Commentary

AUSTRALIAN
POPULATION
STUDIES
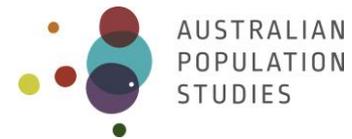
How COVID changed the world of data

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1. Introduction

COVID might have shrunk our worlds to frequent Zoom calls in which we took it in turns to remind each other 'You're on mute'. But COVID also opened up a whole new world of data. Amidst the most severe health pandemic in a century, the Australian Bureau of Statistics (ABS) produced new data products, shortened some of its release timelines, and adapted data series. As a consequence of the pandemic, Australians have access to more timely and frequent updates, new sources of data and greater integration. This article explores how the pandemic changed Australia's data landscape, and how new innovations in 'nowcasting' might shape the nation's data infrastructure in the future.

The COVID pandemic was not only a rapidly evolving health crisis but an economic crisis too – the most severe economic downturn since the Great Depression (Kennedy 2022). Restrictions to limit the spread of COVID saw a reduction in spending, business turnover, losses in jobs and hours worked, and supply chain disruptions (ABS 2022a). By June 2023, GDP had returned to its pre-pandemic trajectory (Figure 1). However, over the course of the pandemic, the cumulative GDP loss was $116 billion – representing the area between the two lines in Figure 1.

The COVID pandemic rocked the demographic boat. Australia's population growth slowed to 0.1 per cent in 2020–21 – the lowest rate in more than 100 years (Figure 2). Australia's net overseas migration fell into negative territory for the first time since the end of WWII, with a net loss of 85,000 people in 2020-21 (ABS 2023c). Births fluctuated in interesting ways. In the December 2020 quarter, nine months after the pandemic hit, births fell. As Gray et al. (2022) point out, crises can make couples cautious about starting a family, and this drop likely reflected the uncertainty that many couples felt in the early months of the COVID lockdowns. But then things turned around. In the March 2021 quarter, nine months after mid-2020, births hit an all-time high (ABS 2023c). We can't be sure as to why this occurred, but it may be that couples felt a little less anxious about the future as the year unfolded. Lockdown boredom may also have been a factor.
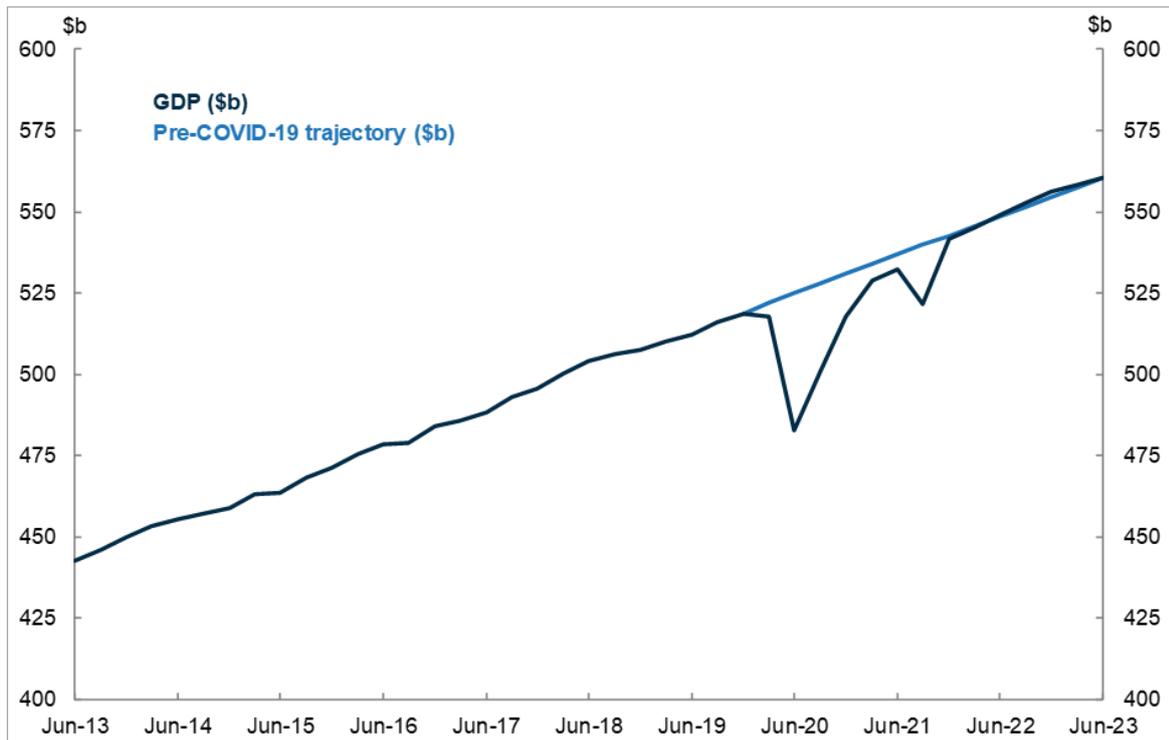
**Figure 1**: Australia's GDP, actual and pre-COVID trajectory

Source: ABS 2023a and Treasury
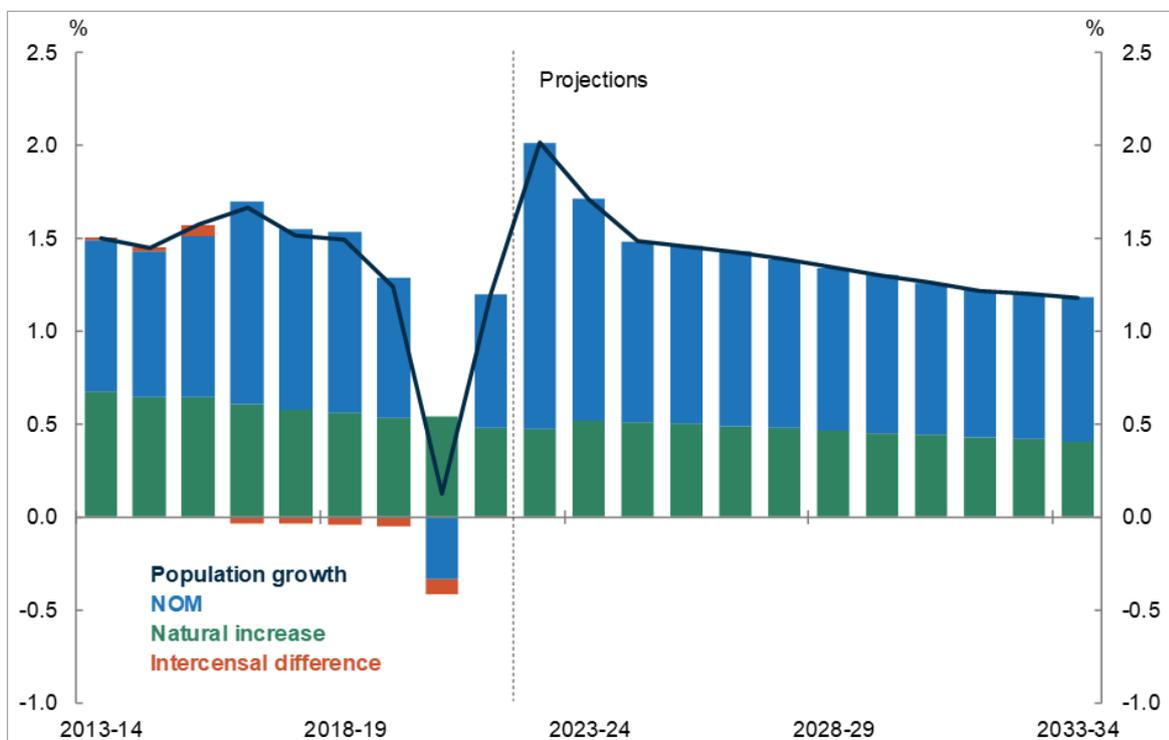
Figure 2: Australia's population growth and components of growth, historical and projected

Source: ABS 2023b and Treasury

Border closures between states and territories reduced internal mobility. The number of interstate moves in the year to March 2021 was 30.2 per cent lower than in 2018-19 (ABS 2023c). The pandemic also influenced where people wanted to live with an increase in net moves from urban areas towards suburban and regional areas (Figure 3) (Centre for Population 2020). COVID doubled the net number of people moving to the regions. The break in the data series in Figure 3 is due to the pandemic's impact on Medicare address information this series relied on, discussed below.
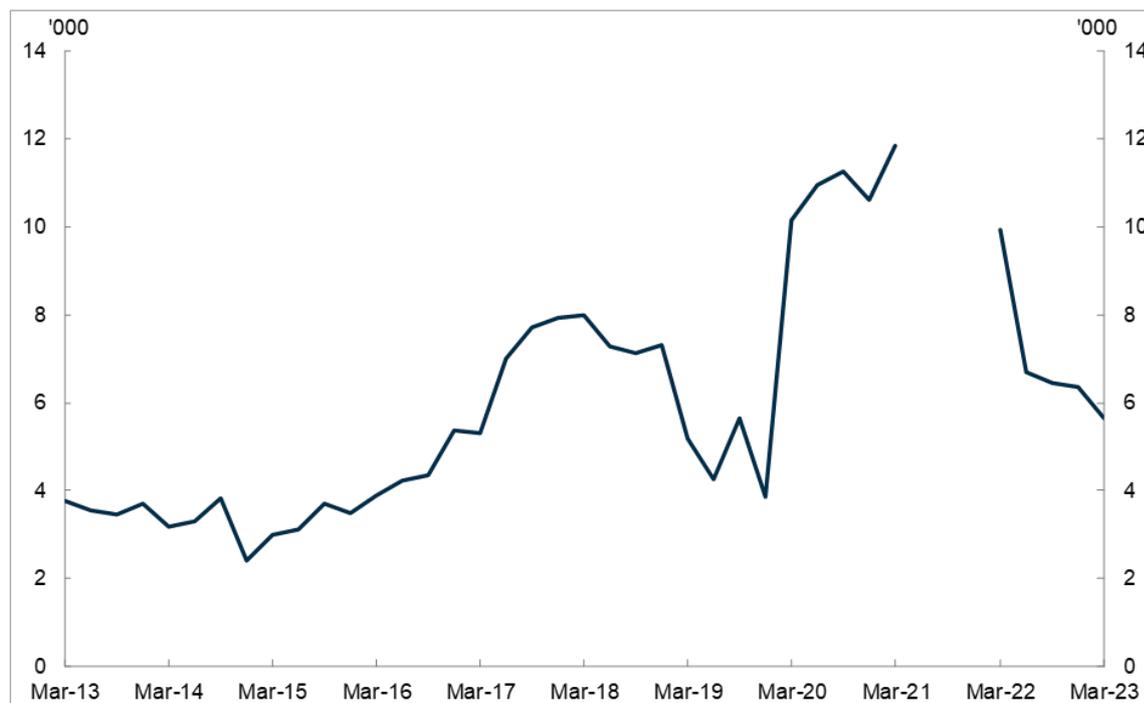
Figure 3: Net internal migration to regions outside capital cities, quarterly
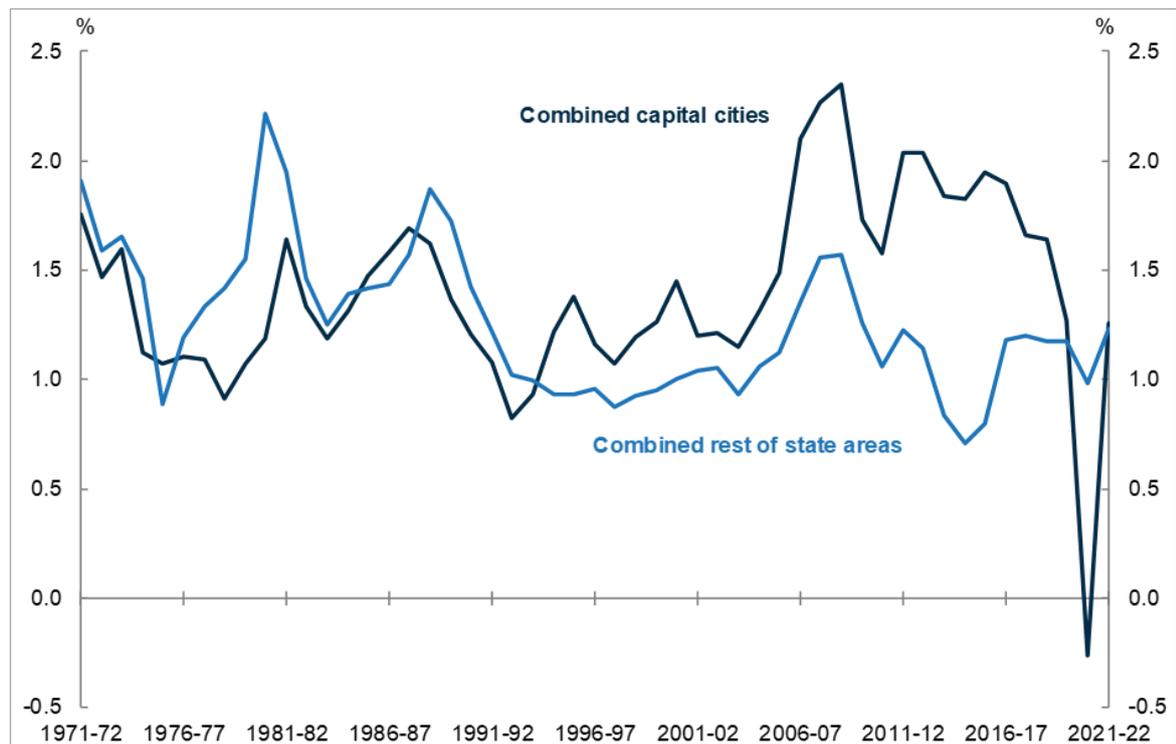*Source*: ABS 2023c and ABS 2021d.
Note: The break in the data series is due to the pandemic's impact on Medicare address information.

In 2020-21, regional areas grew faster than capital cities for the first time since 1993-94 (ABS 2023e) (Figure 4). The popular television show SeaChange debuted in 1998, but it would take two more decades and a pandemic before the data showed more rapid population growth in regional areas than capital cities.

2. Putting the data spotlights on

The data challenge for government agencies during the pandemic was enormous. Data had to be timely to respond to a rapidly changing environment. It had to be delivered at a higher frequency. And data had to be continuous and granular to help us understand the different things happening in different states and territories. Treasury recognised early on that existing data assets weren't going to be sufficient for handling the speed and scale of dual health and economic shocks. A Treasury paper (Hambur et al. 2022) likened using existing data during COVID to the 'streetlight effect' where a drunk only searches for their lost keys under the lamp post, because that's where the light is best.

Figure 4: Combined capital city and rest of state population growth, annual
Source: ABS 2023e and ABS 2019.

When it came to forecasting during the pandemic, historical data – traditionally the foundation for models – suddenly seemed inadequate. The usual patterns and trends, which underpinned models, were disrupted, making usual methodologies less reliable. Then there was the unpredictable nature of the virus. New strains emerged, with different levels of transmissibility and severity, complicating predictive models. The only plausible option involved shining new light on the rapidly evolving economic and demographic situation using new sources of data.

By mid-March 2020 – about the same time that toilet paper madness was unrolling – the ABS already had introduced a range of COVID related products. This included preliminary data as well as smaller, rapid-response surveys to deliver more timely insights (ABS 2021a, ABS n.d). The ABS introduced the Business Impacts of COVID-19 (now named Business Conditions and Sentiments) and the Household Impacts of COVID-19 rapid-response surveys. These surveys fast-tracked the time between the field and publication. The Business Impacts of COVID-19 survey provided information with a delay of 7 days from interviewing to publication, while the Household Impacts of COVID-19 was released around 17 days after the end of the collection period.

The ABS also made greater use of alternate data sources, such as non-survey administrative data and transactions data to develop indicators (ABS 2021a, ABS n.d). In one example, the ABS partnered with other agencies to provide new data through two integrated longitudinal assets – the Person Level Integrated Data Asset (PLIDA, formerly known as MADIP) and the Business Longitudinal Analysis Data Environment (BLADE). These data assets proved valuable because they could be updated frequently, making quicker and more sophisticated analysis possible. The PLIDA and BLADE core data was linked

providing new insights into the interactions between businesses and their employees (Gruen 2022a). These insights allowed governments and policymakers to determine COVID's impact on the business community and examine the economic recovery including employment patterns. Data from the Australian Immunisation Register (AIR) are also linked to PLIDA each week and Provisional Death Registrations data is linked and updated monthly. During the pandemic, the Department of Health and Aged Care used this data to generate insights for Australia's COVID Vaccine and Treatment Strategy. State health departments and primary health networks are also data users.

The pandemic also saw the emergence of new official data sources. It made practical sense for the ABS to draw on data already generated in our increasingly digital world (Gruen 2022a). It makes even more sense when that source provided previously unavailable statistics, faster and with greater coverage than before. The Single-Touch Payroll is a prime example. From April 2020, the ABS worked with the Australian Taxation Office to receive expedited access to the high-frequency Single-Touch Payroll data. This access was significant for a few reasons. First, it provided new and almost real-time insights into the labour market based on more than 10 million employees in Australia (Gruen 2022a). The teamwork resulted in the Weekly Payroll Jobs publication and the more recent Monthly Employee Earnings Indicator publication. Second, the access enabled detailed disaggregation including geospatial analysis which just wasn't possible from the existing monthly Labour Force Survey. And third, it filled a major void. Treasury's data experts observed that during the COVID pandemic the 'unemployment rate was a less informative measure of labour market health than usual (because many workers had been stood down temporarily or were working reduced hours) and other indicators such as hours worked gained more prominence' (Hambur et al. 2022 p. 4). They noted, 'the timeliness and broad coverage of Single Touch Payroll made it one of the most valuable datasets in assessing the health of the labour market in real time… and in modelling fiscal policy response options' (p. 4).

The ABS was not the only government agency stepping up to the challenges of measuring COVID's impact. The Australian Institute of Family Studies introduced the Families in Australia Survey series (https://aifs.gov.au/research_programs/families-australia-survey) which ran from May 2020 to December 2021. The survey series explored how families' lives changed during the pandemic, covering topics such as changes to workforce participation, work patterns, child care, household forms and family supports. The Australian Institute of Health and Welfare established the COVID-19 Register – a national and linked data set (AIHW 2023). The Register combines de-identified COVID case data with other data sets, including immunisation, hospitals and deaths data. Importantly, it will be updated as more data become available, allowing a long-term view of the effects of COVID on health outcomes and health service usage. Combining all the data and research, there are many more lamp posts in the data park to help people find their lost keys.

3. The realm of demographic data in Australia

Prior to COVID, summary mortality information was reported with a 6-month delay from when the death was registered to publication (ABS 2023j). The ABS expedited its mortality data reporting to capture the immediate and detailed COVID impacts. The reporting became essential for

understanding COVID's direct impact and its indirect consequences on the population. In June 2020, the ABS released the first Provisional Mortality Statistics report to account for the beginning of the pandemic (ABS 2020). The ABS continued to produce the report monthly as a way of tracking mortality through the pandemic. This meant that deaths were now reported 3 months after they occurred and on a more frequent and detailed basis. So the consequence of COVID has been to reduce the delay in deaths reporting and support the tracking of mortality during the pandemic and beyond. These reports showed that the pandemic could impact mortality in unexpected ways. In 2022, we saw deaths due to other causes rise, highlighting some of the direct and indirect impacts of the pandemic on our health (ABS 2023f).

The ABS released an article in July on measuring Australia's excess mortality during the COVID pandemic (ABS 2023d). The article provides excess mortality estimates for Australia and the states and territories from 2020 to March 2023. One can see the variations across the states over the Omicron period especially, with Western Australia recording the lowest and Tasmania the highest in this map (Figure 5).
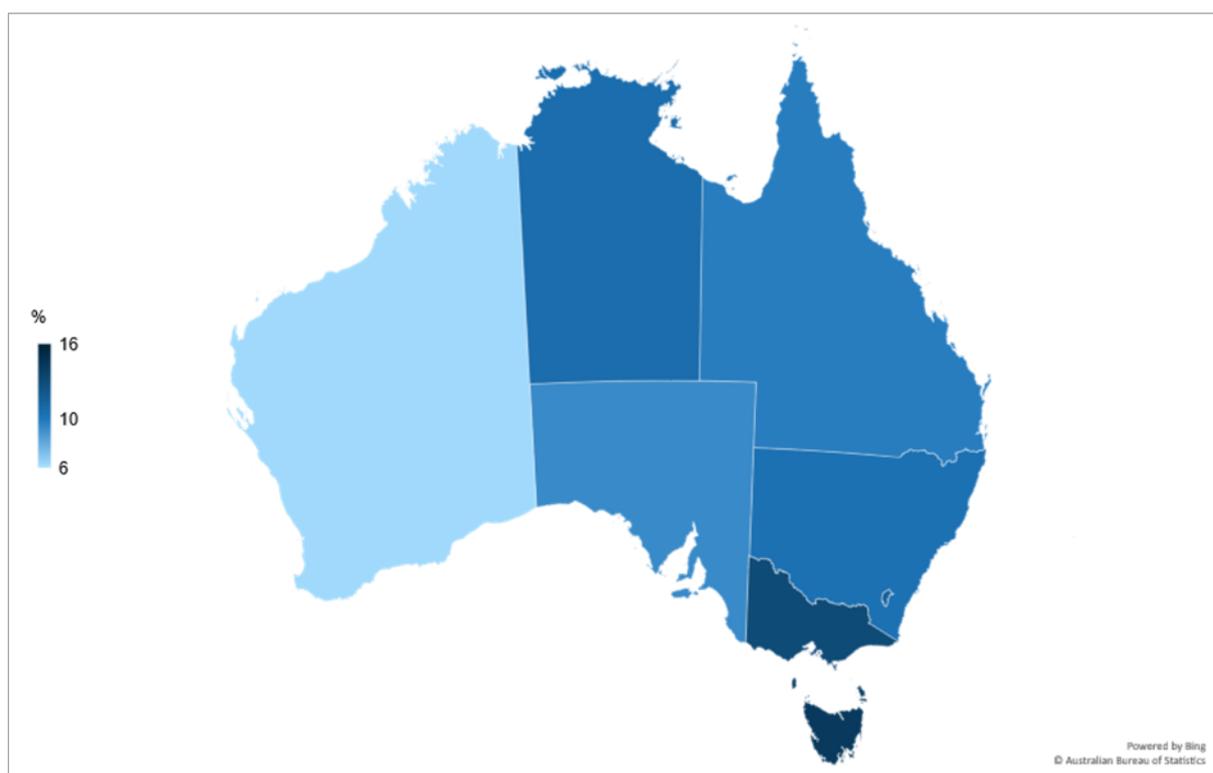
Figure 5: Excess mortality (%), Omicron period (January 2022 – March 2023)
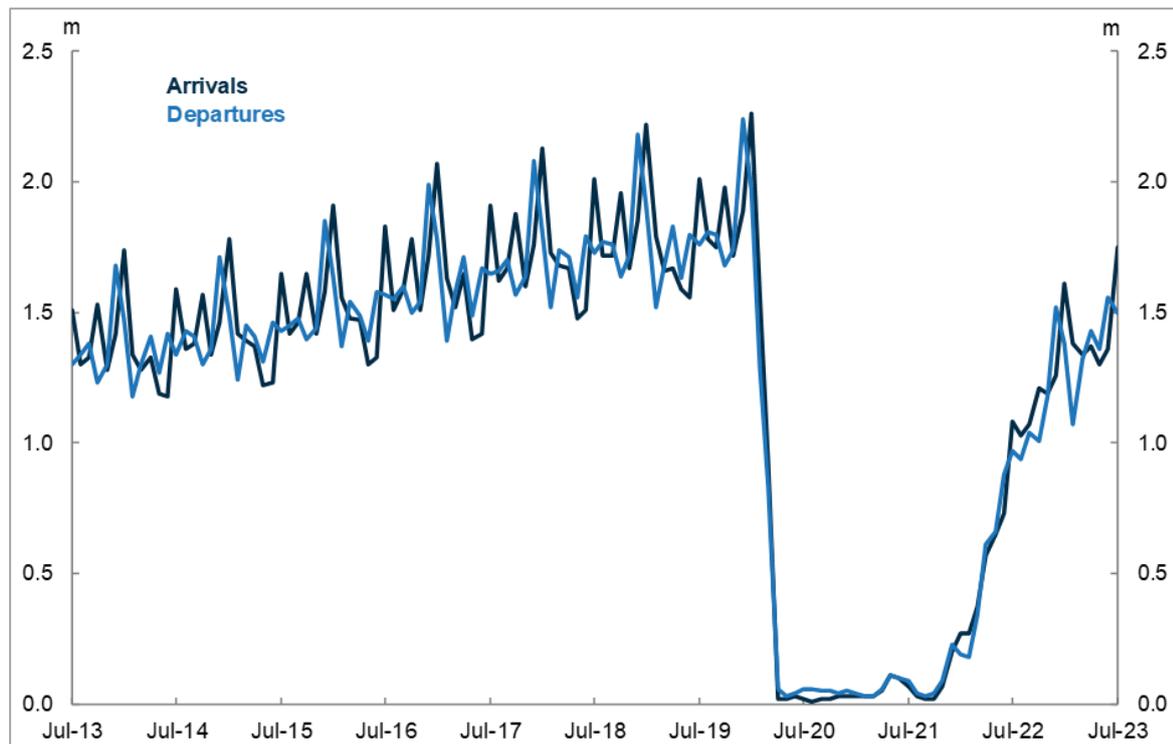*Source*: ABS 2023d

The ABS found that mortality was 9.1 per cent above the expected number of deaths in the first quarter of 2023. In 2022, deaths were 10.9 per cent above expected. This contrasted with the years 2020 and 2021, when Australia had relatively few COVID cases, and significant mobility restrictions. Analysing ABS mortality data for those years, Oxford's Philip Clarke and I published research in *BMJ: Global Health* that studied the impact of lockdowns on mortality (Clarke and Leigh 2022). We found

the mortality rate in Australia was 5.9 per cent lower in 2020–2021 than in 2015–2019. Contrary to those who claimed lockdowns would increase the death rate, we found lockdowns and social distancing reduced short-term mortality.

The ABS has published other articles on COVID mortality so we can see how it has been distributed across population groups (ABS 2023h). The articles have presented COVID mortality data by demographic characteristics. This breakdown helps us track the incidence of direct COVID mortality and indirect mortality, and offered insights into demographics variations. Delivering the W.D. Borrie Lecture last year, I explored some of the health inequalities created by the COVID pandemic. It turns out that although Britain had a higher level of COVID mortality than Australia, the socioeconomic patterns of COVID mortality in the two countries are very similar (Leigh 2022).

Collecting some kinds of demographic data became more difficult during COVID. Registration delays in the reporting of births data were especially pronounced in some places during the pandemic as a result of activity restrictions and lockdowns (Centre for Population 2021). During the pandemic, the Centre for Population – housed in the Australian Treasury – was able to use Medicare newborn entrants data from Services Australia (Centre for Population 2021, pp. 42-43). This data provided a proxy for births to inform fertility assumptions and improve population projections during the pandemic and beyond.

Migration trends were a major focus during the pandemic. With international travel restrictions, the ABS provided more detailed and timely data on returning Australians, international students, and the implications for population growth. For example, additional information was included in Overseas Arrivals and Departures (OAD) to provide more detail on the numbers of arrivals and departures to and from Australia (Gruen 2020). Additional information included analysis of short-term visitor arrivals and a breakdown of international students for each state and territory. In response to heightened interest in traveller data, the ABS also created the temporary Overseas Travel Statistics provisional publication (ABS 2021b). This data was effective in giving governments earlier monthly preliminary information on international travel using border crossing data. As a result, information for the reference month was available four weeks earlier than what was available in the Overseas Arrivals and Departures release (ABS 2021a). Given the value of this information, provisional travel data was added to the existing Overseas Arrivals and Departures release from August 2021. The data give us a dramatic picture (Figure 6). As shown in this chart, from 20 March 2020, almost all overseas travel was banned, as the WHO declared the COVID outbreak a public health emergency. The pandemic disrupted international travel with volumes at a record low in 2021. The Government began to ease travel restrictions in late 2021. International travel in Australia has seen a resurgence since early 2022, with over 19 million arrivals and departures combined across 2022. The ABS also introduced more frequent revisions of net overseas migration estimates (Gruen 2022b). This improvement was about providing the most up-to-date information and enabled adjustments to the preliminary model to account for changed traveller behaviour.

Figure 6: Total overseas arrivals and departures, monthly

Source: ABS 2023g

As noted above, internal movements were fascinating from a demographic point of view. With borders closing and movement restrictions in place, the ABS adjusted its approach to monitoring internal population dynamics, tracking movements between states as well as urban and rural divides. COVID challenged traditional understandings of internal migration, not to mention forecasting the distribution of the population and the flows of people between areas. Remember the demographic boat was rocking – things were still happening fast when the ABS introduced the Provisional Regional Internal Migration Estimates (PRIME) in November 2020 (presented in Figure 3).

These estimates were a way to provide timely insights into internal migration in response to the pandemic and the heightened interest in internal migration data. However, the publication was suspended after the March 2021 release due to the impact of the COVID vaccination program on Medicare data, which is the primary source for internal migration estimates. The vaccination program saw the number of people updating their Medicare address data go through the roof – reflected in the number of interstate moves jumping to a series record 164,000 in September 2021 while there were lockdowns and border restrictions in place (Figure 7).

The pandemic also posed some challenges to the approach taken for finalising internal migration estimates from the 2021 Census. The issue with the Medicare data led the ABS to declare that movements over the second half of 2021 were not reflective of real world internal migration. In addition, the Census data was also affected by lockdown policies in some jurisdictions. The ABS responded to these challenges by giving greater weight to the Census and Medicare data that was unaffected by these impacts. This included discounting the Medicare data over 2020–21 in favour of the Census-based estimates and giving more weight to the earlier (2016) Census data than usual.
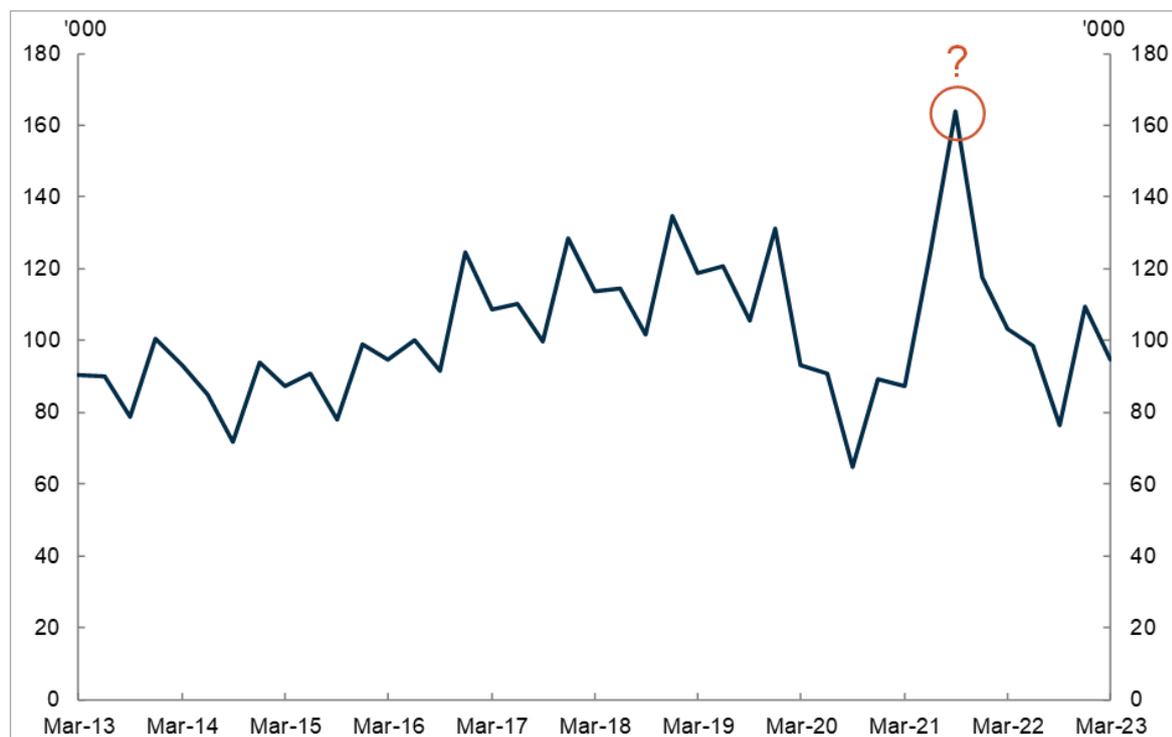
Figure 7: Interstate movements (based on Medicare address changes), quarterly

Source: ABS 2023c

Note: A large number of Medicare address updates occurred during the rollout of the vaccination program in 2021.

4. Looking ahead: demographic data post-COVID

COVID demonstrated the potential for more data integration. The Life Course Data initiative, announced in this year's budget, will connect administrative datasets into a linked longitudinal data asset to support evidence-based policy making at the community level. Linking data across different subject-matter areas and levels of government will bring many benefits. It will enable more comprehensive analysis of the characteristics, programs and service interactions of individuals, households and families (Gruen 2023).

The ABS is exploring new ways to enhance the Census using administrative data. The 2021 Census was supported by integrated administrative data that helped in assuring its quality and led to more accurate area population counts (ABS 2023i). More recently, new income and benefits data added to the 2021 Census for its final data release supported new analysis and insights on Australian pensioners. Work to understand administrative data has led to the release of Census-like population and housing data snapshots (ABS 2023k; ABS 2023l). These experimental datasets have been released as stand-alone products and over time are expected to provide additional information on sub-national population and internal migration patterns.

5. Conclusion

The COVID pandemic delivered lasting change to Australia's statistical systems.

• Before the pandemic, deaths were reported 6 months after the end of the reporting period. Now, they are reported with a 3 month delay.

• Before the pandemic, the delay in reporting overseas arrivals and departures was 6 weeks. Now, provisional data is available in only 2 weeks.

• Before the pandemic, Australia was one of only two OECD countries (the other being New Zealand) to report inflation on a quarterly basis. Now, we have a monthly CPI indicator.

• As a result of the pandemic, the ABS created the Weekly Payroll Jobs publication and the Monthly Employee Earnings Indicator publication.

Yet there may be more to be done. Right now, the reporting delay is 2 weeks for unemployment, 3½ weeks for quarterly inflation, and just over 2 months for national income accounts and house price data. By contrast, share market data are available in real time. And in the September 2023 issue of the *Australian Economic Review*, a series of papers explored innovations in 'nowcasting'. Michael Anthonisz of the Queensland Treasury Corporation (QTC) uses data from Bloomberg and Macrobond, as well as the Citi Australian Data Change Index and the QTC-constructed Financial Conditions Index to provide daily insights into key indicators of the Australian economy including inflation, GDP growth and the unemployment rate (Anthonisz 2023).

Looking locally, Ashton de Silva, Maria Yanotti, Sarah Sinclair and Sveta Angelopoulos find unconventional real-time data such as pedestrian counts could be good high-frequency predictors of local economies, such as suburbs or central business districts (CBDs) (de Silva et al. 2023). And finally, in response to rising house prices, Shuping Shi and Peter C. B. Phillips created a real-time "thermometer" of "housing fever" in Australia and New Zealand. Using data on mortgage interest rates, rents, disposable income, employment and housing supply the authors diagnose in real-time bubbles as they begin to emerge (Shi and Phillips 2023).

These intriguing examples show what is possible using novel data and machine learning algorithms. It may also be possible to use additional data sources to improve estimates of state and territory populations, which are used for a range of important purposes, such as allocating Goods and Services Tax revenue across jurisdictions.

It is vital that government continues to watch developments in this space. In producing statistics, there is always a trade-off between quality and timeliness. In another crisis, policymakers may want data more quickly, even if it comes at the cost of perfection.

Acknowledgments

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