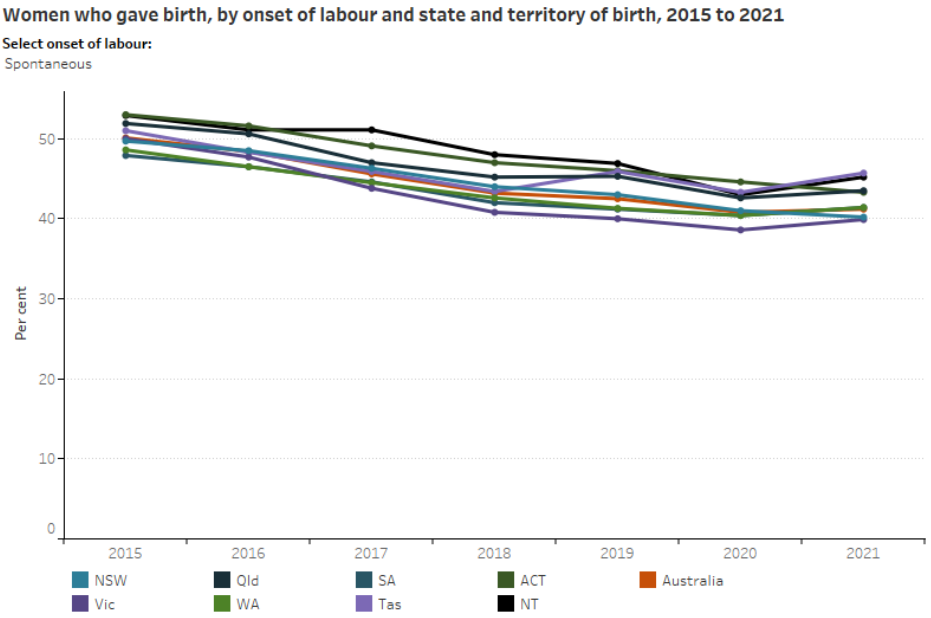
A study in New South Wales found that there was no significant change in induction rates during the first year of the pandemic (Melov et al. 2023).

Between 2015 and 2021, the 3 most common reasons for induction of labour were diabetes, prelabour rupture of membranes and prolonged pregnancy. Prolonged pregnancy was the most common reason for induction in 2015 (17%) and 2016 (16%) and diabetes was the most common reason for induction from 2017 onwards (between 14% and 15%).

Figure 16 presents data on onset of labour.

Figure 16: Proportion of women who gave birth, by onset of labour and state and territory of birth, 2015 to 2021

Line graph shows onset of labour group by state and territory of birth between 2015 and 2021.



Note: 'Induced' may include cases where induction of labour was attempted but labour did not result.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes the during 2020 and 2021 COVID-19 pandemic data table 3.2.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of women who had an induction increased across Australia (from 29.4% in 2015 to 34.7% in 2019). Modelling showed that this was an annual increase of 1.5 percentage points. The observed proportion of women who had an induction was 35.5% in 2020 and 34.2% in 2021, which was lower than the predicted proportions based on the modelling (36.6% in 2020 and 38.1% in 2021). This equated to around 15,380 more women without induction of labour than predicted in 2020 and 2021 combined.

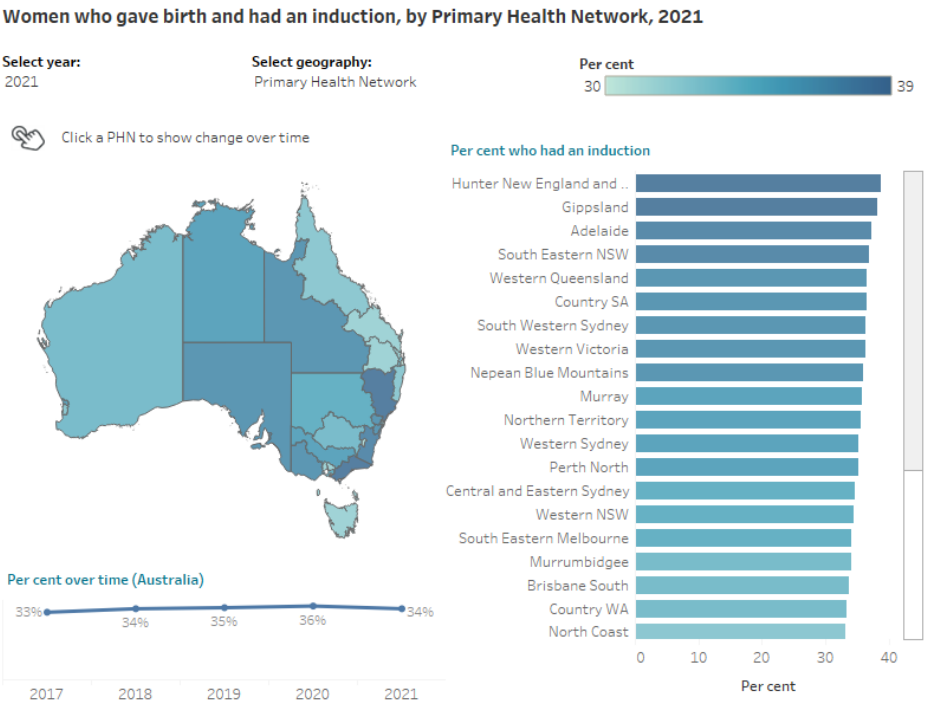
Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

In 2020 and 2021, despite the decrease in the proportion of mothers who had an induction, there was no increase in the proportion of babies with adverse outcomes among mothers who had an induction, such as an Apgar score of less than 7. There was a decrease in the proportion of babies who were born pre-term, of low birthweight or required admission to SCN or NICU, compared with previous

years.

Women who lived in some geographical locations were more likely to have an induction. Explore the map below (Figure 17) to view data on the number and proportion of women who had an induction by PHN, remoteness and SA3.

Figure 17: Proportion of women who gave birth and had an induction, by selected geography, 2017 to 2021
Map shows proportion of inductions by selected geographies and years.



Notes:
1. 'Induced' may include cases where induction of labour was attempted but labour did not result.
2. Data are by place of mother's usual residence. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
3. Remoteness area, PHN and SA3 are derived by applying ABS 2016 ASGS and are only calculated where geographic area of usual residence was provided. Excludes mothers not usually resident in Australia and those whose state or territory of usual residence was 'Not stated'.
4. Data may not add to the total due to rounding.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 3.3.
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Method of birth

Method of birth refers to how the baby was born, which may be vaginally – non-instrumental or with the assistance of forceps or vacuum (instrumental vaginal birth) – or by caesarean section.

For more information on method of birth, see Method of birth in *Australia's mothers and babies*.

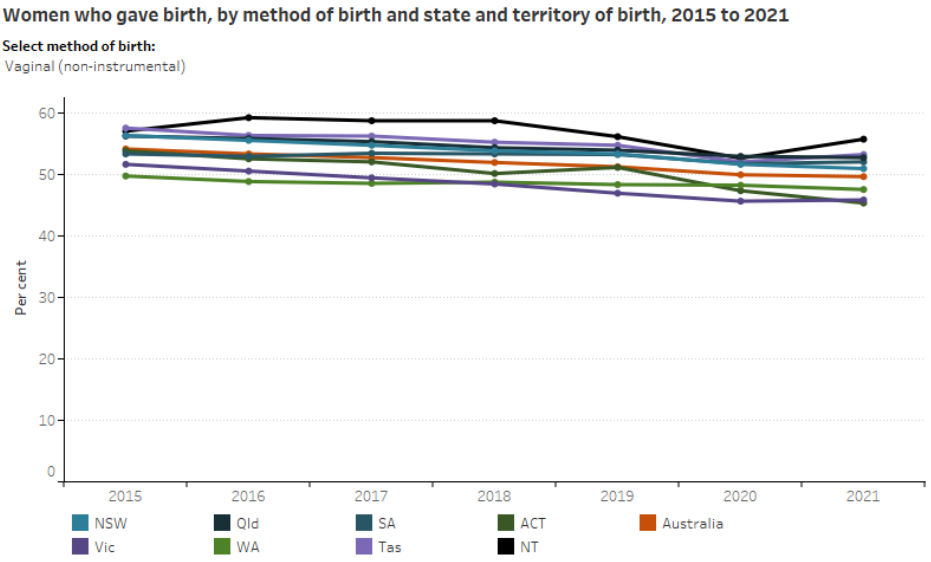
International research is mixed on whether COVID-19 infection increases the occurrence of caesarean section births. Some studies indicate that there was no increase (Chinn et al. 2021; Son et al. 2021), whilst others suggest that COVID-19 infection in pregnancy can increase the risk of needing an emergency caesarean section (Gurol-Urganci et al. 2021; Smith et al. 2023).

A New South Wales based study found that both elective and emergency caesarean section rates increased during the first 2 years of the pandemic (Trinh et al. 2023).

Figure 18 presents data on method of birth.

Figure 18: Proportion of women who gave birth, by method of birth and state and territory of birth, 2015 to 2021

Line graph shows method of birth group by state and territory of birth between 2015 and 2021.



Notes:
1. For NSW, WA (prior to 2016) and the NT, 'Non-instrumental vaginal' includes all women who had a vaginal breech birth, whether or not instruments were used. For the remaining jurisdictions, 'Non-instrumental vaginal' includes vaginal breech births only where instruments were not used.
2. Between 2015 and 2021, 13–15% of women who gave birth in the ACT were non-ACT residents. Care must be taken when interpreting percentages. For example, 41.1% of ACT resident women had a caesarean section in 2021 compared with 47.8% of non-ACT residents who gave birth in the ACT.
3. Not stated may include other methods of birth not categorised elsewhere.
4. For multiple births, the method of birth of the first-born baby was used.

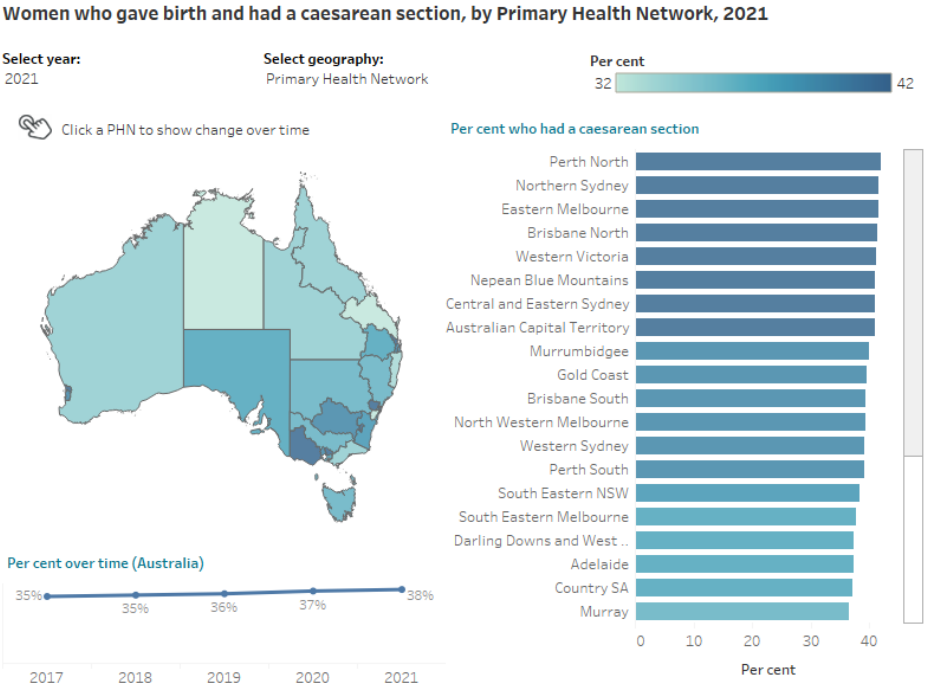
Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 3.4.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of women who had a caesarean section birth increased across Australia (from 33.3% in 2015 to 36.0% in 2019). Modelling showed that this was an annual increase of 0.7 percentage points. The observed proportion of women who had a caesarean section birth was 37.4% in 2020 and 38.2% in 2021, which was similar to the predicted proportions based on the modelling (36.7% in 2020 and 37.4% in 2021).

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Women who lived in some geographical locations were more likely to have a caesarean section birth. Explore the map below (Figure 19) to view data on the number and proportion of women who had a caesarean section birth by PHN, remoteness and SA3.

Figure 19: Proportion of women who gave birth by caesarean section, by selected geography, 2017 to 2021
Map shows proportion of caesarean sections by selected geographies and years.



Notes:
1. For multiple births, the method of birth of the first-born baby was used.
2. Data are by place of mother's usual residence. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
3. Remoteness area, PHN and SA3 are derived by applying ABS 2016 ASGS and are only calculated where geographic area of usual residence was provided. Excludes mothers not usually resident in Australia and those whose state or territory of usual residence was 'Not stated'.
4. Data may not add to the total due to rounding.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 3.5.
https://www.aihw.gov.au/

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Analgesia

Analgesia is used to relieve pain during labour. Data are therefore limited to mothers who had labour, whether spontaneous or induced (note that some mothers who labour may go on to have a caesarean section and also receive anaesthesia). More than one type of analgesic can be administered.

For more information on analgesia, see Analgesia in *Australia's mothers and babies*.

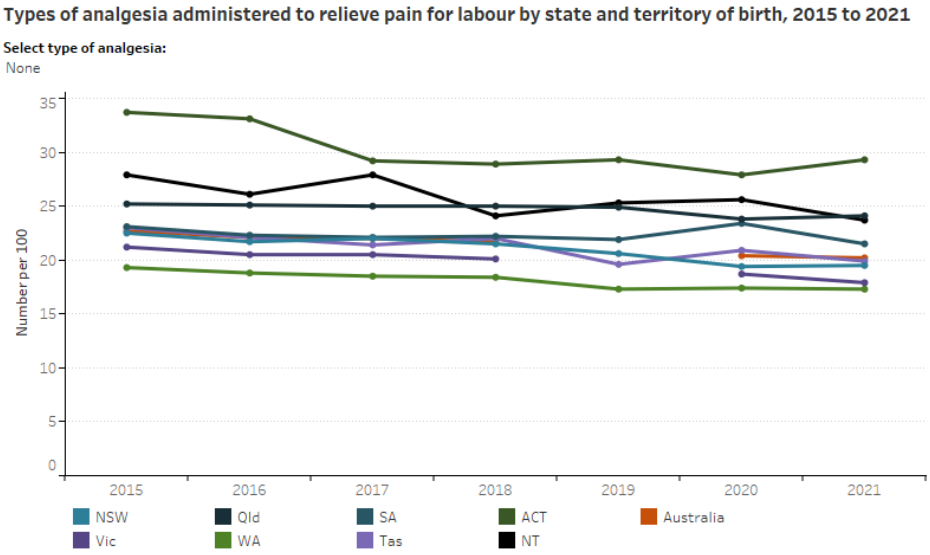
During the pandemic, concerns were raised over which types of analgesia were safe to use for pregnant women who have a COVID-19 infection (D'Souza et al. 2020), which may have influenced the type of analgesia which was administered.

In Australia, nitrous oxide was suspended in many birthing units to reduce the risk of COVID-19 transmission through aerosol generation (Froessler et al. 2022). Research shows that epidural rates did not change during this time, but opioid analgesia use increased (Froessler et al. 2022).

Figure 20 presents data on analgesia type.

Figure 20: Proportion of women who laboured and gave birth, by analgesia type and state and territory of birth, 2015 to 2021

Line graph shows type of analgesia administered by state and territory of birth between 2015 and 2021.



Notes:
1. Only women who had a spontaneous or induced labour are included.
2. For ACT 'Other' includes non-pharmacological methods such as bath, shower, spa, heat pack, aromatherapy, acupressure and acupuncture. In most cases, it has been reported in addition to other listed pharmacological methods.
3. For NT, 'Other' includes non-narcotic oral analgesia and non-pharmacological methods.
4. In 2019, data for Vic and Australia are not published due to data quality reasons for Vic.
5. More than 1 type of analgesia could be recorded. This means that the sums of individual categories are greater than the total numbers of women who gave birth; therefore, totals are not included.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 3.6.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of women who had nitrous oxide during labour decreased from 52.7% in 2015 to 51.7% in 2019 (excluding data from Victoria). Modelling showed that this was an annual decrease of 0.4 percentage points. The observed proportion of women who had nitrous oxide during labour was 50.6% in 2020 and 50.8% in 2021, which was similar to the predicted proportions based on the modelling (51.2% in 2020 and 50.8% in 2021).

Between 2015 and 2019, the proportion of women who had systemic opioids during labour decreased from 16.5% in 2015 to 12.7% in 2019 (excluding data from Victoria). Modelling showed that this was an annual decrease of 1.0 percentage points. The observed proportion of women who had systemic opioids during labour was 12.0% in 2020 and 10.6% in 2021, which was similar to the predicted proportions based on the modelling (11.6% in 2020 and 10.6% in 2021).

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

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Maternal length of stay in hospital

This section focuses on the maternal antenatal (prior to giving birth) and postnatal (after giving birth) length of stay in hospital and includes only mothers who gave birth in hospital.

Antenatal length of stay

Antenatal length of stay refers to the number of days between admission to hospital and the birth event. Data on antenatal length of stay include mothers who gave birth in hospitals only.

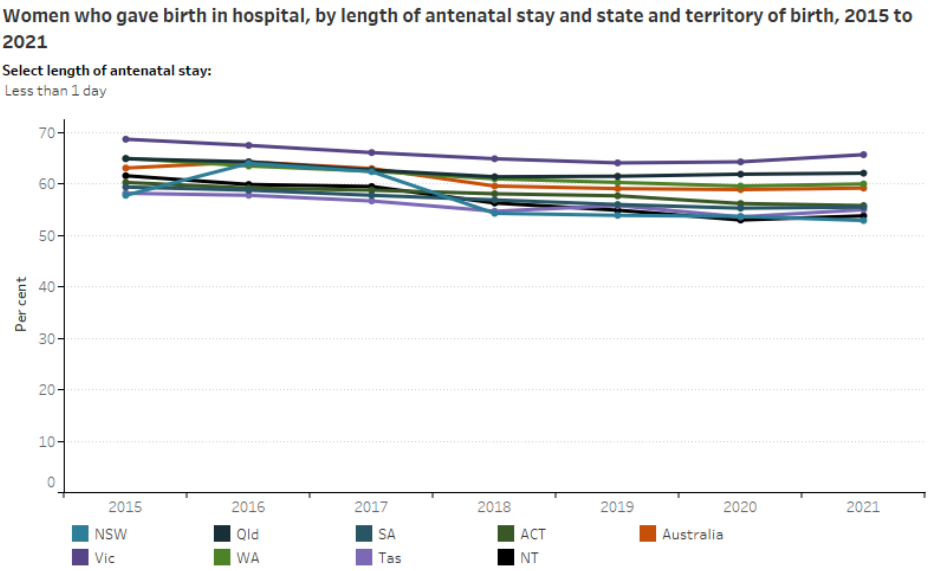
For more information on antenatal length of stay, see Maternal length of stay in hospital in *Australia's mothers and babies*.

Changes in clinical practice and guidelines, and concerns over exposure to COVID-19, may have resulted in changes to the length of antenatal stay in hospital.

Figure 21 presents data on length of antenatal stay in hospital.

Figure 21: Proportion of women who gave birth in hospital, by length of antenatal stay and state and territory of birth, 2015 to 2021

Line graph shows length of antenatal stay by state and territory of birth between 2015 and 2021.



Notes:
1. Prior to 2021, place of birth data were collected at the mother level, rather than the baby level. In 2021, for multiple births, the place of birth of the first-born baby was used. Care should therefore be taken when comparing data across time.
2. Prior to 2021, excludes women who gave birth in a birth centre attached to a hospital. In 2021, excludes women whose first-born baby was born in a birth centre attached to a hospital.
3. 'Not stated' for WA are cases that were not able to be linked to admission records, most predominantly those giving birth before admission.
4. For Tas, these data are not fully reported due to the linkage issues between movement of cases between hospitals. Care must be taken when interpreting these numbers.

Source: AIHW analysis of National Perinatal Data Collection.See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 3.7.
https://www.aihw.gov.au/

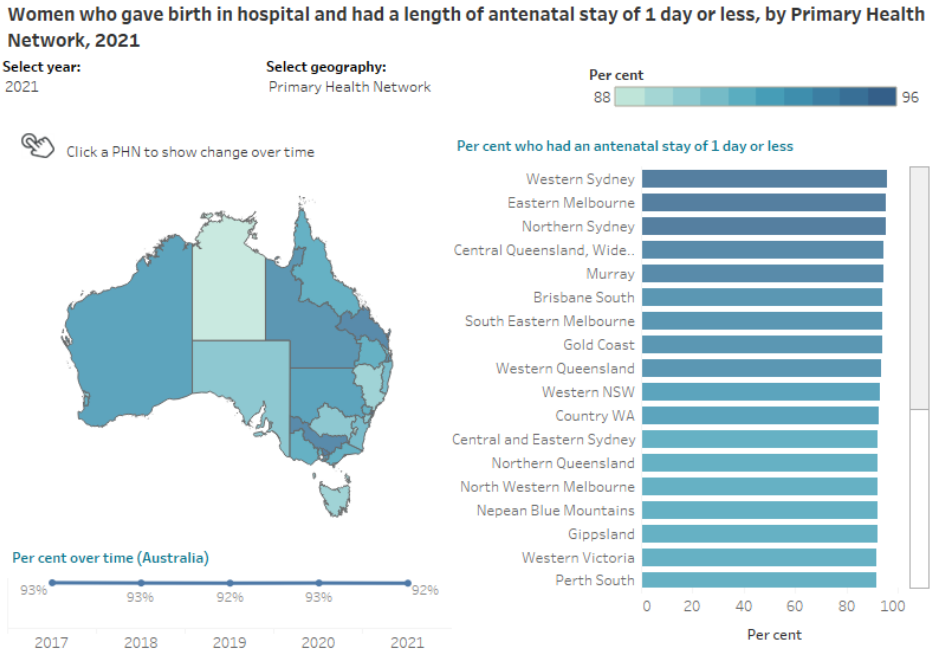
Between 2015 and 2019, the proportion of women who had an antenatal length of stay in hospital of 1 day or less decreased across Australia (from 93.9% in 2015 to 92.2% in 2019). Modelling showed that there was an annual decrease of 0.5 percentage points. The observed proportion of women who had an antenatal length of stay in hospital of 1 day or less was 92.5% in 2020 and 92.1% in 2021, which was similar to the predicted proportion based on the modelling (91.7% in 2020 and 91.2% in 2021).

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Women who lived in some geographical locations were more likely to have an antenatal length of stay in hospital of 1 day or less. Explore the map below (Figure 22) to view data on the number and proportion of women who had an antenatal length of stay in hospital of 1 day or less by PHN, remoteness and SA3.

Figure 22: Proportion of women who gave birth in hospital and had an antenatal length of stay in hospital of 1 day or less, by selected geography, 2017 to 2021

Map shows proportion of women who had an antenatal stay of 1 day or less by selected geographies and years.



Notes:
1. Prior to 2021, place of birth data were collected at the mother level, rather than the baby level. In 2021, for multiple births, the place of birth of the first-born baby was used. Care should therefore be taken when comparing data across time.
2. Prior to 2021, excludes women who gave birth in a birth centre attached to a hospital. In 2021, excludes women whose first-born baby was born in a birth centre attached to a hospital.
3. 'Not stated' for WA are cases that were not able to be linked to admission records, most predominantly those giving birth before admission.
4. For Tas, these data are not fully reported due to the linkage issues between movement of cases between hospitals. Care must be taken when interpreting these numbers.
5. Data are by place of mother's usual residence. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
6. Remoteness area, PHN and SA3 are derived by applying ABS 2016 ASGS and are only calculated where geographic area of usual residence was provided. Excludes mothers not usually resident in Australia and those whose state or territory of usual residence was 'Not stated'.
7. Data may not add to the total due to rounding.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 3.8.
https://www.aihw.gov.au/

Postnatal length of stay

Postnatal length of stay refers to the number of days between the birth event and date of discharge or transfer from the hospital where birth occurred, or date of death. Data on postnatal length of stay are based on mothers who gave birth in hospitals and were discharged to home. This section excludes Western Australia as data are not available for women discharged to home.

For more information on postnatal length of stay, see Maternal length of stay in hospital in *Australia's mothers and babies*.

The World Health Organization (2022) recommends that after an uncomplicated vaginal birth in a health facility, healthy mothers and newborns should receive care in the facility for at least 24 hours after birth. A mother's postnatal length of stay is related to maternal factors, such as recovery after birth particularly for caesarean section birth, management of obstetric and maternal health conditions, management of conditions related to the baby and health system factors such as resourcing pressures (Rayner et al. 2008; Blumenfeld et al. 2015).

The aims of postnatal care in hospital are to provide mothers and their partners and/or family with advice and support around physical recovery, breastfeeding, parenting skills and linking to supports in the community (Rayner et al. 2008).

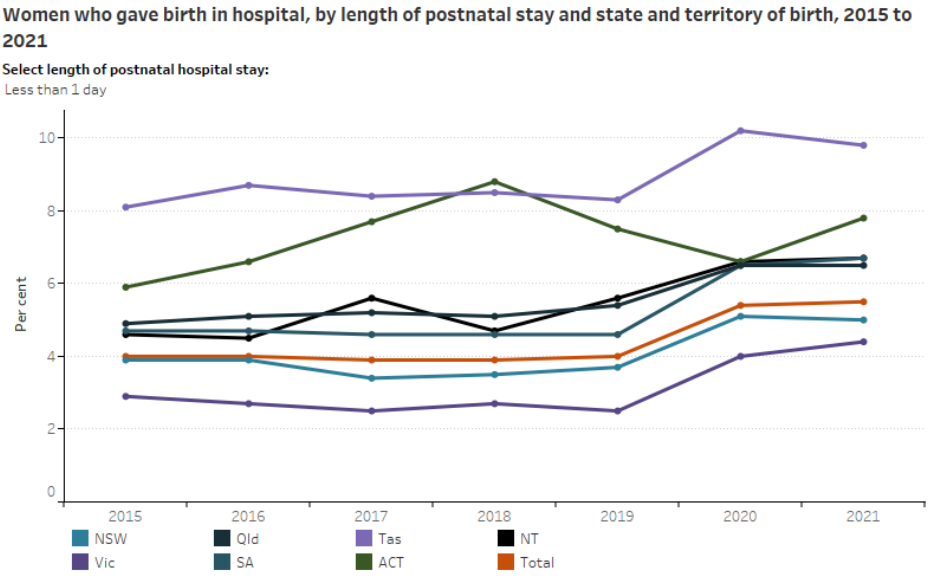
During the pandemic, there was a general shift to shorter hospital stays (AIHW 2023). This may have been due to concerns about exposure to COVID-19, changes in practice guidelines or women requesting an early discharge because of strict visiting rules (Semaan et al. 2022).

Pregnant women with COVID-19 are at increased risk of being admitted to the intensive care unit (Department of Health and Aged Care 2023; Smith et al. 2023), which corresponds to a longer time spent in hospital after giving birth (Gurol-Urganci et al. 2021).

Figure 23 presents data on length of postnatal stay in hospital.

Figure 23: Proportion of women who gave birth in hospital, by length of postnatal stay and state and territory of birth, 2015 to 2021

Line graph shows length of postnatal stay by state and territory of birth between 2015 and 2021.



Notes:
1. Prior to 2021, place of birth data were collected at the mother level, rather than the baby level. In 2021, for multiple births, the place of birth of the first-born baby was used. Care should therefore be taken when comparing data across time.
2. Prior to 2021, excludes women who gave birth in a birth centre attached to a hospital. In 2021, excludes women whose first-born baby was born in a birth centre attached to a hospital.
3. Only includes women who were discharged home.
4. Data excludes WA.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 3.9.
https://www.aihw.gov.au/

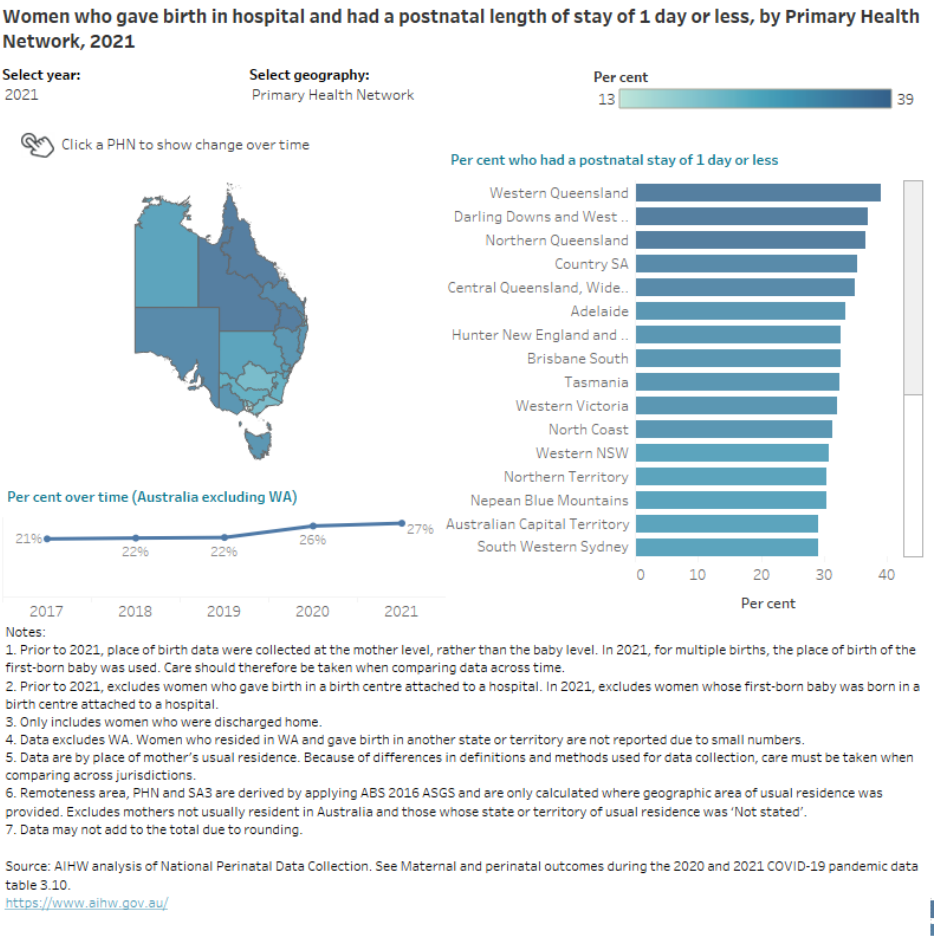
Between 2015 and 2019, the proportion of women who had a postnatal length of stay in hospital of 1 day or less increased (from 20.7% in 2015 to 21.7% in 2019). Modelling showed that this was an annual increase of 0.2 percentage points. The observed proportion of women who had a postnatal length of stay in hospital of 1 day or less was 25.9% in 2020 and 26.9% in 2021, which was higher than the predicted proportions based on the modelling (22.0% in 2020 and 22.2% in 2021). This equated to around 21,840 more mothers staying in hospital for one day or less following a hospital birth than predicted in 2020 and 2021 combined.

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Women who lived in some geographical locations were more likely to have a postnatal length of stay in hospital of 1 day or less. Explore the map below (Figure 24) to view data on the number and proportion of women who had a postnatal length of stay in hospital of 1 day or less by PHN, remoteness and SA3.

Figure 24: Proportion of women who gave birth in hospital and had a postnatal length of stay in hospital of 1 day or less, by selected geography, 2017 to 2021

Map shows proportion of women who had a postnatal stay of 1 day or less by selected geographies and years.



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Australian Government
Australian Institute of Health and Welfare

Baby outcomes

This section looks at outcomes for the baby after birth, including gestational age, birthweight, birthweight adjusted for gestational age, resuscitation, admission to special care nurseries or neonatal intensive care units, baby's hospital length of stay and perinatal deaths.

Gestational age

Gestational age is the duration of pregnancy in completed weeks. The gestational age of a baby has important implications for their health, with poorer outcomes generally reported for those born early (AIHW 2023).

Gestational age is reported in 3 categories: pre-term (less than 37 weeks' gestation), term (37 to 41 weeks) and post-term (42 weeks and over).

For more information on gestational age, see Gestational age in *Australia's mothers and babies*.

International research supports a link between COVID-19 infection during pregnancy and an increased risk of pre-term birth (Chinn et al. 2021; Neelam et al. 2022; Smith et al. 2022, 2023).

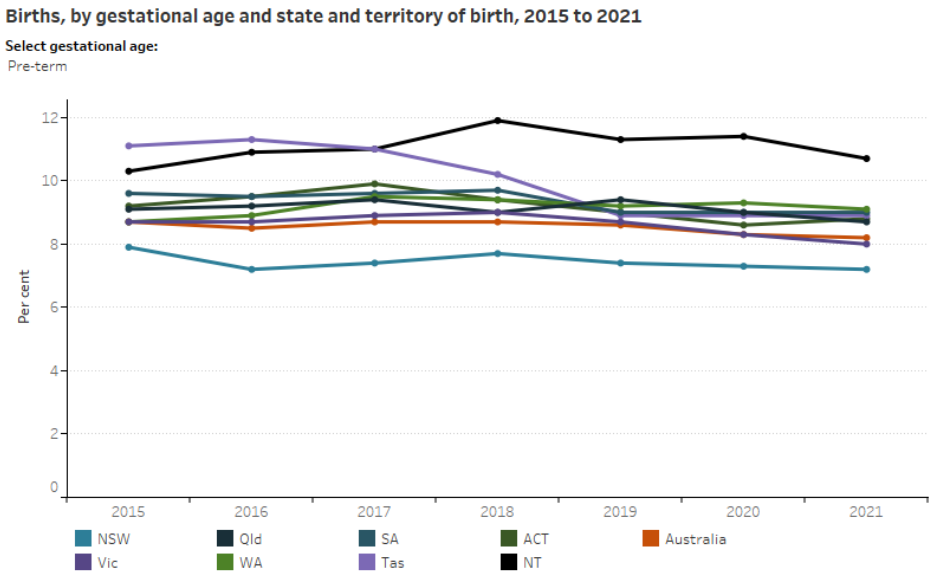
In Australia, the overall proportion of pre-term birth does not appear to have increased during the first 2 years of the COVID-19 pandemic (AIHW 2023), noting that Australia had a relatively low infection rate during this time.

In 2021, the National Preterm Birth Prevention Collaborative – which aims to support the adoption of evidence-based changes in clinical care to reduce preterm birth – expanded their program nationally.

Figure 25 presents data on gestational age.

Figure 25: Proportion of births, by gestational age and state and territory of birth, 2015 to 2021

Line graph shows births by gestational age by state and territory of birth between 2015 and 2021.



Notes:
1. Pre-term births may include late termination of pregnancy.
2. Pre-term births may include a small number of births of less than 20 weeks gestation.
3. Between 2015 and 2021, 13–16% of women who gave birth in the ACT were non-ACT residents (proportion calculated after excluding records where state/territory of usual residence was 'Not stated'). Care must be taken when interpreting percentages. For example, the proportion of pre-term births among babies of ACT residents who gave birth in the ACT in 2021 was 7.4% compared with 17.0% of non-ACT residents who gave birth in the ACT.

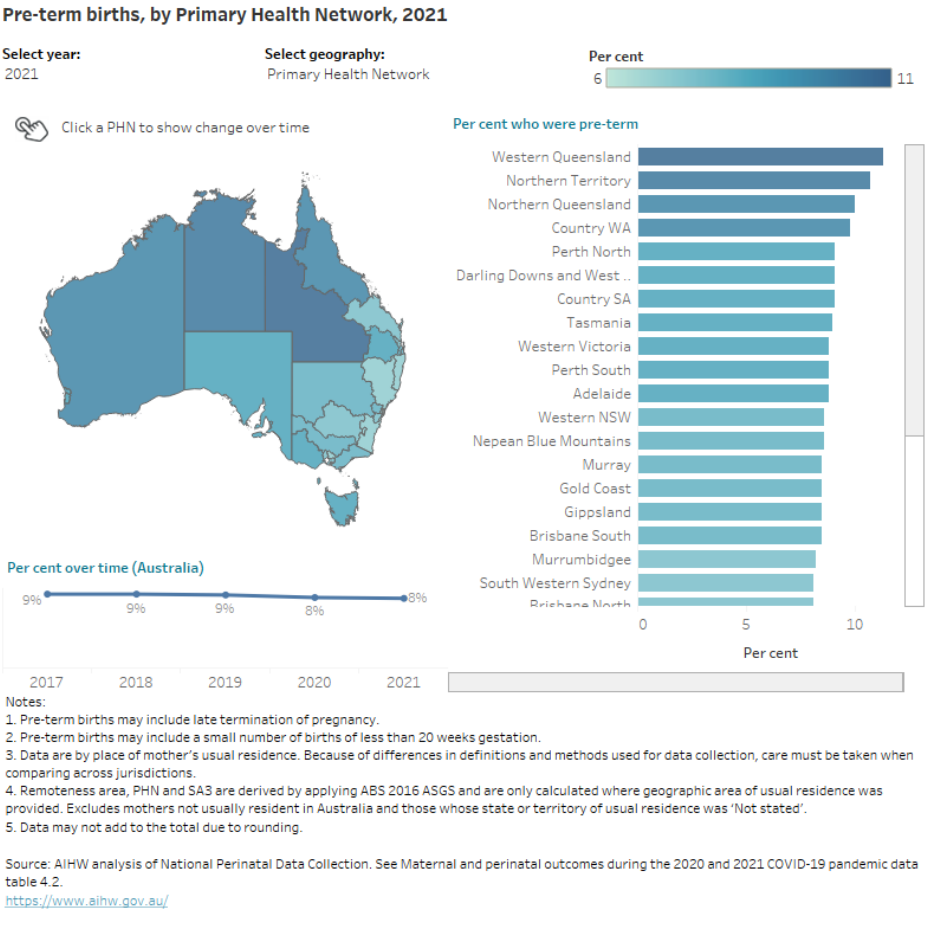
Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 4.1.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of babies who were born pre-term remained relatively stable across Australia (from 8.7% in 2015 to 8.6% in 2019). Modelling showed that there was no annual change. The observed proportion of babies who were born pre-term was 8.3% in 2020 and 8.2% in 2021, which was lower than the predicted proportions based on the modelling (8.6% in 2020 and 8.6% in 2021). This equated to around 2,330 fewer babies born pre-term than predicted in 2020 and 2021 combined.

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Babies of mothers who lived in some geographical locations were more likely to be born pre-term. Explore the map below (Figure 26) to view data on the number and proportion of babies who were born pre-term by PHN, remoteness and SA3.

Figure 26: Proportion of pre-term births, by selected geography, 2017 to 2021
Map shows proportion of pre-term births by selected geographies and years.



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Regan L, Rukundo G, Sahota D, Sakowicz A, Sanin-Blair J, Söderling J, Stephansson O, Temmerman M, Thorson A, Tolosa JE, Townson J, Valencia-Prado M, Visentin S, von Dadelszen P, Adams Waldorf K, Whitehead C, Yassa M and Tielsch JM (2023) 'Adverse maternal, fetal, and newborn outcomes among pregnant women with SARS-CoV-2 infection: an individual participant data meta-analysis' - external site opens in new window, *BMJ Glob Health*, 8(1):9495, doi:10.1136/bmjgh-2022-009495.

Birthweight

Birthweight is the first weight of the baby obtained after birth. Birthweight is reported in 3 categories: low birthweight (birthweight less than 2,500 grams), healthy birthweight (birthweight between 2,500 and 4,499 grams) and high birthweight (birthweight of 4,500 grams or more). For more information on birthweight, see Birthweight in *Australia's mothers and babies*.

Babies with birthweights outside the healthy range are at greater risk of illness, poor development, perinatal death and poorer health in adulthood (AIHW 2023).

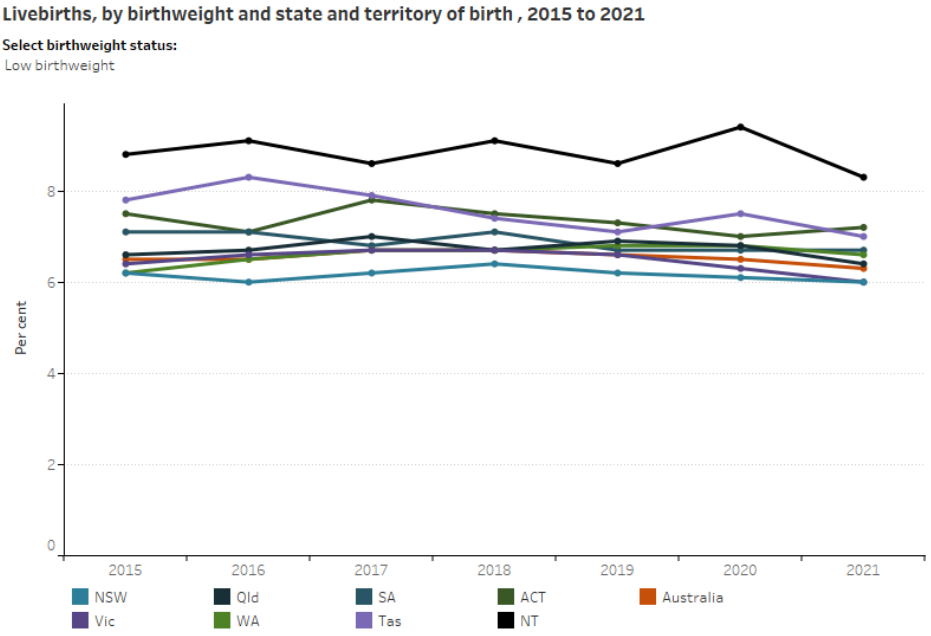
Reviews have provided international evidence that COVID-19 infection during pregnancy increases the rate of low birthweight (New South Wales Health 2021; Smith et al. 2023; Wei et al. 2021).

In Australia, there was no increase in the rate of babies who were low birthweight (AIHW 2023). This may be due to Australia's relatively low infection rate during this time.

Figure 27 presents data on birthweight.

Figure 27: Proportion of live births, by birthweight and state and territory of birth, 2015 to 2021

Line graph shows birthweight by state and territory of birth between 2015 and 2021.



Note: Between 2015 and 2021, 13–15% of women who gave birth in the ACT were non-ACT residents. Care must be taken when interpreting percentages. For example, in 2021, the proportion of live births of ACT residents who gave birth in the ACT where the birthweight was less than 1,500 grams was 0.9%, and where the birthweight was less than 2,500 grams was 6.1%.

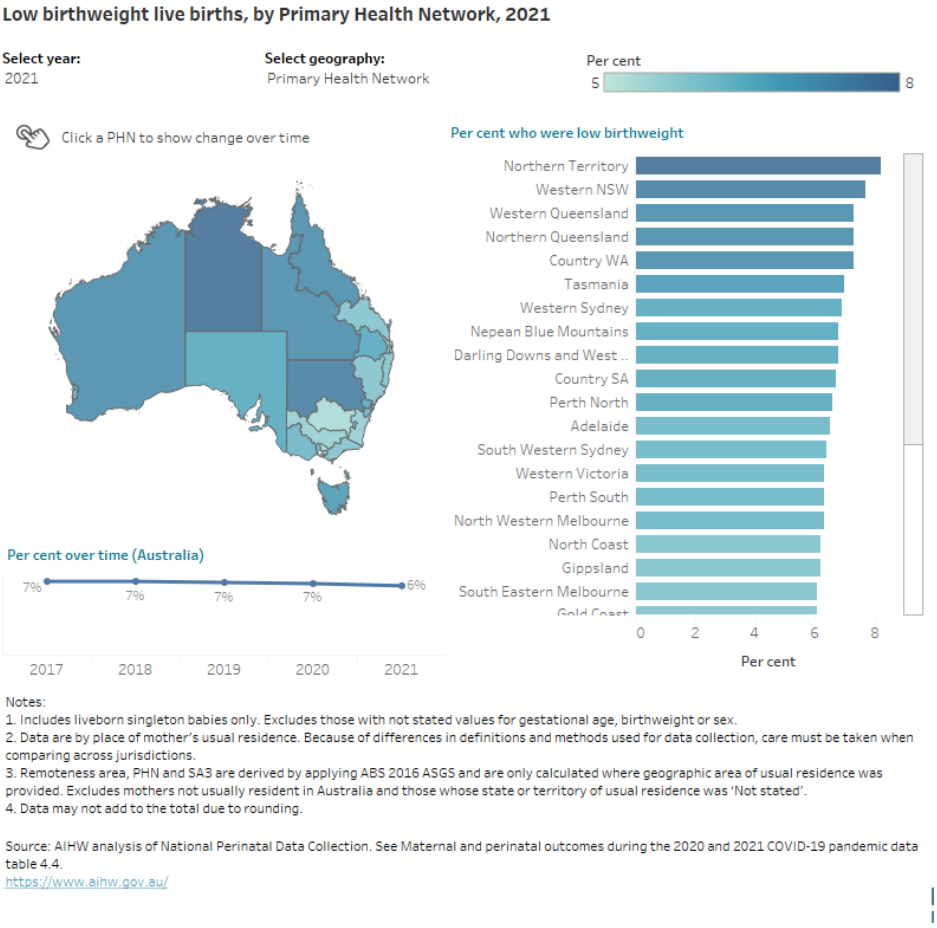
Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 4.3.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of liveborn babies who were of low birthweight has remained stable across Australia (from 6.5% in 2015 to 6.6% in 2019). Modelling showed that this was a small annual increase of 0.1 percentage points. The observed proportion of liveborn babies who were of low birthweight was 6.5% in 2020 and 6.3% in 2021, which was lower than the predicted proportions based on the modelling (6.8% in 2020 and 6.8% in 2021). This equated to around 2,390 more babies born at a healthy birthweight than predicted in 2020 and 2021 combined.

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Babies of mothers who lived in some geographical locations were more likely to be low birthweight. Explore the map below (Figure 28) to view data on the number and proportion of babies who were low birthweight by PHN, remoteness and SA3.

Figure 28: Proportion of low birthweight live births, by selected geography, 2017 to 2021
Map shows proportion of low birthweight births by selected geographies and years.



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Birthweight adjusted for gestational age

A baby may be small due to being born early (pre-term) or be small for gestational age, which indicates a possible growth restriction within the uterus.

Babies are defined as being small for gestational age if their birthweight is below the 10th percentile for their gestational age and sex, and babies are defined as large for gestational age if their birthweight is above the 90th percentile for their gestational age and sex, as determined by national percentiles (calculated through analysis of the National Perinatal Data Collection data for the period 2004 to 2013).

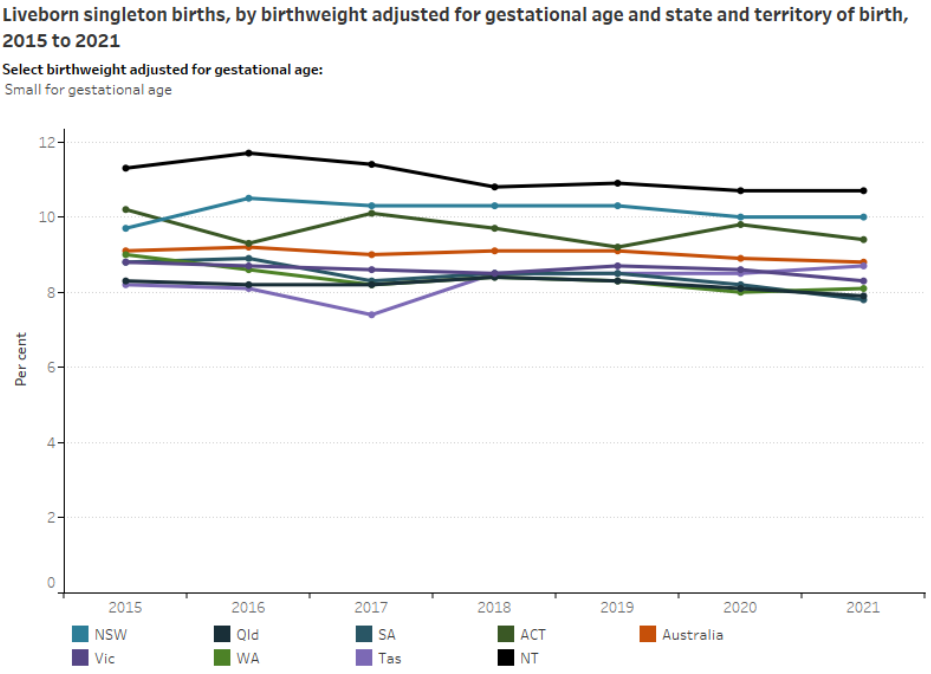
For more information on birthweight adjusted for gestational age, see Birthweight adjusted for gestational age in *Australia's mothers and babies* and Methods.

Research suggests that there is no relationship between COVID-19 infection during pregnancy and the risk of giving birth to a baby that is small for gestational age (Smith et al. 2023; Villar et al. 2021).

Figure 29 presents data on birthweight adjusted for gestational age.

Figure 29: Proportion of liveborn singleton births, by birthweight adjusted for gestational age and state and territory of birth, 2015 to 2021

Line graph live births by birthweight adjusted gestational age by state and territory of birth between 2015 and 2021.



Note: Includes liveborn singleton babies only. Excludes those with not stated values for gestational age, birthweight or sex.

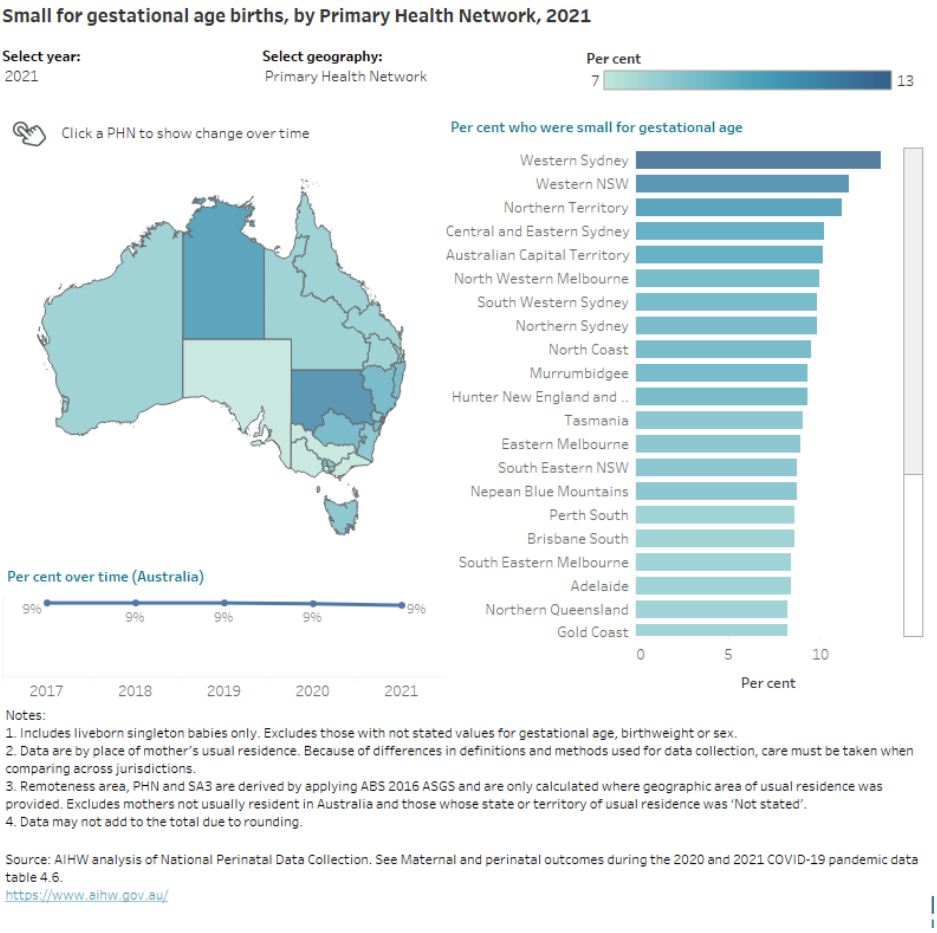
Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 4.5.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of liveborn singleton babies who were small for their gestational age has remained stable across Australia (9.4% in 2015 and 2019). Modelling showed that there was no annual change. The observed proportion of liveborn singleton babies who were small for their gestational age was 9.3% in 2020 and 9.1% in 2021, which was similar to the predicted proportions based on the modelling (9.4% in 2020 and 9.4% in 2021).

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Babies of mothers who lived in some geographical locations were more likely to be small for gestational age. Explore the map below (Figure 30) to view data on the number and proportion of babies who were small for gestational age by PHN, remoteness and SA3.

Figure 30: Proportion of small for gestational age births, by selected geography, 2017 to 2021
Map shows proportion of small for gestational age births by selected geographies and years.



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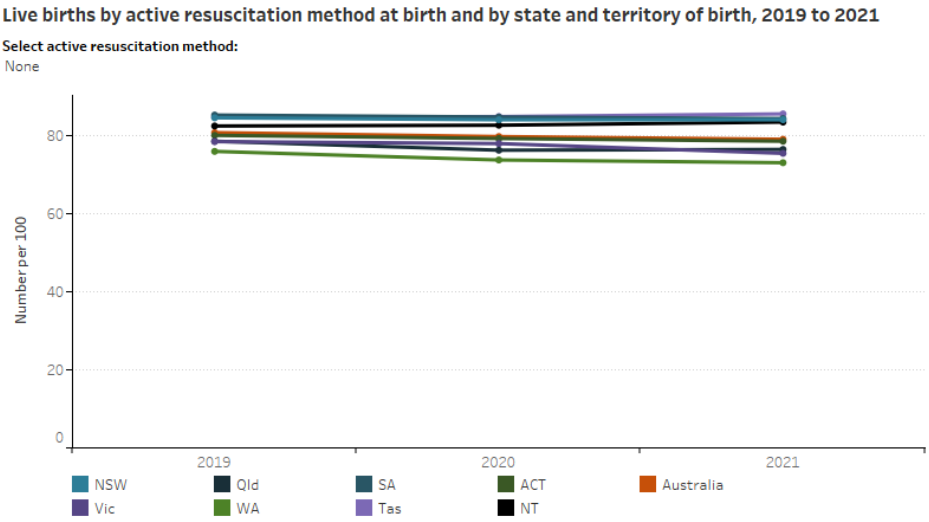
Active resuscitation method

Resuscitation is undertaken to establish independent breathing and heartbeat or to treat depressed respiratory effect and to correct metabolic disturbances. For more information on active resuscitation method, see Active resuscitation method in *Australia's mothers and babies*.

Figure 31 presents data on active resuscitation method. Due to a change in collection of data on resuscitation method, data are available from 2019.

Figure 31: Proportion of live births, by active resuscitation method at birth and state and territory of birth, 2019 to 2021

Line graph shows active resuscitation method at birth by state and territory of birth between 2019 and 2021.



Notes:
1. Due to a change in collection of data on resuscitation method, data are available from 2019.
2. Because of differences in definitions and methods used for data collection, care must be taken when comparing across jurisdictions.
3. Between 2019 and 2021, 14–15% of women who gave birth in the ACT were non-ACT residents. Care must be taken when interpreting percentages.
4. More than 1 type of active resuscitation method could be recorded. This means that the sums of individual categories are greater than the total numbers of liveborn babies; therefore, totals are not included.
5. Qld supplied data on continuous positive airway pressure (CPAP) for births from 1 July 2019.
6. For Qld, 'Intubation' includes suction for meconium via ETT and IPPV via ETT for births prior to 1 July 2019, and for births from 1 July 2019 includes suction for meconium via ETT, IPPV via ETT and Intubation.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 4.7.
https://www.aihw.gov.au/

The proportion of babies who did not require active resuscitation was 80.7 per 100 live births in 2019, 79.7 per 100 in 2020 and 79.0 per 100 in 2021.

It was not possible to undertake linear regression modelling for active resuscitation method, as not enough years of data are available to establish a baseline trend. For more information on modelling the trend over time, see Methods.

Admission to a special care nursery or neonatal intensive care unit

Babies are admitted to a special care nursery (SCN) or neonatal intensive care unit (NICU) if they require more specialised medical care and treatment than is available on the postnatal ward. Data are limited to liveborn babies who were born in hospital and discharged home and may not include babies who were transferred between hospitals and then admitted to an SCN or NICU.

For more information on admission to SCN or NICU, see Admission to a special care nursery or neonatal intensive care unit in *Australia's mothers and babies*.

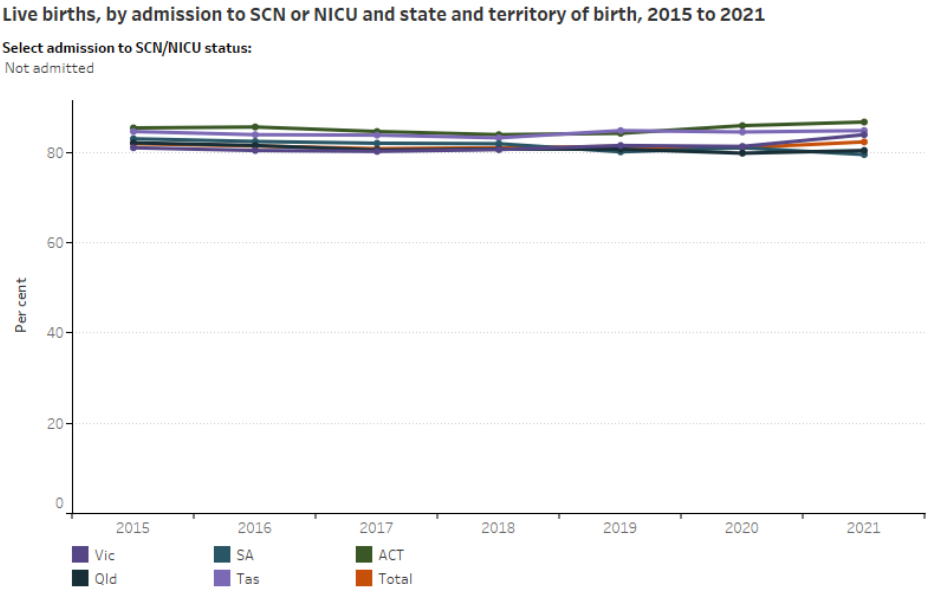
Research suggests that babies were more likely to require admission to SCN or NICU if their mothers had a positive case of COVID-19 at the time they gave birth (Gurol-Urganci et al. 2021; Smith et al. 2023; Wei et al. 2021).

Given Australia's low infection rates early in the pandemic, babies born in Australia were less likely than babies born in countries with higher infection rates to require admission to SCN or NICU due to maternal COVID-19 infection.

Figure 32 presents data on admission to SCN or NICU. Data exclude New South Wales and Western Australia (as data are not available), and the Northern Territory (as data are not available for the entire trend period).

Figure 32: Proportion of live births, by admission to SCN or NICU and state and territory of birth, 2015 to 2021

Line graph shows admission to SCN or NICU by state and territory of birth between 2015 and 2021.



Notes:
1. Between 2015 and 2021, 13–15% of women who gave birth in the ACT were non-ACT residents. Care must be taken when interpreting percentages.
2. Data excludes NSW, WA and NT.
3. Babies who were transferred between hospitals and subsequently admitted to an SCN or NICU may not be included as 'admitted' in these data.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 4.8.
https://www.aihw.gov.au/

Between 2015 and 2019, the proportion of liveborn babies who were admitted to the SCN or NICU increased (from 17.0% in 2015 to 18.1% in 2019). Modelling showed that this was an annual increase of 0.3 percentage points. The observed proportion of liveborn babies who were admitted to the SCN or NICU was 18.3% in 2020 and 17.2% in 2021, which was lower than the predicted proportions based on the modelling (18.8% in 2020 and 19.1% in 2021). This equated to around 4,260 fewer babies requiring specialised care in a SCN or NICU than predicted in 2020 and 2021 combined.

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

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Baby length of stay in hospital

Baby length of stay refers to the number of days between giving birth and the date of discharge or transfer from the hospital where birth occurred, or death. For more information on baby length of stay in hospital, see Baby length of stay in hospital in *Australia's mothers and babies*.

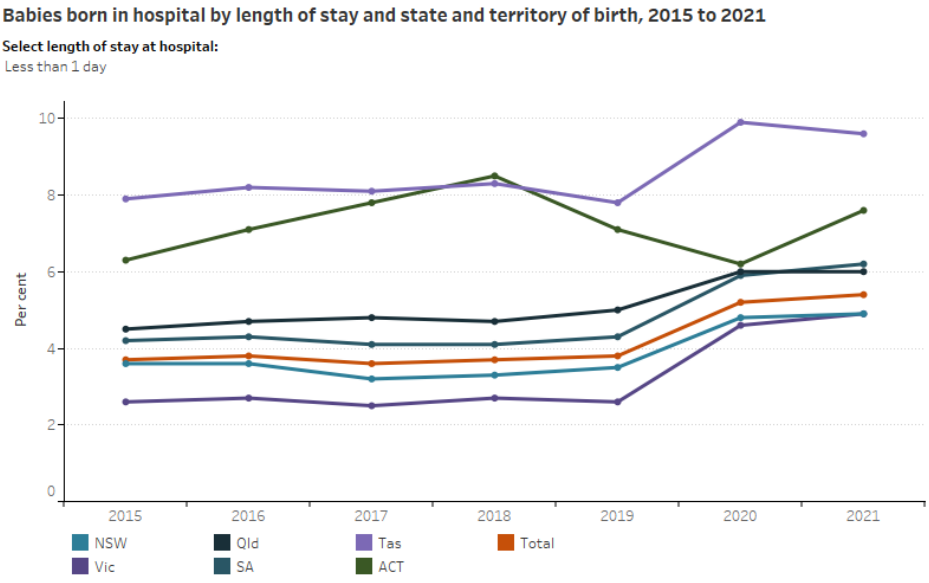
During the pandemic, the length of time babies stayed in hospital has shortened (Handley et al. 2022). This was likely a result of concerns about exposure to COVID-19, changes in practice guidelines or women requesting an early discharge because of strict visiting rules (Semaan et al. 2022).

However, babies whose mothers had a COVID-19 infection at the time of birth were more likely to require a prolonged hospital stay compared with babies whose mothers did not have COVID-19 (Gurol-Urganci et al. 2021).

Figure 33 presents data on baby length of stay in hospital. Data exclude Western Australia (as data are not available for women discharged to home) and the Northern Territory (as data are not available for the entire trend period).

Figure 33: Proportion of babies born in hospital, by length of stay and state and territory of birth, 2015 to 2021

Line graph shows baby length of stay by state and territory of birth between 2015 and 2021.



Notes:
1. Includes liveborn babies born in hospital only (excludes birth centres attached to hospitals).
2. Only babies who were discharged home are included.
3. Prior to 2021, place of birth data were collected at the mother level, rather than the baby level. Prior to 2021, for multiple births, the place of birth of the first-born baby was used for all subsequent babies. Care should therefore be taken when comparing data over time.
4. Between 2015 and 2021, 13–15% of women who gave birth in the ACT were non-ACT residents. Care must be taken when interpreting percentages.
5. Data excludes WA and NT.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during 2020 and 2021 COVID-19 pandemic data table 4.9.
https://www.aihw.gov.au/

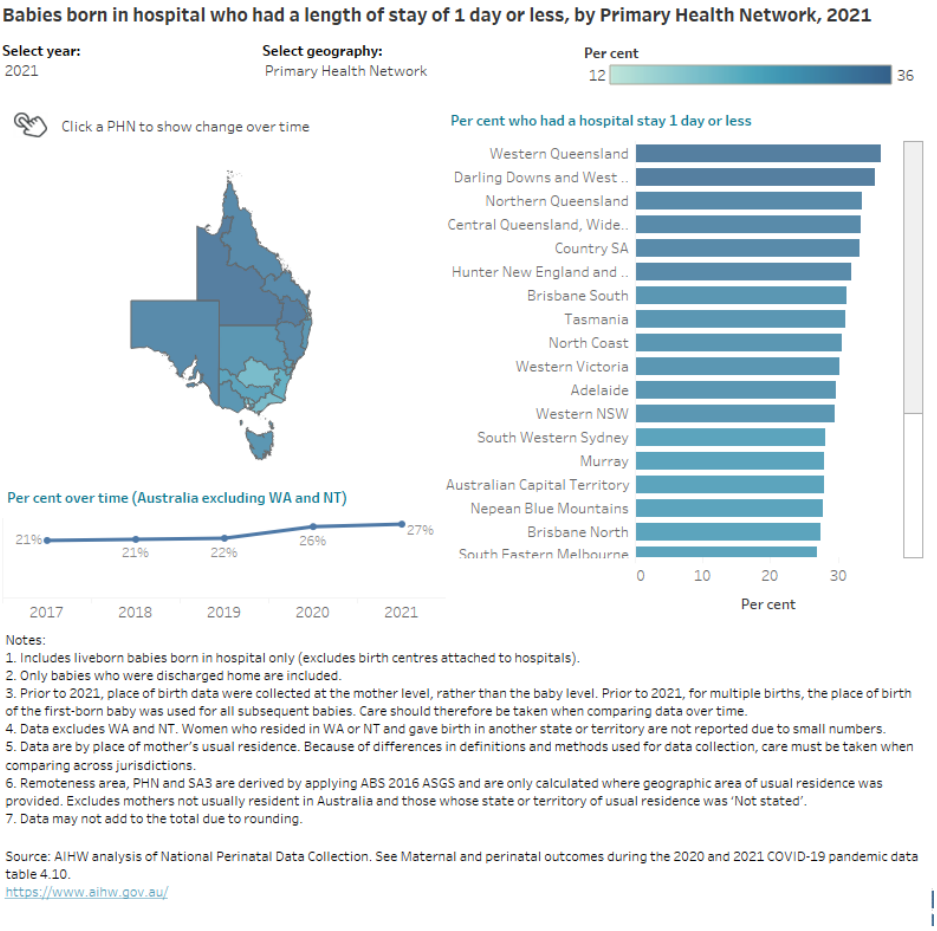
Between 2015 and 2019, the proportion of liveborn babies who had a hospital stay of 1 day or less increased from 19.8% in 2015 to 21.6% in 2019. Modelling showed that this was an annual increase of 0.4 percentage points. The observed proportion of liveborn babies who had a hospital stay of 1 day or less was 25.8% in 2020 and 26.7% in 2021, which was higher than the predicted proportions based on the modelling (22.0% in 2020 and 22.4% in 2021). This equated to around 19,890 more babies staying in hospital for one day or less following a hospital birth than predicted in 2020 and 2021 combined.

Data for modelling exclude 'Not stated' data and therefore may not match the proportions presented in the data visualisation above. For more information on modelling the trend over time, see Methods.

Babies of mothers who lived in some geographical locations were more likely to have a hospital stay of 1 day or less. Explore the map below (Figure 34) to view data on the number and proportion of babies who had a hospital stay of 1 day or less by PHN, remoteness and SA3.

Figure 34: Proportion of babies born in hospital who had a length of stay of 1 day or less, by selected geography, 2017 to 2021

Map shows proportion of babies who had length of stay of 1 day or less by selected geographies and years.



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Semaan A, Dey T, Kikula A, Asefa A, Delvaux T, Langlois EV, van den Akker T and Benova L (2022) 'Separated during the first hours-postnatal care for women and newborns during the COVID-19 pandemic: A mixed-methods cross-sectional study from a global online survey of maternal and newborn healthcare providers - external site opens in new window', *PLOS Glob Public Health*, 2(4):214, doi:10.1371/journal.pgph.0000214.

Perinatal deaths

Content warning: This content contains information some readers may find distressing as it relates to stillbirth and the loss of a baby.

The data presented in this section are from the National Perinatal Mortality Data Collection (NPMDC). The latest report from this collection, Stillbirths and neonatal deaths, is available as a web article.

Perinatal deaths refer to the death of a baby prior to or during labour and/or birth (stillbirth) or up to 28 days after birth (neonatal death), where the baby is of 20 or more completed weeks of gestation or with a birthweight of at least 400 grams.

In 2019, the Stillbirth Centre for Research Excellence created the Safer Baby Bundle which is a collection of evidence-based interventions designed to reduce stillbirths in late pregnancy (Centre of Research Excellence Stillbirth, 2019).

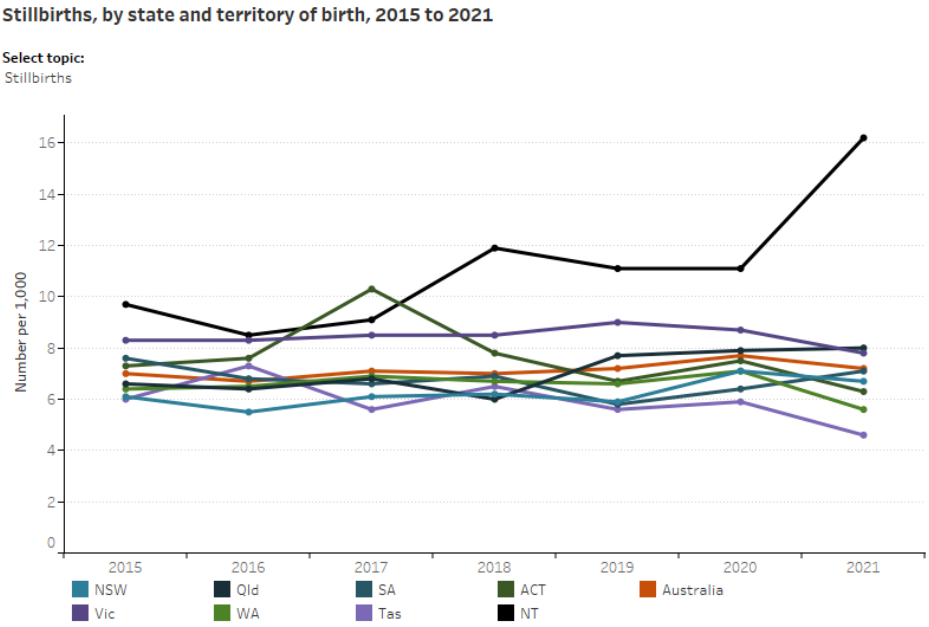
International evidence is mixed on whether COVID-19 infection during pregnancy increases the risk of stillbirth. Some research indicates that there is no increase (Smith et al. 2023), whilst other research suggests that COVID-19 infection can increase the risk of stillbirth (DeSisto et al. 2021; Gurol-Urganci et al. 2021).

In Australia, a study of pregnant women who lived in Melbourne found that stay at home orders were associated with an increase in pre-term stillbirths (Hui et al. 2023).

Figure 35 presents data on stillbirths and neonatal deaths.

Figure 35: Stillbirths and neonatal deaths, by state and territory of birth, 2015 to 2021

Line graph shows perinatal deaths by state and territory of birth between 2015 and 2021.



Note: Stillbirth and perinatal mortality rates were calculated using total births (live births and stillbirths) and may include late termination of pregnancy (20 weeks or more gestation). Neonatal mortality rates were calculated using live births.

Source: AIHW analysis of National Perinatal Data Collection. See Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic data table 4.11.
https://www.aihw.gov.au/

The stillbirth rate was between 6.7 and 7.7 per 1,000 births between 2015 and 2021. The rate in 2021 (7.2 per 1,000 births) is lower than in 2020 (7.7 per 1,000 births) and the same as in 2019. These changes are similar to year-to-year fluctuations observed in the stillbirth rate. For more information on perinatal deaths, see Stillbirths and neonatal deaths.

It was not possible to undertake linear regression modelling for stillbirths due to high variability between years of data. For more information on modelling the trend over time, see Methods.

References

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Technical notes

 

Data sources

National Perinatal Data Collection

The National Perinatal Data Collection (NPDC) began in 1991 and is a national population-based cross-sectional collection of data on pregnancy and childbirth. The NPDC collects national information on the pregnancy and childbirth of mothers, and the characteristics and outcomes of their babies. A standard de-identified extract is provided from states and territories to the Australian Institute of Health and Welfare (AIHW) on an annual basis to form the NPDC.

The NPDC supports a range of reports and products, including:

- *Australia's mothers and babies*
- National Core Maternity Indicators reports and data visualisations
- *Indigenous mothers and their babies* reports
- other specialist reports, indicator-based reports and customised data requests.

Detailed information on completeness, accuracy and other aspects of data quality for the NPDC is in the data quality statement - external site opens in new window.

See Technical notes in *Australia's mothers and babies* for more information on:

- collection of perinatal data by states and territories
- collation of national perinatal data
- the scope and structure of the NPDC
- Perinatal National Minimum Data Set items
- NPDC data quality, timeliness and availability.

National Perinatal Mortality Data Collection

The National Perinatal Mortality Data Collection (NPMDC) is a population-based cross-sectional collection of data regarding the deaths of babies in hospitals and in the community and includes all neonatal deaths and stillbirths of a baby at least 20 weeks' gestation or at least 400 grams birthweight, during pregnancy, birth or within 28 days of birth.

The NPMDC commenced with the 2013 birth cohort and builds on information collected in the NPDC. Common identifier fields in the NPDC and NPMDC allow demographic information regarding perinatal death records in the NPMDC to be retrieved from the NPDC for reporting.

There are 33 voluntary data items collected in the NPMDC which are supplied by state and territory health authorities using a standard de-identified extract to the AIHW on an annual basis. Data specifications supplied to jurisdictions for collection are included in the related data tables.

Detailed information on completeness, accuracy, and other aspects of data quality for the NPMDC is in the data quality statement - external site opens in new window.

See Technical notes in *Australia's mothers and babies* for more information on:

- NPMDC data quality, timeliness and availability
- Definitions used in reporting perinatal deaths.

Methods

Modelling

Linear regression modelling is a statistical procedure that allows continuous data to be modelled according to a line of best fit, which is then used to extrapolate the trajectory of the data. The adequacy of the fit of the models are considered with relevancy to the underlying data, including procedures used to assess whether the modelling assumptions have been satisfied.

For this report, linear regression modelling has been used to establish a baseline annual trend for the rate of a selected characteristic or outcome between 2015 and 2019. This was to ensure that there were a sufficient number of years for the modelling and that it was based on the most recent trend.

The baseline annual trend was used to predict the proportion of a characteristic or outcome for 2020 and 2021. The predicted proportion was then compared to the observed proportion for 2020 and 2021, that is, the proportion that actually occurred in the population.

The observed proportions in 2020 and 2021 have been described as higher or lower than the predicted proportions where the relative difference is 5% or greater of the predicted value. This means that small absolute differences between observed and predicted proportions with low values may meet this threshold, while changes for larger absolute differences with higher values may not meet this threshold. For example, an observed value of 3.4% and predicted value of 3.2% would represent a relative difference of 6%, whilst an observed value of 83.6% and predicted value of 84.8% would represent a relative difference of 1%.

It was not possible to undertake linear regression modelling for some characteristics or outcomes due to the following:

- alcohol consumption during pregnancy did not have enough years of data to establish a baseline trend
- active resuscitation method did not have enough years of data to establish a baseline trend
- diabetes status had high variability between years, which did not meet the assumption of linearity
- stillbirths had high variability between years, which did not meet the assumption of linearity.

There was a potential for biased estimations if ‘Not stated’ values were included in the linear regression model. Therefore, these values were assumed to be missing completely at random and were excluded.

Perinatal mortality rates

Calculation of stillbirth rate

The stillbirth rate is presented as the number of stillbirths per 1,000 births (that is, all live births and stillbirths) in a specified population.

Stillbirth rate = 1,000 x Number of stillbirths / Total number of births

Calculation of neonatal mortality rate

The neonatal mortality rate is presented as the number of neonatal deaths per 1,000 live births in a specified population. Neonatal deaths are those which are live born and subsequently die within 28 days of birth.

Neonatal mortality rate = 1,000 x Number of neonatal deaths / Number of live births

Calculation of perinatal mortality rate

The perinatal mortality rate is presented as the number of stillbirths or neonatal deaths (perinatal deaths) per 1,000 births (that is, all live births and stillbirths) in a specified population.

Perinatal mortality rate = 1,000 x Number of perinatal deaths / Total number of births

Geography

Geographic data are based on the usual residence of the mother. Between 2017 and 2021, the usual residence of the mother is based on Statistical Area Level 2 (SA2) of the Australian Bureau of Statistics Australian Statistical Geography Standard Edition 2016 for all states and territories.

Prior to 2017, a different correspondence was used for SA2, meaning that differences between pre-2017 and 2017-2021 may be due to changes in the geographic borders rather than changes in the data. As a result, geography is reported from 2017 onwards in this report.

Note that disaggregating by geography was not possible for outcomes where there were a high proportion of small numbers requiring suppression (see Confidentiality). These outcomes include alcohol consumption during pregnancy, diabetes and hypertension status, home births, type of analgesia, active resuscitation method and perinatal deaths.

Primary Health Network

Primary Health Networks (PHNs) have been established by the Department of Health to increase the efficiency and effectiveness of medical services and improve the coordination of care for patients.

Perinatal data at Statistical Area Level 2 (SA2) were linked to 2017 PHNs using Australian Bureau of Statistics correspondence files.

The relevant proportion for each PHN was then calculated, and PHNs were categorised based on the median, interquartile ranges and 10th and 90th percentiles for the proportions at the PHN level. The categories were then adjusted to account for natural breaks in the distribution of the data and for easier interpretation (for example, a range with a maximum of 52.1% of mothers receiving antenatal care in the first trimester would be revised to a maximum of 50%). PHNs were allocated to categories based on unrounded proportions.

Remoteness

This report uses the Australian Statistical Geography Standard Remoteness Structure, which groups geographic areas into six classes of Remoteness Area based on their relative access to services using the Accessibility/Remoteness Index of Australia.

The six classes are: *Major cities*, *Inner regional*, *Outer regional*, *Remote*, *Very remote* and *Migratory*, see the *Australian Statistical Geography Standard (ASGS): Volume 5 – Remoteness Structure, July 2016* (ABS 2018a).

Remoteness data used in this report are derived by applying this classification to the mother's usual area of residence in the NPDC. Remoteness area was calculated where geographic area of usual residence was provided.

Statistical Area Level 3

Statistical Areas Level 3 (SA3) are geographical areas built from whole Statistical Areas Level 2 (SA2) and are designed for the output of regional data. SA3s create a standard framework for the analysis of ABS data at the regional level through clustering groups of SA2s that have similar regional characteristics. Whole SA3s aggregate to form Statistical Areas Level 4 (SA4). There are 358 spatial SA3 regions covering the whole of Australia without gaps or overlaps (ABS 2018b).

Perinatal data at Statistical Area Level 2 (SA2) were linked to Statistical Area Level 3 (SA3) using Australian Bureau of Statistics correspondence files.

Confidentiality

To maintain privacy and confidentiality of individuals, cells in the data tables are suppressed if there is a risk of disclosure of an attribute of an individual that was not already known. A cell in a table is considered identifiable if, as well as being able to identify the entity, other details are also revealed. It is AIHW policy that these cells need to be confidentialised, unless the attribute that would be disclosed is deemed to be non-sensitive in the context of the data being published.

Small numbers

Numbers of less than 5 have not been published (n.p.), in line with guidelines for protecting the privacy of individuals. Exceptions to this are small numbers in 'Other' and 'Not stated' categories. Consequential suppression of numbers has also been applied where required to prevent back-calculation of small numbers. However, all suppressed numbers have been included in the totals.

Per cents based on denominators of less than 100 have also been suppressed (n.p.) for reliability reasons.

Australian national birthweight percentiles by gestational age

Birthweight percentiles were calculated from data on all liveborn singleton babies born in Australia between 2004 and 2013 with a gestational age of 20–44 weeks.

Records with indeterminate sex were excluded from analysis. Records with missing or not stated data for sex, birthweight or gestational age were also excluded. Birthweight outliers were calculated and excluded using a method based on Tukey's box and whisker plots.

Gestational age is reported in completed weeks of gestation, calculated from the first day of the last menstrual period (LMP) or estimated by prenatal and/or postnatal assessment if the LMP date was missing. Birthweight is reported to the nearest 5 grams.

Small for gestational age is defined as babies with birthweight below the 10th percentile according to the national birthweight percentiles for the period 2004 to 2013.

For more information on data used to assign percentiles see National Perinatal Data Collection annual update 2021 data table 6.1.

References

ABS (Australian Bureau of Statistics) (2018a). *Australian Statistical Geography Standard (ASGS): Volume 5 – Remoteness Structure* - external site opens in new window, ABS, Australian Government.

ABS (Australian Bureau of Statistics) (2018b), Australian Statistical Geography Standard (ASGS): Volume 1 – Main structure and Greater Capital City Statistical Areas - external site opens in new window, ABS, Australian Government,

Notes

Amendments

4 July 2024 – The following changes have been made to *Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic*:

- Antenatal care: Victorian data for number of antenatal visits in 2016 and 2017 has been removed due to a data issue. This includes removal of a figure, associated text and the removal of 2017 Victorian data from Figure 9 (proportion of women who gave birth and had 5 or more antenatal visits, by selected geography, 2017 to 2021).
- Admission to a special care nursery or neonatal intensive care: Text on excluded jurisdictions has been updated from “South Australia” to “the Northern Territory”.
- Data visualisations: All maps have had a minor update made to the colour gradient.

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Many stakeholders provided valuable advice and input to this report, including the Department of Health and Aged Care, National Perinatal Data Development Committee and the National Maternity Data Development Project Advisory Group.

This report was funded by the Department of Health and Aged Care under the National Maternity Data Development Project.

Data quality statement

Information on completeness, accuracy and other aspects of data quality for the data sources used in this report are available from:

- National Perinatal Data Collection (NPDC), 2021: data quality statement - external site opens in new window
- National Perinatal Mortality Data Collection (NPMDC), 2021: data quality statement - external site opens in new window.

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Data

Data tables: Maternal and perinatal outcomes during the 2020 and 2021 COVID-19 pandemic

Data
XLSX 1.5Mb

Related material

Resources

Australia's mothers and babies

Resource

Antenatal care during COVID-19, 2020

Resource

The first year of COVID-19 in Australia: direct and indirect health effects

Resource

Related topics

- COVID-19
- Mothers & babies