

Queensland Government population projections, 2023 edition: Background research

Introduction

The Queensland Government population projections for the state of Queensland are generated using a multi-regional cohort component model. This methodology, which ages population cohorts over time, incorporates assumptions about the future levels of fertility, mortality, net overseas migration (NOM) and net interstate migration (NIM). This paper examines historical trends in these components of Queensland's population change.

Historical data for the components of population change were sourced from the Australian Bureau of Statistics (ABS) and Queensland Health. The time periods available and quality vary across data sources, and changes to the generation methods influence comparability of data over time. Where available, data for these components during the period impacted by the COVID-19 pandemic are also presented. The data presented within this paper may be subject to future revision.

COVID-19 pandemic

The World Health Organization declared the novel coronavirus (COVID-19) a worldwide pandemic on 11 March 2020. The pandemic and associated response measures and restrictions enacted by different levels of government both within Australia and internationally have impacted population growth in Australia since early 2020. Most restrictions and associated health measures were eased incrementally in Australia during 2022, although impacts on population growth were still ongoing.

The Australian Government closed its international border to non-citizens and non-residents from 20 March 2020. Restrictions on movements across the international border remained in place for nearly two years. On 21 February 2022, Australia was reopened to fully vaccinated visa holders, and from 6 July 2022, vaccination requirements were lifted for all arrivals.

During 2020 and 2021, state and territory governments enacted restrictions on border crossings, with variations to the specific conditions and timing of restrictions between jurisdictions. Queensland's state border was first closed to interstate arrivals from selected 'COVID-19 hot spots' on 26 March 2020. Domestic travellers were again able to travel to Queensland with no restrictions from 15 January 2022.

COVID-19 and the resulting closure of Australia's international border affected the flow of overseas migrants. In the year to June 2021, all Australian states and territories, including Queensland, experienced a net loss of population due to overseas migration for the first time on modern record. In contrast, while state border restrictions initially reduced the number of interstate movements across Queensland's border, the number of arrivals has since recovered more than departures, resulting in record-high NIM to Queensland in 2021–22.

Queensland experienced an increase in the number of births in 2021. There were very few deaths in Queensland attributed to COVID-19 in 2020 and 2021, although these deaths increased in 2022.

Fertility

The **total fertility rate (TFR)** in a specific year is defined as:

- the average number of babies that would be born to a woman if she were to live to at least the end of her child-bearing years and gave birth to babies in alignment with the age-specific fertility rates (ASFRs) observed in that specific year.

The TFR depends on the current age structure and ASFRs of the female population. It is derived by summing single-year ASFRs.

Replacement level fertility is the TFR at which a population exactly replaces itself from one generation to the next, without migration or changes to maternal mortality and child mortality rates. The rate is approximately 2.1 births per woman for many countries, including Australia.

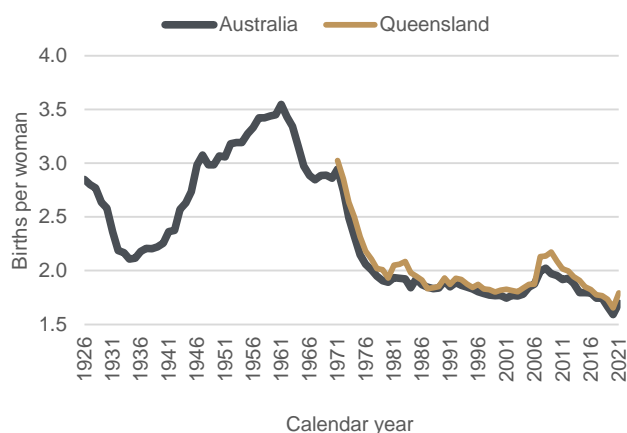
With no migration and unchanged mortality rates, a TFR below replacement-level fertility will lead to an eventual population decline. However, net positive migration can offset a below-replacement TFR and generate population growth.

Long-term trends

The ABS publishes the number of registered births on an annual basis, together with the TFR for each year. These show that, consistent with long-term international trends, Australia's TFR has varied considerably over the last century. There has been a general downward trend in TFR in recent decades and the level in 2020 was the lowest on record (Figure 1).

Australia's fertility initially fell in the 1930s during the Great Depression then peaked at 3.55 babies per woman in 1961 at the height of the post-World War 2 'baby boom'. Over the following two decades, with broad social changes including greater reproductive control and increased female participation in the labour force, the TFR fell sharply to below two babies per woman by the late 1970s.

Figure 1 Total fertility rate, Australia and Queensland



Source: ABS, *Australian Historical Population Statistics*, 2019 (for years 1926 to 1975); ABS, *Births, Australia*, various issues

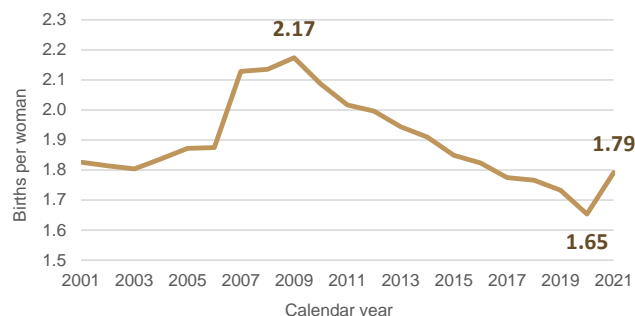
From the late 1970s to the early 2000s, Australia's TFR gradually declined, reflecting the increasing tendency to delay partnering and childbearing. Australia's fertility rate then temporarily increased to a peak of 2.02 babies per woman in 2008, the highest recorded since 1976. Since then, Australia's TFR resumed falling and reached the lowest level ever recorded in 2020 (1.59 babies per woman). Data on Queensland's TFR is available from the 1970s onwards. It shows that Queensland's TFR has followed a similar trajectory to that of Australia, although it has usually been slightly higher than Australia's TFR.

While there are many reasons for declining fertility rates, they are primarily due to a reduction in desired family size and the postponement of family formation, underpinned by higher levels of female education and employment as well as access to birth control and reproductive technology¹.

Queensland trends

Over the 20 years to 2021, Queensland's TFR peaked at 2.17 babies per woman in 2009, and slowly declined from that point, falling to 1.65 in 2020. TFR experienced an increase in 2021, reaching 1.79 (Figure 2).

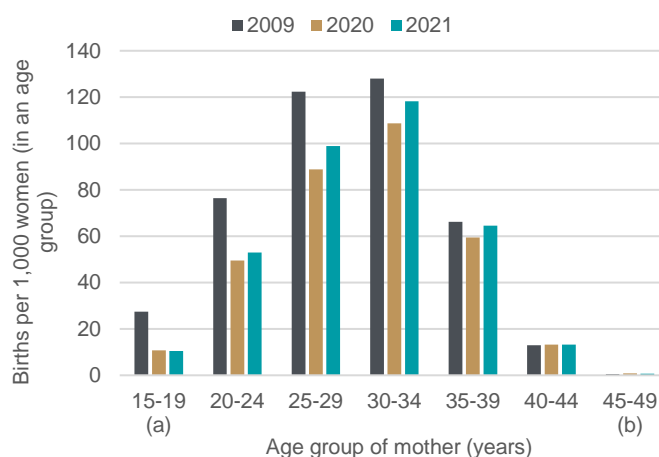
Figure 2 Total fertility rate, Queensland



Source: ABS, *Births, Australia*, various issues

The fall in TFR from its 20-year peak in 2009 to its 20-year low in 2020 was a result of lower rates for females in all age groups, except females aged 40 years and over. The increase in overall fertility between 2020 and 2021 was driven by higher rates for women aged between 20 and 39 years, while rates for women aged less than 20 years and 40 years and over remained relatively stable (Figure 3).

Figure 3 Age-specific fertility rates, Queensland



- (a) Includes births to mothers aged less than 15 years.
- (b) Includes births to mothers aged 50 years or more.

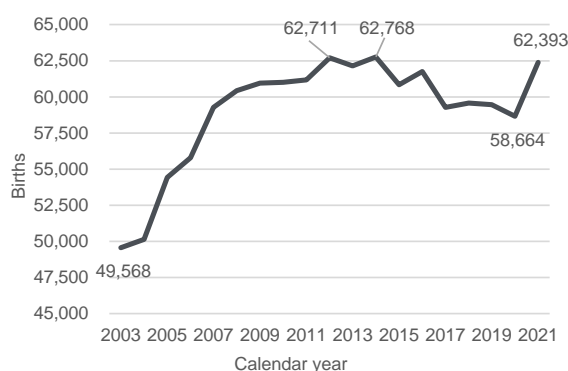
Source: ABS, *Births, Australia*, various issues

Fertility impacts during the COVID-19 pandemic

Data from the Queensland Perinatal Data Collection (PDC) to December 2021 showed that the number of live births to Queensland mothers for the 2021 calendar year reached levels last seen in 2012 to 2014 (Figure 4). Preliminary data for 2022 indicate that the number of live births is easing from the peak experienced in 2021.

¹ McDonald, P (2020), *A Projection of Australia's Future Fertility Rates*, Centre for Population research paper, The Australian Government, Canberra

Figure 4 Live births to Queensland mothers^(a)



(a) Data are preliminary and subject to revision.

Source: Queensland Health, *Queensland Perinatal Data Collection (PDC)*, unpublished data

Life expectancy

Life expectancy at birth estimates the average number of years that a newborn baby born during a certain period would live, assuming they experience the age and sex-specific mortality rates recorded during that period through their lifetime.

Life expectancy can be used to compare mortality across populations or through time, as it standardises for the size, age, and sex composition of the underlying population. This is important to account for, as people of different ages, sex and time periods do not experience the same mortality rate.

While the total number of deaths in Queensland may vary between years, the age and sex composition of the population also changes. As such, a year-on-year increase (or decrease) in the total number of deaths does not necessarily indicate an increase (or decrease) in mortality rates and subsequent decrease (or increase) in life expectancy at birth. For this reason, life expectancy is instead used to compare changes in mortality over time.

Long-term trends

Consistent with national and international trends, male and female life expectancies at birth in Queensland have increased substantially since the late 1800s (Table 1). Historical life-expectancy improvements reflect improved prevention, detection and treatment of non-communicable diseases, better nutrition, hygiene and control of infectious diseases, improved road safety, as well as a reduction in tobacco smoking^{2,3}.

Table 1 Life expectancy at birth^(a), Queensland

Time period	Males	Females
	— years —	
1881–1890	41.3	49.8
1891–1900	49.5	55.8
1901–1910	54.2	59.3
...
1971	67.8	74.7
1976	69.0	76.1
1981	71.1	78.3
1986	73.0	79.4
1991	74.4	80.5
1995–1997	75.4	81.3
2000–2002	77.2	82.4
2005–2007	78.9	83.6
2010–2012	79.5	84.0
2015–2017	80.0	84.4
2019–2021	80.9	85.1

(a) Data from 1995 are based on three years of death registrations and estimated resident population data. This is designed to reduce the impact of year-to-year statistical variations, particularly at younger ages where there are small numbers of deaths and at very old ages where the underlying population is small.

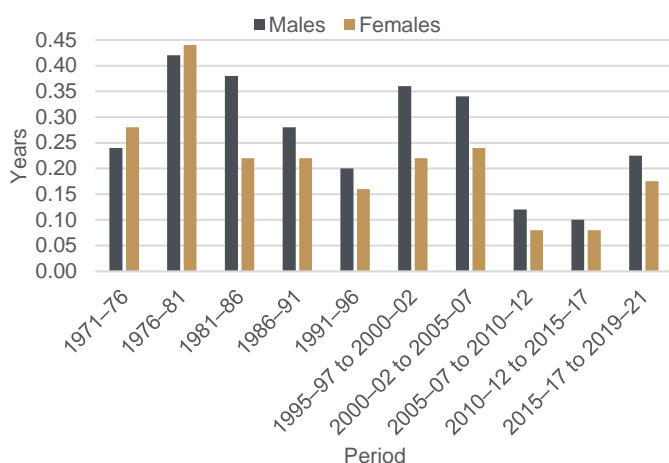
Source: ABS, *Australian Historical Population Statistics*, 2014 (for years 1881–1890 to 2010–2012); ABS, *Life Tables, States, Territories and Australia*, various issues (for years 2015–17 and 2019–21).

The magnitude of improvements in life expectancy has been variable over time. While average annual improvements were quite strong from the 1970s to the mid-2000s, these slowed between 2005–2007 and 2015–2017. Average annual improvements between 2015–2017 and 2019–2021 have returned to levels closer to longer-term trends (Figure 5).

² Lopez, A. D., & Adair, T. (2019). Slower increase in life expectancy in Australia than in other high income countries: the contributions of age and cause of death. *Medical Journal of Australia*, 210(9), 403-409.

³ AIHW, Magnus P, Sadkowsky K. (2006). Mortality over the twentieth century in Australia: trends and patterns in major causes of death. Canberra: AIHW.

Figure 5 Life expectancy at birth by sex, average annual improvements, Queensland

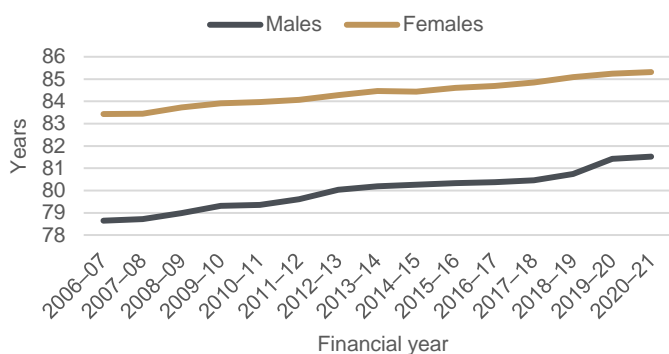


Source: ABS, *Australian Historical Population Statistics*, 2014 (for years 1971 to 2010–12); ABS, *Life Tables, States, Territories and Australia*, various issues (for years 2015–17 and 2019–21).

Recent trends

It is estimated that between 2006–07 and 2020–21, life expectancy at birth for males increased from 78.6 years to 81.5 years, and from 83.4 years to 85.3 years for females (Figure 6).

Figure 6 Life expectancy at birth, Queensland



Source: QGSO estimates, derived from estimates of deaths in ABS *Deaths, Australia*, 2021

Mortality impacts during the COVID-19 pandemic

While the COVID-19 pandemic began in March 2020, there were very few deaths in Queensland due to COVID-19 until early 2022, when these deaths began to increase considerably. At the time of writing, 2020–21 was the latest time period for which life expectancy estimates in Queensland could be derived using publicly available data, and reflect periods without many deaths

⁴ ABS, *Provisional Mortality Statistics, Australia*, Jan - Jul 2022

due to COVID-19. However, more up-to-date deaths data from other sources are available, indicating the impact of the pandemic on deaths.

COVID-19 as an underlying cause of death

Throughout the pandemic, the ABS has reported the total number of deaths due to COVID-19 registered by jurisdictional Registries of Births, Deaths and Marriages.

Queensland experienced very few COVID-19 deaths in 2020 and 2021. From March 2020 to late October 2021, six people had died in Queensland with COVID-19 attributed as the underlying cause of death (either the acute infection or the long-term effects). This figure increased to 69 by the end of January 2022 and subsequently reached a total of 1,592 deaths by the end of December 2022 (Table 2). For context, there were 31,928 total deaths recorded from all causes within Queensland in 2020, and 34,335 in 2021^{4,5}.

Table 2 Registered deaths due to COVID-19, by date of occurrence^(a), Queensland

Deaths	Occurred by end of ^(b)
— cumulative number —	— date —
6	July 2021
6	October 2021
69	January 2022
338	February 2022
499	March 2022
563	April 2022
698	May 2022
835	June 2022
1,009	July 2022
1,264	August 2022
1,426	September 2022
1,473	October 2022
1,518	November 2022
1,592	December 2022

- (a) Data for January 2022 onwards are provisional and may underestimate the number of deaths due to COVID-19 due to the lag between the date a death occurs and when it is registered and received by the ABS.
- (b) Doctor-certified deaths that occurred and were registered and received by the ABS as at these dates, except for earlier periods which had longer registration windows (deaths occurring by July 2021 were registered by end September 2021, similarly deaths occurring by October 2021 registered by end November 2021).

Source: ABS, *COVID-19 Mortality in Australia*, various editions

⁵ These data include both doctor and coroner-certified deaths, while data reported in the *Excess mortality due to all causes of death* section on page 5 are based on doctor-certified deaths only.

Nationally, there were 14,407 registered deaths of people who died either from or with COVID-19 by the end of December 2022⁶. This included 11,969 deaths with an underlying cause of death assigned to acute COVID-19 infection with the virus being laboratory-confirmed. Almost 9 in 10 deaths were among people aged 70 years or older. For deaths registered by the end of November 2022, the ABS reported that the median age for those who died from COVID-19 was 85.4 years (83.6 years for males, 87.4 years for females)⁷. The impacts of these deaths on future life expectancy levels are yet to be realised.

Excess mortality due to all causes of death

Reporting only on deaths attributed to COVID-19 does not give a complete representation of impacts on mortality experienced during the pandemic. Excess mortality is used to account for changes in mortality due to all causes, not just COVID-19. It reflects the impacts of changes in personal behaviour, as well as restrictions and measures enacted during the pandemic on all causes of death, including an increase or reduction in deaths from other causes.

Excess mortality is the difference between the observed number of deaths from all causes that occurred during a period, and the expected number of deaths based on recent history. To account for the natural variation in the number of deaths, excess mortality for a particular period is considered to be higher or lower than expected only if it falls outside the 95% confidence interval of the expected estimate for the same period⁸.

On a weekly basis, the number of deaths in Queensland was within the expected historical range for the majority of 2020 and 2021. On an annual basis, based on doctor-certified deaths, there were 786 fewer deaths in Queensland than expected in 2020, and 853 more than expected in 2021 (Table 3). Excess deaths data for 2022 were not available at the time of writing. As such, it could not be determined if the greater number of deaths attributed to COVID-19 in 2022, or other factors influencing mortality, would cause a deviation from historical mortality patterns.

Table 3 Expected, observed and excess deaths^{(a)(b)}, Queensland

Time period	Expected	Observed	Excess
	— number —		
2016	27,422	27,126	-296
2017	28,328	28,939	611
2018	29,085	28,629	-456
2019	29,695	29,896	201
2020	30,695	29,909	-786
2021	30,460	31,313	853

- (a) Data include all doctor-certified deaths occurring by the end of December 2021 and registered and received by the ABS by 28 February 2022. Data are provisional and will change as additional death registrations are received.
- (b) Deaths that are coroner-certified were not included in this analysis, as these account for a very small proportion of deaths nationally.

Source: ABS, *Measuring Australia's excess mortality during the COVID-19 pandemic*, 30 March 2022

Net overseas migration

Net overseas migration (NOM) is the net gain or loss of population through immigration to and emigration from Australia, regardless of nationality, citizenship, legal status, or visa category.

From September quarter 2006, ABS estimates of NOM have been based on a traveller's actual duration of stay or absence using the '12/16' rule. A traveller is included in the resident population if they are in Australia for a total of 12 months or more over a 16-month period. Conversely, a traveller is excluded from the estimated resident population if they are away for a total of 12 months or more over a 16-month period.

Recent trends

The ABS introduced a new method for measuring overseas migration in 2006–07. Since that time there has been considerable variation in estimates of NOM in both Australia and Queensland, reflecting changing economic conditions and immigration programs.

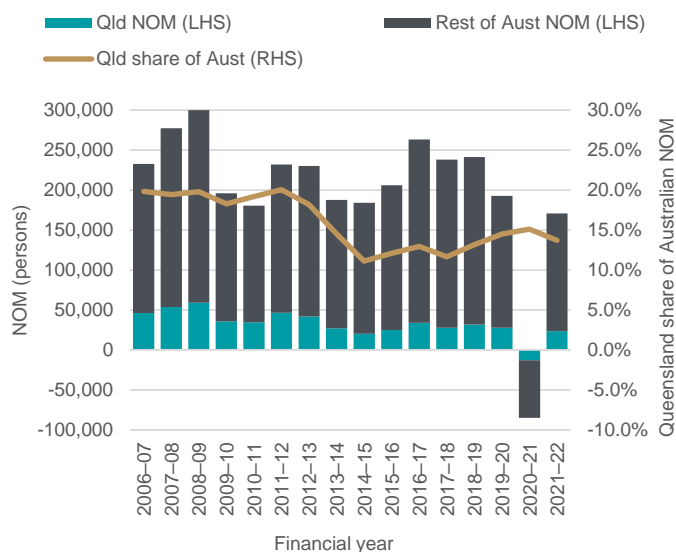
Queensland's share of NOM in Australia was 19.8% in 2006–07. This share remained relatively stable before dropping to 11.1% in 2014–15, then trending upwards to 14.5% in 2019–20. While NOM for Australia and Queensland was negative in 2020–21 due to the impacts of COVID-19, positive levels returned in 2021–22, with the Queensland share estimated at 13.7% (Figure 7).

⁶ ABS, Summary report - Provisional Mortality Statistics, Jan - Oct 2022

⁷ ABS, COVID-19 Mortality in Australia: Deaths registered until 30 November 2022

⁸ ABS, *Measuring Australia's excess mortality during the COVID-19 pandemic*, 30 March 2022

Figure 7 Net overseas migration, Queensland and rest of Australia



Note: Queensland accounted for 15.1% of the net Australian loss in 2020–21.

Source: ABS, *National, state and territory population*, June 2022

Overseas migration impacts during the COVID-19 pandemic

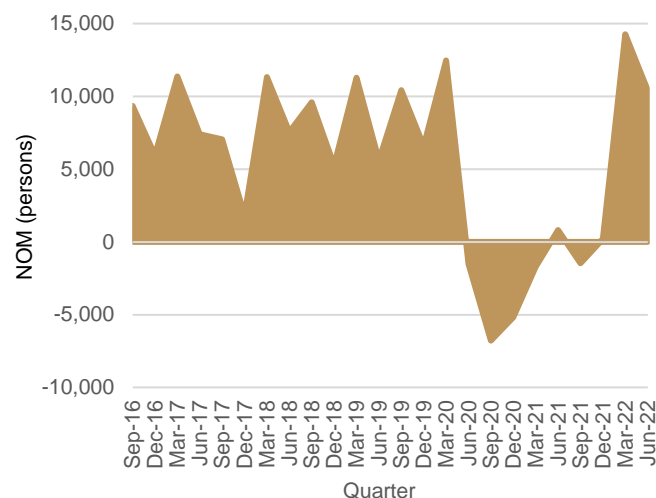
Following the international border closure on 20 March 2020, total overseas arrivals to Queensland decreased to 94,000 in 2020–21 compared with over 4 million in 2018–19⁹. Similarly, there were 122,540 overseas departures from Queensland in 2020–21, substantially lower than the approximately 2.9 million in 2019–20, and well below the 3.9 million recorded in 2018–19.

While the number of international border crossings does not directly equate to population change, NOM also moderated in 2019–20 and was negative in 2020–21 for both Australia and Queensland (Figure 7). Queensland accounted for 15.1% of the net Australian loss due to overseas migration in 2020–21.

Quarterly NOM data available to June 2022 show that, for the period between June 2020 and December 2021, Queensland recorded either negative NOM or historically low positive levels of NOM (Figure 8).

With the easing of international travel restrictions, net overseas migration has recovered. Queensland's NOM in the March 2022 quarter was 14,269 persons (Figure 8) and was the highest March figure recorded since 2009, accounting for 14.6% of Australia's NOM of 88,696 persons. Similarly, Queensland's June 2022 quarter NOM (10,422 persons) was the highest recorded since 2012, accounting for 18.0% of Australia's total (58,052 persons).

Figure 8 Net overseas migration, by quarter, Queensland



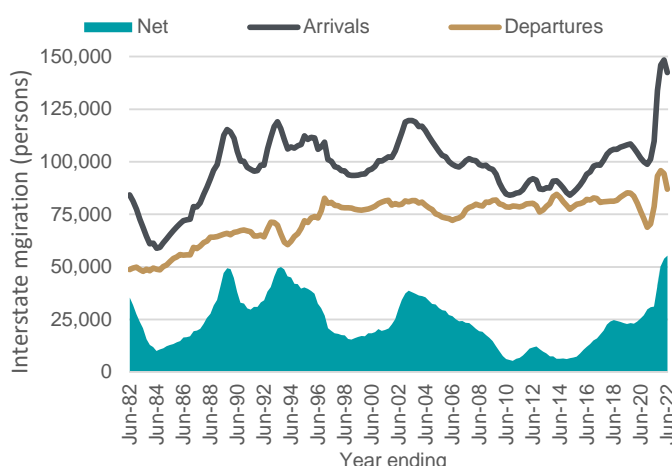
Source: ABS, *National, state and territory population*, June 2022

Net interstate migration

Net interstate migration (NIM) is the net result of population movement into a state or territory from other states or territories to reside (arrivals), subtracting equivalent population movement out of the state or territory (departures).

The current ABS time series since 1982–83 shows that Queensland has consistently recorded more interstate arrivals than departures, and therefore positive NIM (Figure 9).

Figure 9 Interstate migration, arrivals, departures and NIM, Queensland



Source: ABS, *National, state and territory population*, June 2022

⁹ ABS, *Overseas arrivals and departures*, August 2022, based on state of residence / intended stay

Interstate migration impacts during the COVID-19 pandemic

The pandemic and associated measures disrupted interstate migration trends, with impacts seen on both the magnitude and timing of interstate movements around the nation. Various measures relating to movements across Queensland's state border were introduced from 26 March 2020, until they were lifted entirely from 15 January 2022.

Despite border closures, interstate arrivals to Queensland remained relatively high. While arrivals moderated slightly in 2019–20 to 101,800 persons, they rose to 109,800 persons in 2020–21, then increased again to a record high of 142,400 persons in 2021–22. Interstate departures from Queensland, which had been consistently decreasing since September quarter 2019, began to rebound from March quarter 2021 to levels beyond those seen historically as border restrictions were relaxed (Figure 9).

The combined effects of these changes to arrivals and departures during the pandemic resulted in continued increase in net interstate migration to Queensland. NIM increased to 25,300 persons in 2019–20, then further to 31,200 persons in 2020–21, followed by a record-high 55,400 persons in 2021–22.

Long-term trends

There has been considerable variation in Queensland's interstate migration over time, with arrivals typically more variable than departures. Prior to 2022, interstate arrivals to Queensland peaked three times (during 1989–90, 1992–93 and 2002–03). From the peak of 119,600 persons in 2002–03, arrivals trended downwards to 84,700 persons in 2009–10, before remaining relatively stable through to 2014–15. Arrivals then trended upwards, reaching 108,000 persons in 2018–19. Since then, interstate arrivals to Queensland have increased further to a record high in 2021–22.

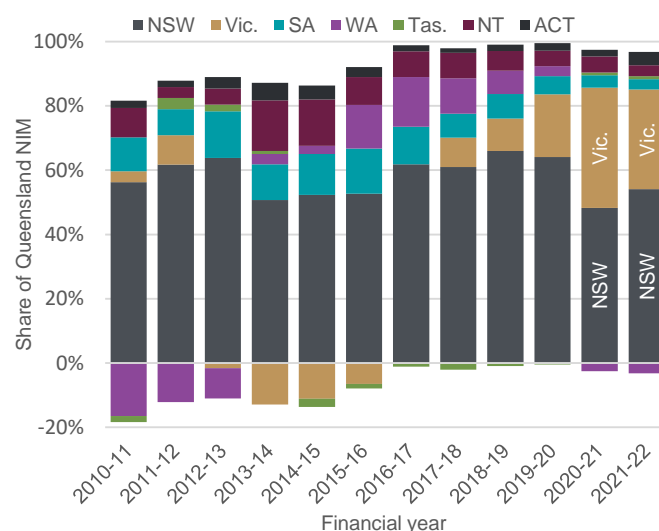
Interstate departures from Queensland increased from 47,900 persons in 1982–83 to 80,600 persons in 1996–97. Levels then remained relatively stable through to 2018–19, before moderating due to the COVID-19 pandemic, then reaching a record high level in 2021–22.

Largely due to the variation in arrivals over the last four decades, NIM for Queensland has varied considerably, from a low of 6,200 persons in 2009–10 to 49,200 persons in 1992–93. More recently, NIM fell to very low levels during the period 2009–10 to 2014–15, before recovering to 22,800 persons in 2018–19. NIM has continued to grow since, and in 2021–22 (at 55,400 persons) surpassed the previous peak seen in 1992–93.

The largest source of interstate migrants to Queensland has consistently been New South Wales (Figure 10). The second-largest flow of interstate migrants to Queensland over the past five years has been from Victoria. However, net interstate flows between Queensland and Victoria

have been mixed over the years. Queensland experienced a net outflow of population to Victoria over the years 2012–13 through to 2016–17, which overlapped to some extent with the years Queensland experienced a period of record low NIM. Similarly, Queensland has experienced net interstate outflows to Western Australia and Tasmania in several years since 2010–11.

Figure 10 Composition (%) of Queensland NIM, from states and territories



Source: ABS, *National, state and territory population*, June 2022