
# The experience of COVID-19 in Australia, including long-COVID – Evidence from the COVID-19 Impact Monitoring Survey Series, August 2022

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## Abstract

The aim of this paper is to describe the experience of COVID-19 in Australia, examine the factors associated with whether or not someone had COVID-19, including long-COVID, and relate this experience to broader measures of wellbeing. Data for the paper comes from the 12th wave of the COVID-19 Impact Monitoring series, with a total of 3,510 responses collected between the 8th and 22nd of August using the Life in Australia™, online probability-based panel. The paper shows that females, young adults, and those who live in a household in the middle part of the income distribution have had the highest probability of contracting COVID-19 as well as the greatest number of infections. The paper presents the types of symptoms people with COVID-19 have experienced, the number and distribution of symptoms experienced per person (10.2 symptoms, on average), and experiences of long-COVID in Australia. We also present what would appear to be the first estimate in Australia of the relationship between experiences of COVID-19 and changes in wellbeing from prior to the pandemic showing a complex relationship.

# Executive summary

The ANU Centre for Social Research and Methods COVID-19 Impact Monitoring Survey Series has been tracking wellbeing, attitudes, and behaviours of adult Australians since the start of the COVID-19 period. On the 8th of August 2022, data collection began for the 12th wave of the series with a total of 3,510 responses collected between the 8th and 22nd of August. The aim of this paper is to describe the experience of COVID-19 in Australia, examine the factors associated with whether or not someone had COVID-19, including long-COVID, and relate this experience to broader measures of wellbeing.

## COVID-19 infections

- The majority of Australian adults (52.4%) reported having either had COVID-19 or at the very least thinking they have had it. Specifically, 44.0% had COVID-19 confirmed on testing, 6.5% had a suspected case of COVID-19 but tested negative, and a further 1.8% had a suspected case of COVID-19 but did not undertake any testing.
- A higher proportion of females than males reported having ever had COVID-19 – 56.1% compared to 48.5%.
- Younger adults were more likely to have had COVID-19 than older Australians, with nearly two-thirds (63.2%) of those aged 25-44 years, but only around a third (33.6%) of those aged 75 years and over, reporting having ever had COVID-19.
- The vast majority of Australians (83.4%) who have had COVID-19 have only had it one time. However, 11.2% of those who have had COVID-19 reported that they had it twice, and a further 5.4% three times or more.
- The highest number of COVID-19 infections is amongst those in the middle and upper-middle income categories. Those in the highest income households had significantly fewer COVID-19 infections than these two groups, but the lowest level of reported infection was amongst those in the lower-middle income group and those in the lowest income households in particular.

## COVID-19 symptoms

- Amongst those who had COVID-19, 89.5% reported that they had had symptoms. Of those who had at least one symptom, the average number of symptoms experienced per person was 10.2.
- The most common symptom that was reported was tiredness, with 86.7% of those with at least one symptom reporting that they experienced tiredness. The next four symptoms were reported by around three-quarters of those with symptoms – namely runny nose/sneezing (78.1%), sore throat (76.7%), cough (76.5%), and headache (74.7%).
- Females reported around 2.3 additional symptoms compared to males (10.1 symptoms compared to 7.8).
- The average number of symptoms decreased with age, with the youngest age group reporting 4.2 additional symptoms compared to the oldest age group (10.6 symptoms for those aged 18 to 24 years and 6.4 symptoms for those aged 75 years or older).

## Long-COVID

- There are a number of alternative definitions of long-COVID, and no consensus. Some definitions require symptoms to have persisted for 4 weeks, others for 12 weeks. Other definitions require symptoms to be restricting daily activity. In this paper, we follow the National Institute for Health and Care Excellence (NICE) in the UK which distinguishes between Acute COVID-19 (Signs and symptoms of COVID-19 for up to 4 weeks) and long-COVID, which itself is made up of two different thresholds:
    - Ongoing symptomatic COVID-19 - Signs and symptoms of COVID-19 from 4 weeks up to 12 weeks.
    - Post-COVID-19 syndrome - Signs and symptoms that develop during or after an infection consistent with COVID-19, continue for more than 12 weeks and are not explained by an alternative diagnosis.
- 29.0% of adults with confirmed or suspected COVID-19 experienced long-COVID, or symptoms more than 4 weeks after the person first had COVID-19, that are not explained by something else. This equates to an estimated 14.2% of Australian adults.
- We estimate that 4.7% of adult Australians have had or currently have post-COVID-19 syndrome (symptoms that lasted 3 months or more).
- Of those who reported COVID-19 symptoms that lasted for more than 4 weeks, 22.5% said that it reduced their ability to carry-out day-to-day activities compared with the time before they had COVID-19 'a lot', with 63.3% saying it reduced their ability 'a little'. This was quite similar for those who had symptoms for 3 months or more (21.6% and 64.3%).
- Among survey respondents who were infected more than 4 weeks ago and who still reported symptoms at the time of the survey, the average number of months with symptoms was 1.97 months. Among those who had had long-COVID (symptoms that lasted for more than 4 weeks) but were no longer experiencing symptoms, the average number of months with symptoms was 3.53.
- The most common symptoms experienced by those with COVID-19 symptoms for 4 weeks or more were tiredness (experienced by 82.1%) and weakness (58.4%).

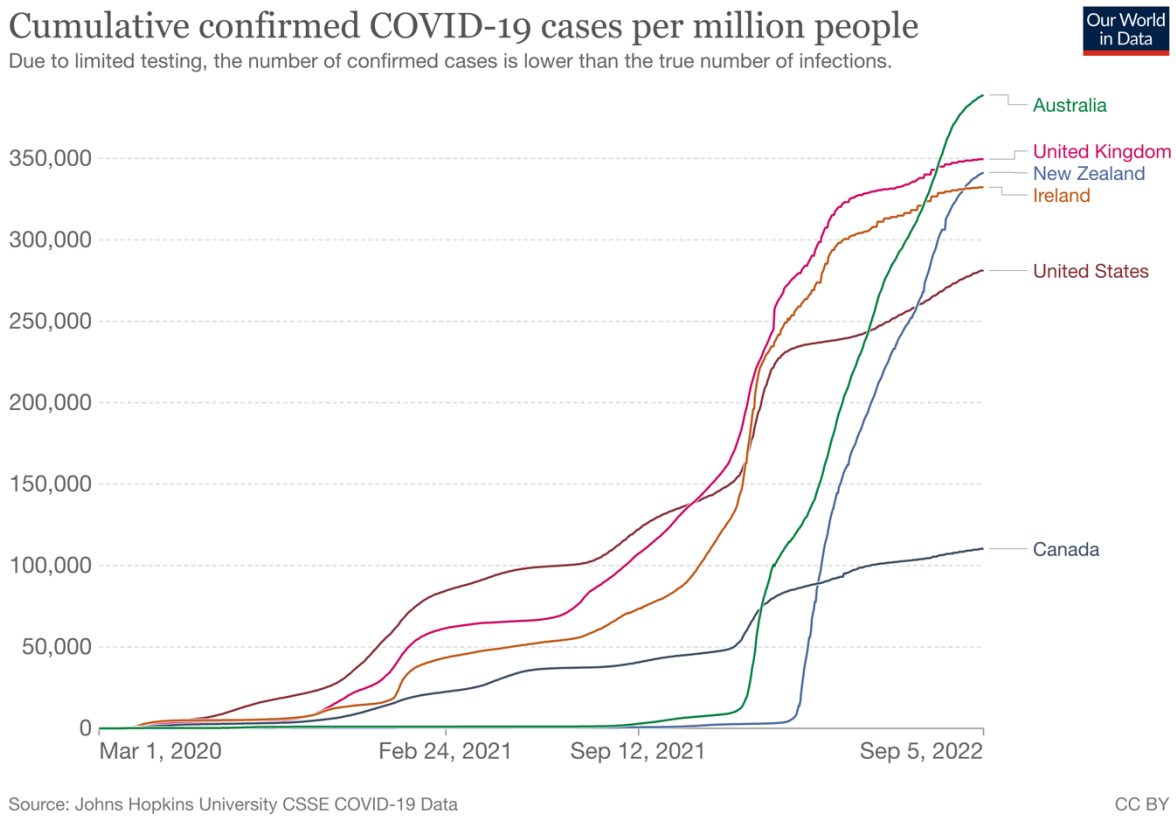
## COVID-19 and wellbeing

- In this paper we also present what would appear to be the first estimate in Australia of the relationship between experiences of COVID-19 and changes in wellbeing from prior to the pandemic. This relationship is estimated using longitudinal data, and holds when we control for the relationship between age/sex and wellbeing.
- Those adult Australians who have not had COVID-19 at all reported average life satisfaction in August 2022 of 6.70 (on a scale of 0 to 10). Those who had acute-COVID-19 but not recently and did not have long-COVID at any stage had the highest level of life satisfaction amongst all the groups (7.02).
- Those who had long-COVID and who reported that this has led to restrictions on their ability to carry out day to day activities had the lowest level of life satisfaction. Compared to a short (less than 4 weeks) bout of COVID-19, those who experience long-COVID have significantly and substantially lower life satisfaction, even when we hold constant the level of life satisfaction prior to the pandemic.
- Focussing on those with at least one COVID-19 symptom (regardless of whether they had long-COVID or not), each additional symptom is associated with a lower level of wellbeing conditional on life satisfaction pre-COVID. For those with long-COVID, an extra month of symptoms is associated with a lower level of life satisfaction.

# 1 Introduction and overview

Comparing Australia with five other large, high-income, English-speaking countries, there have been very different COVID-19 experiences since the start of the pandemic. Keeping in mind that the proportion of those who have symptoms or who have been a close contact with a confirmed COVID-19 case who undertake a COVID-19 test has declined substantially, in the last few months as the requirements to do so have been relaxed[1] we can see from Figure 1 that the UK, Ireland and the US had a very high relative number of COVID-19 cases (per million people) in the early stages of the pandemic, with Australia and New Zealand having very few cases up until late 2021/early 2022. Canada has had an experience somewhere in between these two groups. Since early 2022, however, the number of confirmed cases has increased substantially in Australia and New Zealand, with Australia now having the highest cumulative confirmed cases per million amongst the six countries.

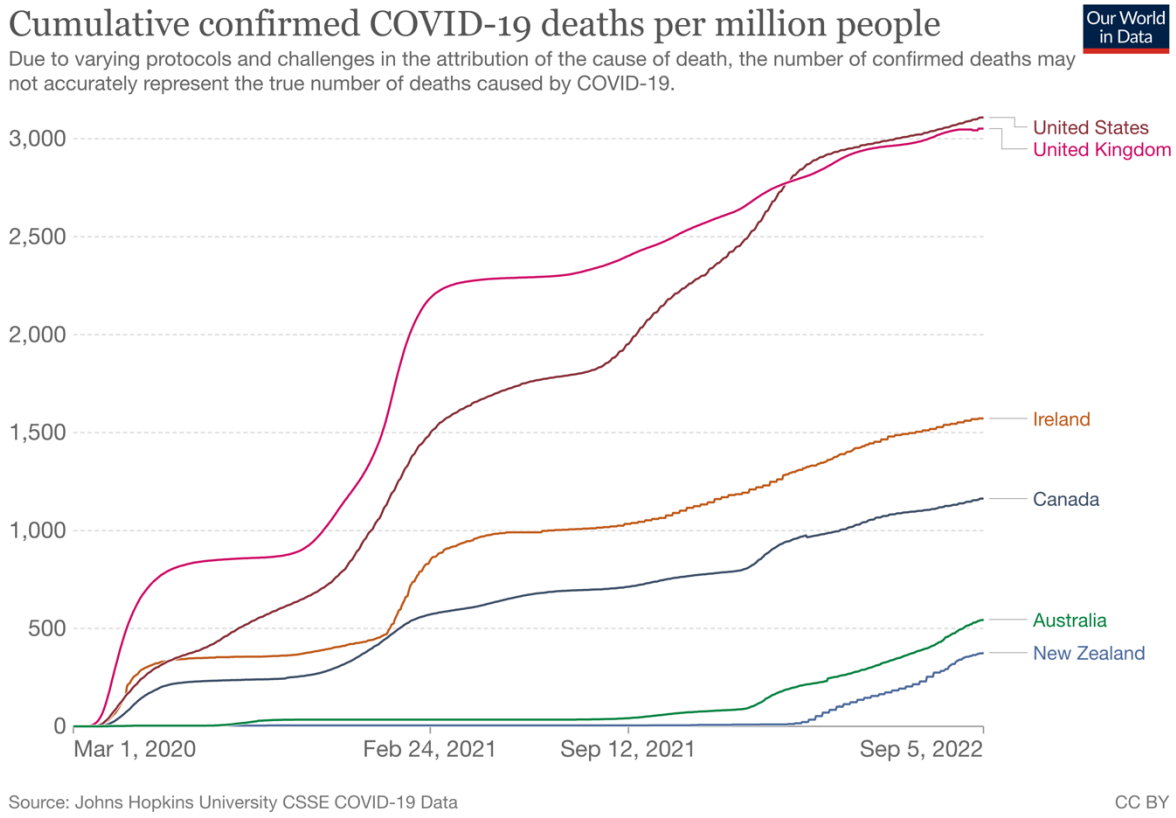
**Figure 1 Cumulative confirmed COVID-19 Cases per million people; Australia, Canada, Ireland, New Zealand, UK, and US – March 2020 to September 2022**




Deaths due to COVID-19 tell a different story. The UK and US had high COVID-19 mortality rates in 2020 and 2021, with mortality continuing to increase in 2022 such that there have been more than 3,000 COVID-19 deaths per million people in those two countries over the COVID-period. Canada and Ireland have had a steady number of COVID-19 deaths (with some clear upswings), but mortality rates that are far lower than their two large neighbouring countries. Australia and New Zealand, on the other hand, had relatively few COVID-19 deaths up until late-2021. The 1,000$^{th}$ confirmed death in Australia did not occur till August 2021, with New Zealand having fewer than 100 deaths up until March 2022. Death rates in these two countries only increased in late 2021 and early 2022 respectively. However, despite the fact that

cumulative reported case numbers per million population in these two countries are now at or above those in the other four countries in the figures, cumulative deaths per million people are still relatively low.

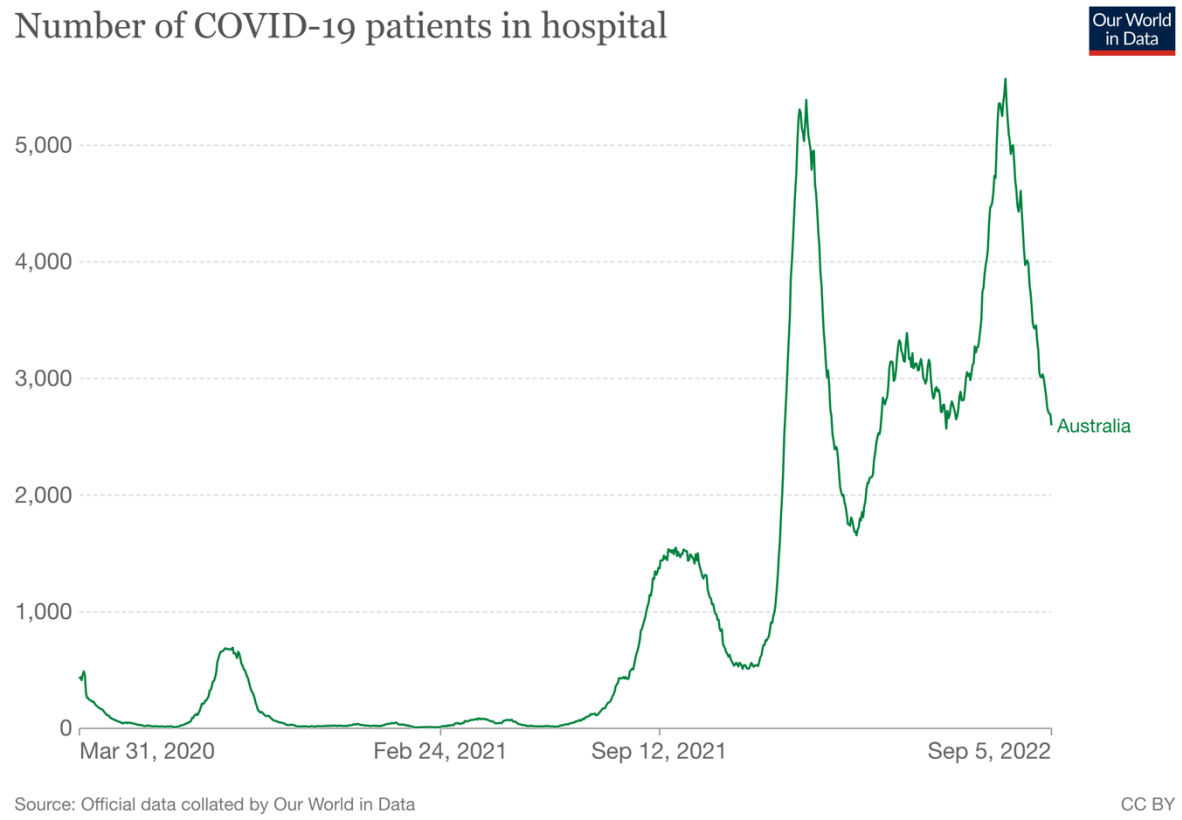
Figure 2 Cumulative confirmed COVID-19 deaths per million people; Australia, Canada, Ireland, New Zealand, UK, and US – March 2020 to September 2022




The experience of COVID-19 has therefore been very different in Australia (and New Zealand) compared to other countries that we usually compare ourselves against. For those who have been infected, this has occurred much later in the pandemic after everyone has had the opportunity to be vaccinated (including one or more booster-shots) and after treatment for those with COVID-19 has improved quite substantially (Burki 2022).

That is not to say that the experience of COVID-19 in Australia has not been traumatic for those who have been hospitalised or those who have had close family and friends hospitalised or die from the disease. The more than 14,000 deaths from COVID-19 in Australia (based on surveillance reports) and multiple thousands of COVID-19 patients in hospital on a given day (as of early September 2022, Figure 3) may have serious and long-lasting impacts for years to come. Rather, it is to say that other country experiences have in many ways been far worse.

Figure 3 COVID-19 patients in hospital on a given day; Australia – March 2020 to September 2022




Another consequence of the very different COVID-19 experience in Australia compared to many other countries is that for the first two-years or so of the pandemic there was not a sufficient number of people in most social surveys who have had COVID-19 to analyse and make generalised conclusions. There have been a number of targeted follow-up studies and a substantial amount of analysis of administrative data systems. However, administrative data systems do not have the rich subjective data of social surveys, and targeted follow-up studies by definition do not include those who have not been exposed to COVID-19.

The ANU Centre for Social Research and Methods COVID-19 Impact Monitoring Surveys has been tracking wellbeing, attitudes, and behaviours of adult Australians since the start of the COVID-19 period. The first wave of the series was collected in the second half of April 2020 with data eventually collected on 3,155 Australians over a two-week period. On the 8th of August 2022, data collection began for the 12th wave of the COVID-19 Impact Monitoring series, with data on a total of 3,510 adults collected between the 8th and 22nd of August.

Given the substantial increase in COVID-19 cases since the 11th wave of data collection in the COVID-19 Impact Monitoring series (undertaken in April 2022), the 12th wave of data collection focused in part on the experience of COVID-19 amongst Australian adults, including a focus on self-perceived experience of long-COVID. The aim of this paper is to describe this experience, examine the factors associated with whether or not someone had COVID-19, including long-COVID, and relate this experience to broader measures of wellbeing. The dataset is described in the next section of the paper, with the remainder of the paper structured as follows. First, in Section 3 we describe the experience of COVID, including the proportion of adults who report they had COVID-19, the number of times someone is infected, and their symptoms. In

Section 4 we focus on different aspects of long-COVID, including the type of symptoms and the number of months with symptom. In Section 5 we relate the COVID-19 experience to changes in wellbeing since prior to the pandemic, and in Section 6 we provide some concluding comments.

# 2 Overview of the COVID-19 Impact Monitoring Survey

In April 2020, the Social Research Centre on behalf of the ANU Centre for Social Research and Methods collected the first wave of data as part of the Centre's COVID-19 Impact Monitoring Series.[2] Since that first wave of data collection, surveys have been undertaken a further 11 times, with the most recent wave of data collection undertaken in August 2022.

Surveys have also been conducted with the same group of respondents in January and February 2020, just before the COVID-19 pandemic started in Australia, as part of the ANUpoll and Australian Social Survey International-ESS (AUSSI-ESS) surveys respectively.[3] This allows us to track outcomes for the same group of individuals from just prior to COVID-19 impacting Australia through to two-and-a-bit years since COVID-19 first reached Australia.

The August 2022 survey collected data from 3,510 Australians aged 18 years and over.[4] Data collection for this most recent ANUpoll commenced on the 8th of August 2022 with a pilot test of telephone respondents. The main data collection commenced on the 9th and concluded on the 22nd of August. Just over half (57.6%) of the sample had completed the survey by the 11th of August (and hence results are more indicative of early rather than mid-August) and the average interview duration was 23.9 minutes.

The Social Research Centre collected data online and through Computer Assisted Telephone Interviewing (CATI) in order to ensure representation from the offline Australian population. Around 3.5% of interviews were collected via CATI.[5] A total of 4,294 panel members were invited to take part in the August 2022 survey, leading to a wave-specific completion rate of 81.7%.[6]

Data in the paper is weighted to population benchmarks. For Life in Australia™, the approach for deriving weights generally consists of the following steps:

1. Compute a base weight for each respondent as the product of two weights:
    a. Their enrolment weight, accounting for the initial chances of selection and subsequent post-stratification to key demographic benchmarks
    b. Their response propensity weight, estimated from enrolment information available for both respondents and non-respondents to the present wave.
2. Adjust the base weights so that they satisfy the latest population benchmarks for several demographic characteristics.

Across all twelve surveys undertaken during the COVID-19 period, there were 6,524 respondents who completed at least one of the waves of data collection. Of these, 19.1% completed one wave of data collection only, with a further 13.1% having completed two waves. At the other end of the distribution, 21.1% of the cumulative respondents completed all twelve waves of data collection and a further 6.4% completed eleven of the twelve waves. This leaves 40.4% of the pool of respondents who completed between three and ten waves. Appendix Table 1 gives the number of respondents for each of the twelve waves of data collection during the COVID-19 period, as well as the two pre-COVID waves.

# 3 Experience of COVID-19

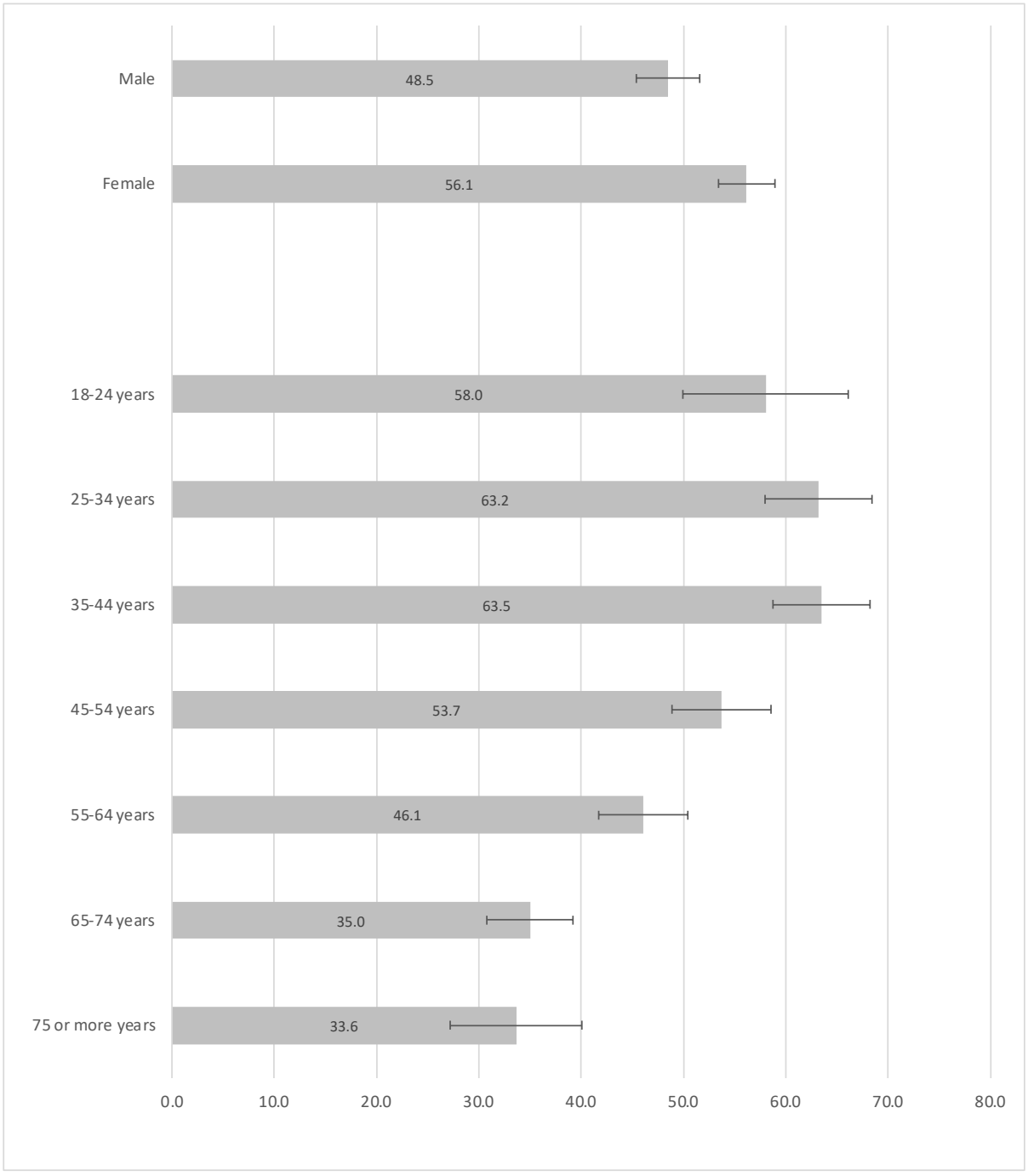
## 3.1 Whether ever experienced COVID-19

Using the August 2022 wave of data collection for the COVID-19 Impact Monitoring Survey series, the majority of Australian adults (52.4%) reported having either had COVID-19 or at the very least thinking they have had it. Specifically, 44.0% had COVID confirmed on testing, 6.5% had a suspected case of COVID-19 but tested negative, and a further 1.8% had a suspected case of COVID-19 but did not undertake any testing. There is no guarantee, of course, that these individuals in the latter two categories actually had COVID-19. Their negative test may have been genuine (for the first group) and those who did not undertake any testing may have ended up testing (and being) negative. Nonetheless, results from this question show that less than half of adult Australians (47.6%) do not think that they have had a suspected or confirmed case of COVID-19.

The vast majority of Australians (83.4%) who have had COVID-19 have only had it one time. However, 11.2% of those who have had COVID-19 reported that they had it twice, and a further 5.4% three times or more.

There was substantial variation in the proportion of people who had ever had COVID-19 by age and sex (Figure 4), consistent with official national reports of confirmed cases.[7] According to the August 2022 ANUpoll, a higher proportion of females than males reported having ever had COVID-19 – 56.1% compared to 48.5%. Younger adults were more likely to have had COVID-19 than older Australians, with nearly two-thirds (63%) of those aged 25-44 years, but only around a third (34%) of those aged 75 years and over, reporting having ever had COVID-19.

Figure 4 Proportion of adults reporting having ever had COVID-19, by age and sex, August 2022




Notes: 1. Includes adults aged 18 years or older who either report having ever tested positive for COVID or who suspect having had COVID but either tested negative or did not have a test. 2. Percentages are weighted. 3. The "whiskers" on the bars indicate the 95% confidence intervals for the estimate.

Source: ANUpoll: August 2022.

## 3.2 Factors associated with COVID-19 infection

We examined demographic, socioeconomic and geographic factors independently associated with COVID-19 infection. To do this we used negative-binomial regression, after testing and confirming overdispersion, mutually adjusting for all factors. The first column of Table 1 gives

the average number of infections without controlling for any other factors (but using population weights). The next two columns give the coefficient estimates from the analysis, as well as the level of statistical significance for that particular variable. The column that follows gives the level of group significance if there are more than two categories in that group (for example age). The last three columns give the incidence rate ratios, as well as the 95% confidence intervals for the incidence rate ratios (lower and upper bounds).

The first few lines of the table confirm that females and younger Australians are estimated to have higher rates of infection than males and older Australians respectively, holding constant other observed characteristics. There are only a small number of Aboriginal and Torres Strait Islander Australians in the dataset and therefore differences from the non-Indigenous population are estimated with a significant amount of uncertainty. They had a higher average number of infections per person than non-Indigenous Australians (0.90 vs 0.67), with an adjusted rate ratio of 1.39 (95% CI: 0.89-2.18).

There is little evidence of an association between infection rates and broad country of birth and language spoken at home after mutually adjusting for all variables in the model. Those who have a Certificate III/IV as their highest qualification have the highest infection rates, with those who have a postgraduate degree having the lowest infection rates. Infection rates were lower among those living outside, compared to within, a capital city (adjusted RR=0.85, 95%CI: 0.73-0.98), and among those living in the second most disadvantaged quintile (compared to the least disadvantaged, adjusted RR = 0.80, 95% CI 0.67-0.95); and they decreased with decreasing household income (adjusted RR for lowest compared to highest = 0.77, 95% CI 0.72-0.95).

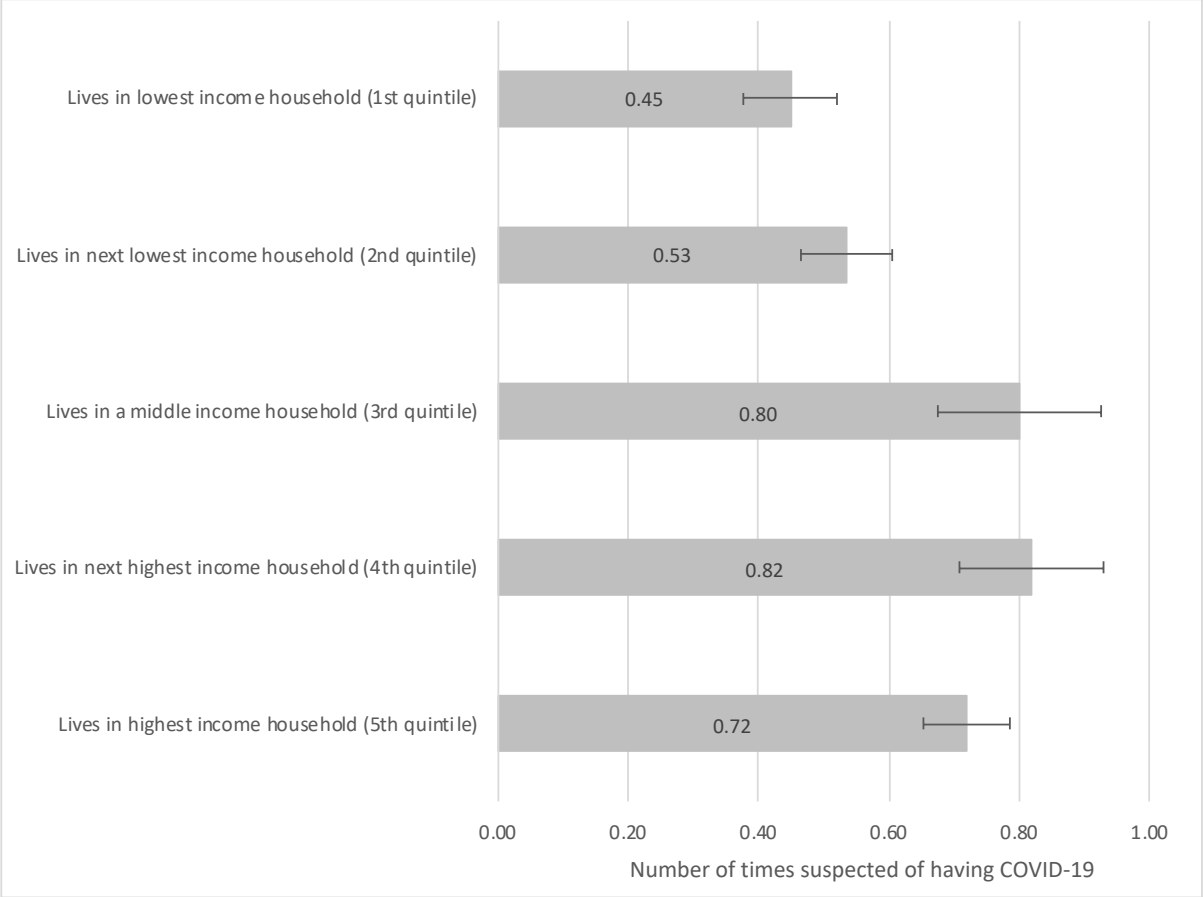
## Table 1 Factors associated with number of COVID-19 infections, August 2022

| Explanatory variables | Mean value | Coefficient | Signifi-cance | Group p-value | Rate Ratio | 95% Confidence interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower bound | Upper bound |
| Male | 0.614 | Ref | | | 1.00 | — | — |
| Female | 0.731 | 0.105 | * | | 1.11 | 0.98 | 1.26 |
| Aged 18 to 24 years | 0.705 | -0.144 | | <0.001 | 0.87 | 0.69 | 1.09 |
| Aged 25 to 34 years | 0.859 | 0.053 | | | 1.06 | 0.87 | 1.29 |
| Aged 35 to 44 | 0.859 | Ref | | | 1.00 | — | — |
| Aged 45 to 54 years | 0.696 | -0.207 | ** | | 0.81 | 0.67 | 0.98 |
| Aged 55 to 64 years | 0.571 | -0.314 | *** | | 0.73 | 0.59 | 0.91 |
| Aged 65 to 74 years | 0.403 | -0.615 | *** | | 0.54 | 0.43 | 0.67 |
| Aged 75 years plus | 0.390 | -0.556 | *** | | 0.57 | 0.43 | 0.76 |
| Non-Indigenous | 0.668 | Ref | | | 1.00 | — | — |
| Indigenous | 0.902 | 0.332 | | | 1.39 | 0.89 | 2.18 |
| Born in Australia | 0.659 | Ref | | 0.551 | 1.00 | — | — |
| Born overseas in a main English-speaking country | 0.574 | -0.092 | | | 0.91 | 0.77 | 1.09 |
| Born overseas in a non-English speaking country | 0.785 | 0.033 | | | 1.03 | 0.80 | 1.33 |
| Speaks English only | 0.637 | Ref | | | 1.00 | — | — |
| Speaks a language other than English at home | 0.794 | 0.005 | | | 1.01 | 0.79 | 1.28 |
| Has not completed Year 12 or post-school qualification | 0.486 | -0.036 | | 0.133 | 0.96 | 0.76 | 1.22 |
| Completed Year 12 but does not have post-school qualifications | 0.661 | Ref | | | 1.00 | — | — |
| Has a Certificate III/IV, Diploma or Associate Degree | 0.738 | 0.147 | | | 1.16 | 0.97 | 1.38 |
| Has an undergraduate degree | 0.709 | -0.027 | | | 0.97 | 0.83 | 1.14 |
| Has a post graduate degree | 0.684 | -0.098 | | | 0.92 | 0.76 | 1.09 |
| Lives in the most disadvantaged areas (1st quintile) | 0.686 | 0.047 | | 0.001 | 1.05 | 0.85 | 1.30 |
| Lives in next most disadvantaged areas (2nd quintile) | 0.556 | -0.227 | *** | | 0.80 | 0.67 | 0.95 |
| Lives in a middle advantage area (3rd quintile) | 0.710 | 0.068 | | | 1.07 | 0.89 | 1.29 |
| Lives in next most advantaged areas (4th quintile) | 0.696 | 0.012 | | | 1.01 | 0.85 | 1.21 |
| Lives in the most advantaged areas (5th quintile) | 0.699 | Ref | | | 1.00 | — | — |
| Lives in a capital city | 0.728 | Ref | | | 1.00 | — | — |
| Lives outside of a capital city | 0.565 | -0.166 | ** | | 0.85 | 0.73 | 0.98 |
| Lives in lowest income household (1st quintile) | 0.449 | -0.267 | ** | 0.002 | 0.77 | 0.62 | 0.95 |
| Lives in next lowest income household (2nd quintile) | 0.535 | -0.107 | | | 0.90 | 0.75 | 1.07 |
| Lives in a middle-income household (3rd quintile) | 0.799 | 0.151 | * | | 1.16 | 0.98 | 1.39 |
| Lives in next highest income household (4th quintile) | 0.819 | 0.121 | | | 1.13 | 0.97 | 1.32 |
| Lives in highest income household (5th quintile) | 0.719 | Ref | | | 1.00 | — | — |
| Constant | | -0.262 | ** | | | | |
| Sample size | | 3,164 | | | | | |

Notes: Negative binomial regression model. Ref = reference group. Significance of coefficients: *** p<.0.001; ** p<0.05; * p< 0.10. Source: ANUpoll: August 2022

The socioeconomic measure in the model that had the strongest evidence of association with COVID-19 infections is household income. Both in the regression analysis, as well as using simple descriptive statistics (Figure 5), we can see that the highest number of COVID-19 infections is amongst those in the middle and upper-middle income categories, with an average of 0.8 and 0.82 COVID-19 infections for individuals in these households respectively. Those in the highest income households have significantly fewer COVID-19 infections than these two groups (0.72 infections on average), but the lowest level of reported infection is amongst those in the lower-middle income group (0.53 infections on average) and those in the lowest income households in particular (0.45). The positive relationship between income and number of infections is quite different to what was observed in other contexts earlier in the pandemic, with most studies finding that people with relatively low income had higher rates of COVID-19 infection (Baena-Díez et al. 2020; Khanijahani et al. 2021)

Figure 5 Average number of COVID-19 infections, by household income, August 2022




Notes: 1. Includes adults aged 18 years or older who have had COVID-19 2. Estimates are weighted. 3. The “whiskers” on the bars indicate the 95% confidence intervals for the estimate.

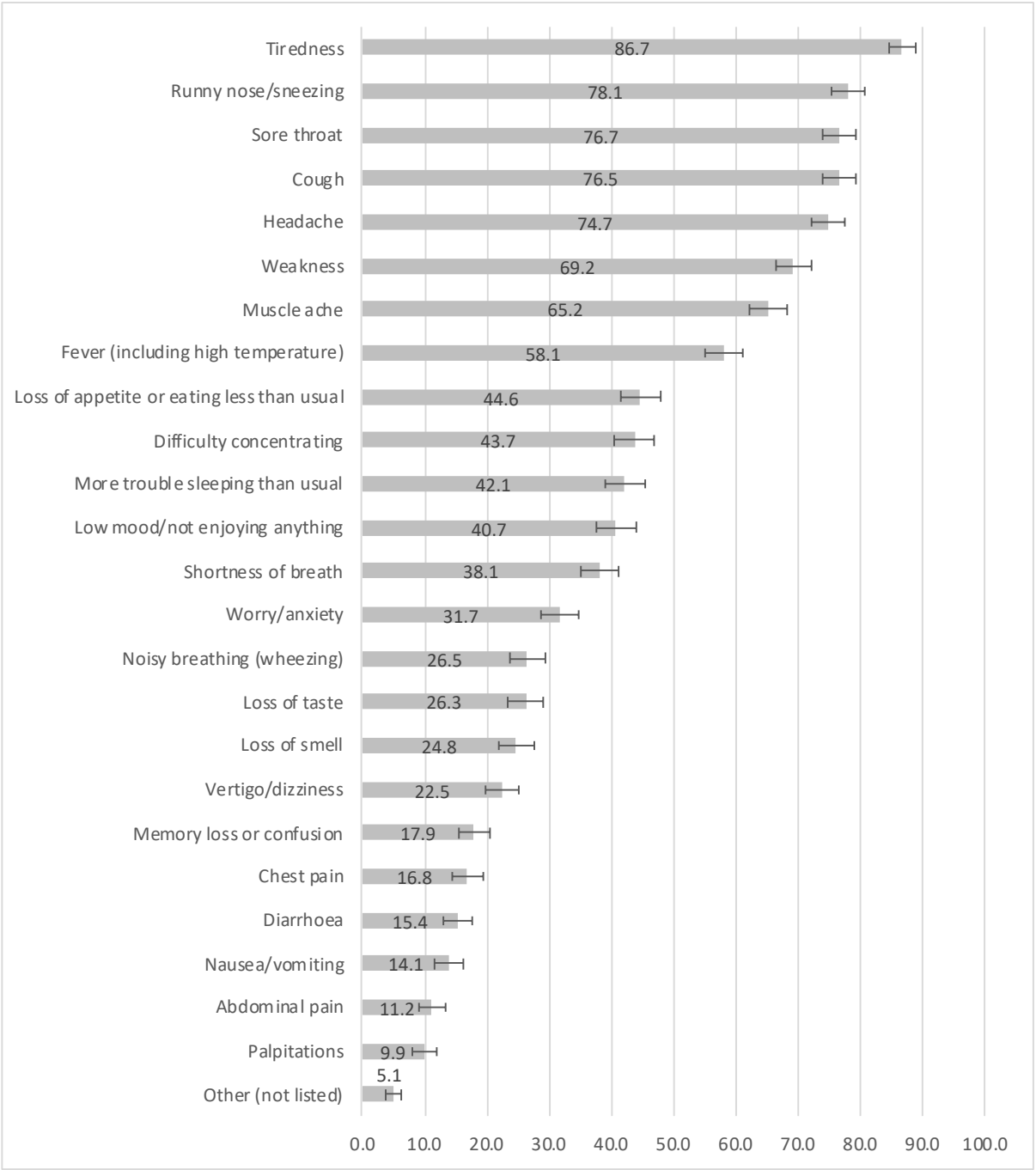
Source: ANUpoll: August 2022.

## 3.3 COVID-19 symptoms

Like with other illnesses, the experience of COVID-19 varies quite substantially across those who were infected. Amongst respondents who said they had COVID-19, 89.5% reported that they had had symptoms. Of those who had at least one symptom, the average number of symptoms experienced per person is 10.2. Around a quarter of Australians with symptoms experienced 7 or less, whereas another quarter experienced 13 or more.

As shown in Figure 6, the most common symptom that was reported was tiredness, with 86.7% of those with at least one symptom reporting that they experienced tiredness. The next four symptoms were reported by around three-quarters of those with symptoms – namely runny nose/sneezing (78.1%), sore throat (76.7%), cough (76.5%), and headache (74.7%). There were three other symptoms that more than half of the relevant population experienced – weakness (69.2%), muscle ache (65.2%), and fever (58.1%).

Figure 6 COVID-19 symptoms, for those who experienced any symptoms, August 2022



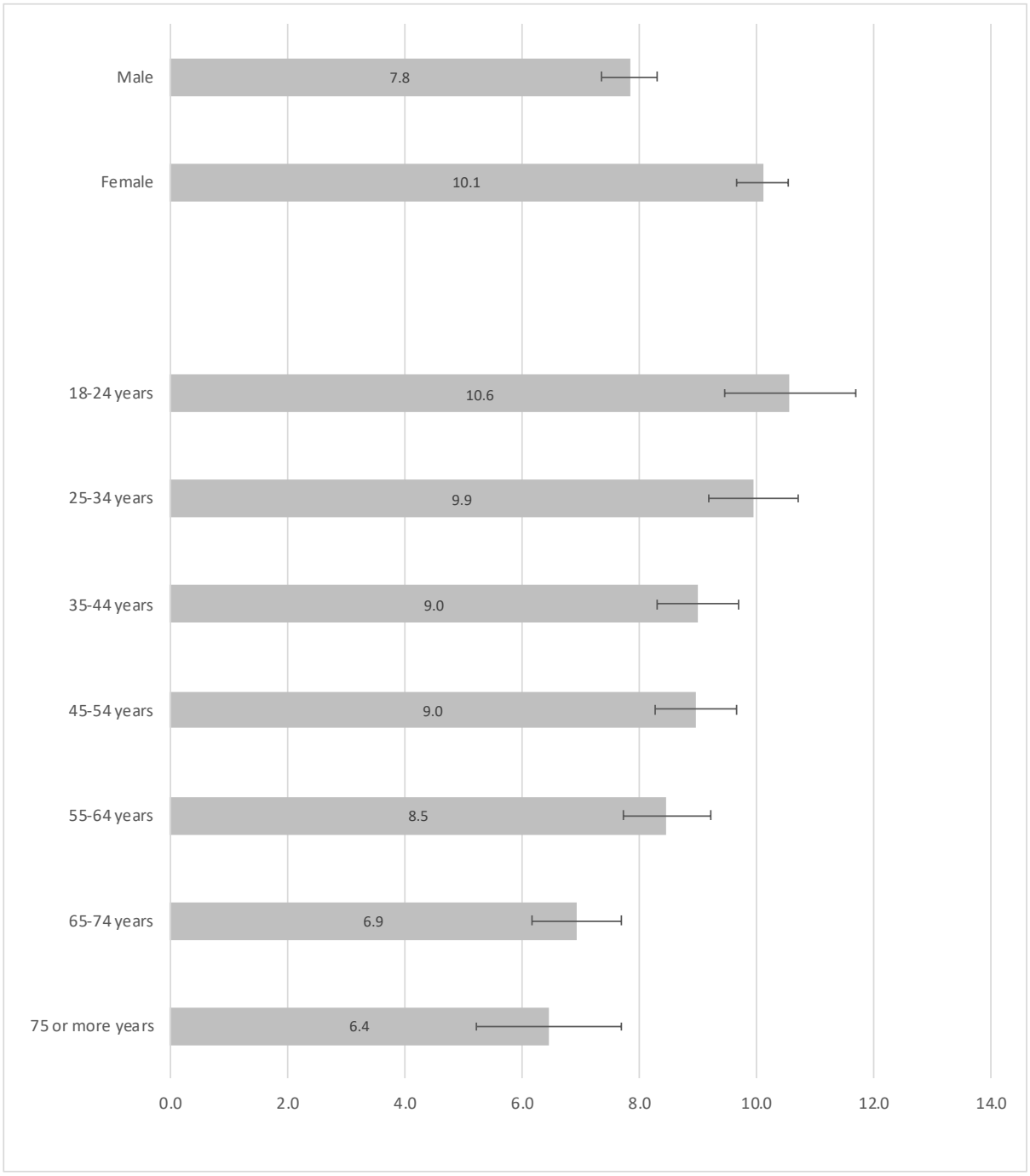

Notes: 1. Includes adults aged 18 years or older who have had COVID-19 2. Percentages are weighted. 3. The “whiskers” on the bars indicate the 95% confidence intervals for the estimate.

Source: ANUpoll: August 2022.

Figure 7 shows that on average, females report around 2.3 additional symptoms compared to

males (10.1 symptoms compared to 7.8), and the average number of symptoms decreases with age, with the youngest age group reporting 4.2 additional symptoms compared to the oldest age group (10.6 symptoms for those aged 18 to 24 years and 6.4 symptoms for those aged 75 years or older).

Figure 7 Average number of COVID-19 symptoms, by age and sex, August 2022




Notes: 1. Includes adults aged 18 years or older who have had COVID-19 2. Percentages are weighted. 3. The “whiskers” on the bars indicate the 95% confidence intervals for the estimate.

Source: ANUpoll: August 2022.

We estimated the factors associated with the number of symptoms using negative binomial

regression, focusing on those who had a confirmed or suspected case of COVID-19. Full results from the analysis are given in Table 2. These show that age and sex remain associated with number of symptoms after mutually adjusting for all variables in the model; and we also find a greater number of symptoms for those born in Australia compared to those born overseas. There is little evidence of an association between the other variables in the model and number of symptoms.

Table 2 Factors associated with number of COVID-19 symptoms among those who ever had COVID-19, August 2022

| Explanatory variables | Mean value | Coefficient | Signifi-cance | Group p-value | Rate Ratio | 95% Confidence interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower bound | Upper bound |
| Male | 7.83 | Ref | | | 1.00 | — | — |
| Female | 10.10 | 0.195 | *** | | 1.22 | 1.12 | 1.31 |
| Aged 18 to 24 years | 10.56 | 0.150 | * | <0.001 | 1.16 | 1.00 | 1.35 |
| Aged 25 to 34 years | 9.94 | 0.120 | ** | | 1.13 | 1.01 | 1.26 |
| Aged 35 to 44 | 8.99 | Ref | | | 1.00 | — | — |
| Aged 45 to 54 years | 8.95 | -0.050 | | | 0.95 | 0.85 | 1.07 |
| Aged 55 to 64 years | 8.46 | -0.057 | | | 0.94 | 0.83 | 1.07 |
| Aged 65 to 74 years | 6.92 | -0.264 | *** | | 0.77 | 0.66 | 0.89 |
| Aged 75 years plus | 6.45 | -0.405 | *** | | 0.67 | 0.52 | 0.85 |
| Non-Indigenous | 9.04 | Ref | | | 1.00 | — | — |
| Indigenous | 9.89 | -0.108 | | | 0.90 | 0.61 | 1.32 |
| Born in Australia | 9.49 | Ref | | <0.001 | 1.00 | — | — |
| Born overseas in a main English-speaking country | 8.40 | -0.018 | | | 0.98 | 0.87 | 1.11 |
| Born overseas in a non-English speaking country | 7.85 | -0.238 | *** | | 0.79 | 0.70 | 0.89 |
| Speaks English only | 9.14 | Ref | | | 1.00 | — | — |
| Speaks a language other than English at home | 8.79 | 0.050 | | | 1.05 | 0.95 | 1.17 |
| Has not completed Year 12 or post-school qualification | 8.70 | 0.091 | | 0.469 | 1.10 | 0.93 | 1.29 |
| Completed Year 12 but does not have post-school qualifications | 9.07 | Ref | | | 1.00 | — | — |
| Has a Certificate III/IV, Diploma or Associate Degree | 9.38 | 0.102 | * | | 1.11 | 0.99 | 1.24 |
| Has an undergraduate degree | 8.92 | 0.052 | | | 1.05 | 0.94 | 1.18 |
| Has a post graduate degree | 8.52 | 0.071 | | | 1.07 | 0.93 | 1.24 |
| Lives in the most disadvantaged areas (1st quintile) | 9.80 | 0.033 | | 0.972 | 1.03 | 0.92 | 1.17 |
| Lives in next most disadvantaged areas (2nd quintile) | 9.22 | 0.038 | | | 1.04 | 0.92 | 1.17 |
| Lives in a middle advantage area (3rd quintile) | 9.09 | 0.011 | | | 1.01 | 0.91 | 1.13 |
| Lives in next most advantaged areas (4th quintile) | 9.09 | 0.016 | | | 1.02 | 0.91 | 1.13 |
| Lives in the most advantaged areas (5th quintile) | 8.47 | Ref | | | 1.00 | — | — |
| Lives in a capital city | 8.90 | Ref | | | 1.00 | — | — |
| Lives outside of a capital city | 9.41 | 0.037 | | | 1.04 | 0.95 | 1.13 |
| Lives in lowest income household (1st quintile) | 8.48 | -0.001 | | 0.111 | 1.00 | 0.85 | 1.17 |
| Lives in next lowest income household (2nd quintile) | 9.90 | 0.120 | ** | | 1.13 | 1.00 | 1.27 |
| Lives in a middle-income household (3rd quintile) | 8.64 | -0.030 | | | 0.97 | 0.86 | 1.09 |
| Lives in next highest income household (4th quintile) | 9.51 | 0.035 | | | 1.04 | 0.94 | 1.14 |
| Lives in highest income household (5th quintile) | 8.97 | Ref | | | 1.00 | — | — |
| Constant | | 2.011 | *** | | 7.47 | 6.42 | 8.69 |
| Sample size | | 1,500 | | | | | |

Notes: Negative binomial regression model. Ref = reference group. Significance of coefficients: *** p<.0.001; ** p<0.05; * p< 0.10. Source: ANUpoll: August 2022

# 4 Long-COVID

For most people who are exposed to COVID-19 symptoms will last under a week, with many experiencing symptoms only for a few days or even less. However, for a significant minority of those who are infected, symptoms can last for much longer, extending for many weeks or months, or even over a year for a very small minority of people (Raveendran et al. 2021). For those who experience what is generally referred to as long-COVID, the persistence of symptoms over an extended period of time can have profound impacts on their lives and livelihoods.

There are a number of alternative definitions of long-COVID, and no consensus (see Box 1). Some definitions require symptoms to have persisted for 4 weeks, others for 12 weeks. Other definitions require symptoms to be restricting daily activity. In this paper, we follow the National Institute for Health and Care Excellence (NICE) in the UK which distinguishes between Acute COVID-19 (Signs and symptoms of COVID-19 for up to 4 weeks) and long-COVID (symptoms longer than 4 weeks). There are also different thresholds used within the long-COVID category, which we will explore later in this section.

### Box 1. Alternative definitions of long-COVID

At the time of this report, the Commonwealth Department of Health and Aged Care defined long-COVID as 'where symptoms of COVID-19 remain, or develop, long after the initial infection – usually after 4 weeks'. The World Health Organisation (WHO) uses the following clinical case definition[8] for a slightly differently named condition, but one that is often also referred to as long-COVID:

> *Post COVID-19 condition occurs in individuals with a history of probable or confirmed SARS CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms and that last for at least 2 months and cannot be explained by an alternative diagnosis. Common symptoms include fatigue, shortness of breath, cognitive dysfunction but also others and generally have an impact on everyday functioning. Symptoms may be new onset following initial recovery from an acute COVID-19 episode or persist from the initial illness. Symptoms may also fluctuate or relapse over time.*

The National Institute for Health and Care Excellence (NICE) in the UK takes a slightly different approach and uses three different categories in their case definition:[9]

- Acute COVID-19 – Signs and symptoms of COVID-19 for up to 4 weeks.
- Ongoing symptomatic COVID-19 – Signs and symptoms of COVID-19 from 4 weeks up to 12 weeks.
- Post-COVID-19 syndrome – Signs and symptoms that develop during or after an infection consistent with COVID-19, continue for more than 12 weeks and are not explained by an alternative diagnosis.

Importantly though, the NICE also states that:

*In addition to the clinical case definitions, the term 'long COVID' is commonly used to describe signs and symptoms that continue or develop after acute COVID-19. It includes both ongoing symptomatic COVID-19 (from 4 to 12 weeks) and post-COVID-19 syndrome (12 weeks or more).*

Those respondents in our survey who had a suspected or confirmed case of COVID-19 were asked 'Would you describe yourself as having "long COVID" now or in the past. That is, you are or were still experiencing symptoms more than 4 weeks after you first had COVID-19, that are not explained by something else.'[10]

A total of 6.8% of Australians or 12.9% of those who had ever had COVID-19 reported that it had not been 4 weeks since they first had COVID-19, so they were excluded from the analysis of long-COVID. Excluding these individuals and focusing on those who think they had had COVID-19 at some stage, when asked about long-COVID:

- 13.9% said 'Yes, and I am still experiencing symptoms';
- 15.1% said 'Yes, but I no longer have symptoms'; and
- 71.0% said 'No'

Some definitions of long-COVID require that the symptoms that do persist have an impact on the patient (see box below). One follow-up question we asked was therefore 'Does/Did this experience of long-COVID reduce your ability to carry-out day-to-day activities compared with the time before you had COVID-19?' Of those who reported COVID-19 symptoms that lasted for more than 4 weeks, 22.5% said 'Yes, a lot', 63.3% said 'Yes, a little', with the remaining 14.2% saying 'Not at all.' When we focus on those who have had COVID-19 symptoms for 3 months or more (see Section 4.2), the per cent of people who had reductions in their ability to carry-out day-to-day activities was very similar (21.6% and 64.3% respectively).

Table 3 combines the information from these questions in order to summarise the COVID-19 experience in Australia, up until mid-August 2022. Across all Australian adults, 47.6 per cent had not had a confirmed or suspected case of COVID-19. At the other extreme, 11.3 per cent had COVID-19, had symptoms for at least 4 weeks, and had a reduced ability to carry out day-to-day actions because of long-COVID symptoms.

If we exclude those who had COVID-19 less than four weeks ago (and who might therefore end up with long-COVID) and combine those with and without reduced activity, this equates to 14.2% of the remainder of Australian adults who had COVID-19 with symptoms that lasted for longer than 4 weeks, or 29.0% of adults with a confirmed or suspected case of COVID-19 ending up experiencing long-COVID.

Table 3 Per cent of Australians by experience of COVID-19 and long-COVID

| | All Australians | Excluding recent COVID-19 and never had COVID-19 |
|---|---|---|
| Never had COVID-19 | 47.6 | |
| Had COVID-19, but has not been 4 weeks since first symptoms | 6.8 | |
| Had COVID-19 but not long-COVID | 32.4 | 71.0 |
| Had long-COVID without reduced ability | 1.9 | 4.2 |
| Had long-COVID with reduced ability | 11.3 | 24.8 |
| Total | 100 | 100 |

Source: Long-COVID is defined as experiencing COVID symptoms for 4 weeks or more. ANUpoll: August 2022

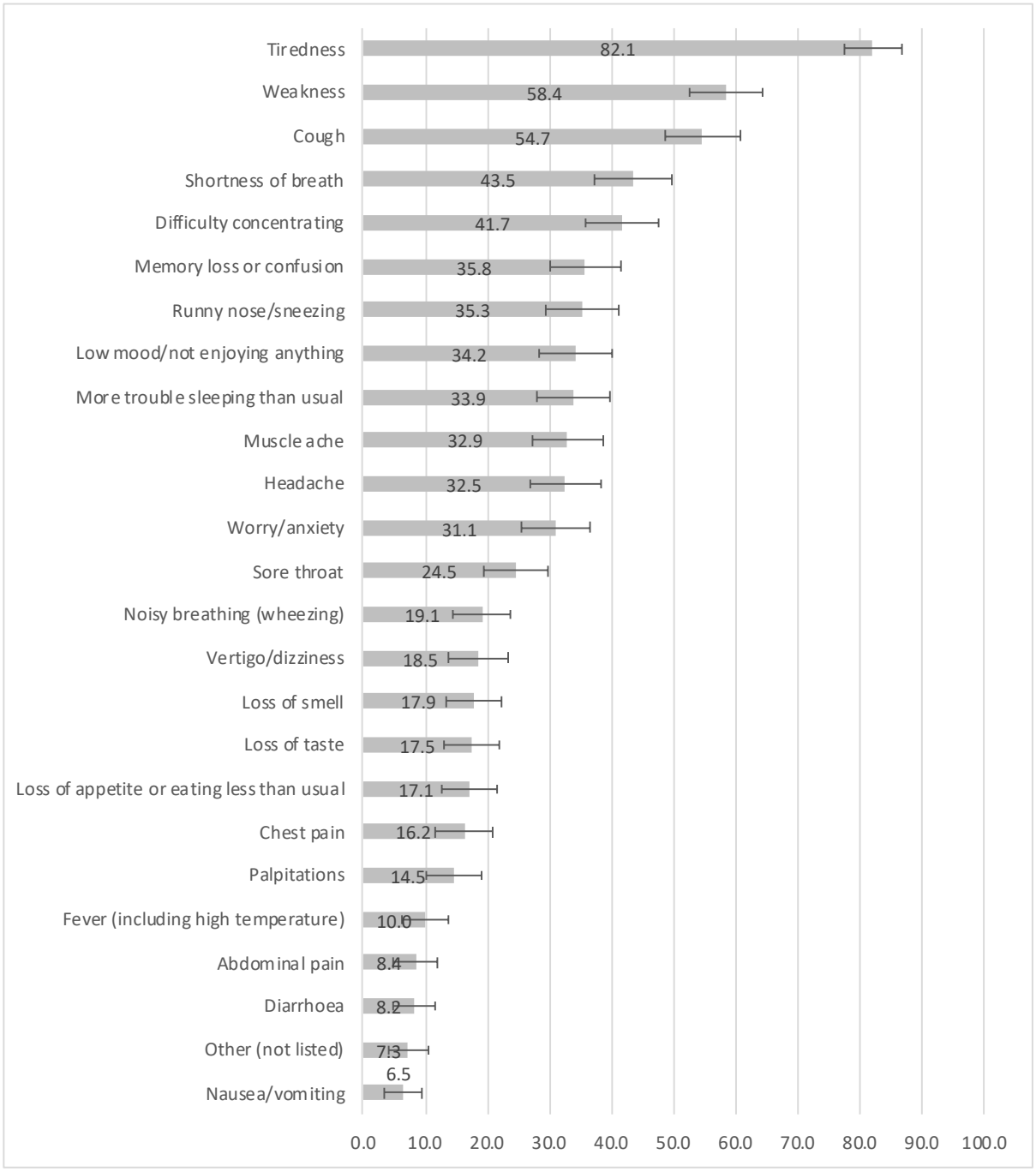
Age and sex were associated with long-COVID.[11] Without controlling for other factors, and estimating for the whole population apart from those who had COVID-19 less than 4 weeks ago, females were more likely to report long-COVID than males (17.7% compared to 10.6%). Young Australians were more likely to report long-COVID compared to older Australians (20.5% for those aged 18 to 24 compared to 5.9% of those aged 75 years or over) (Figure 10).

## 4.1 Symptoms for those with long-COVID

Those who reported that they had symptoms for at least 4 weeks were asked 'Do you or did you have any of the following symptoms as part of your experience of long COVID?' with respondents told to 'Please include any pre-existing symptoms which long COVID has made worse but don't include any symptoms that only occurred in the first 4 weeks of having COVID-19.'

Figure 8 shows that the most common symptom experienced by those reporting long-COVID, excluding any symptoms that only occurred in the first 4 weeks of having COVID-19. Once again, tiredness ranked the highest (82.1% of those with long-COVID). However, two symptoms that ranked reasonably high amongst long-COVID symptoms but did not rank as high for all COVID-19 symptoms were shortness of breath (43.5%), difficulty concentrating (41.7%), and memory loss or confusion (35.8%).

Figure 8 Percentage with long-COVID symptoms, for those who experienced long-COVID, August 2022




Notes: 1. Includes adults aged 18 years or older who have had long-COVID, defined as experiencing COVID symptoms for 4 weeks or more 2. Estimates are weighted. 3. The "whiskers" on the bars indicate the 95% confidence intervals for the estimate.

Source: ANUpoll: August 2022.

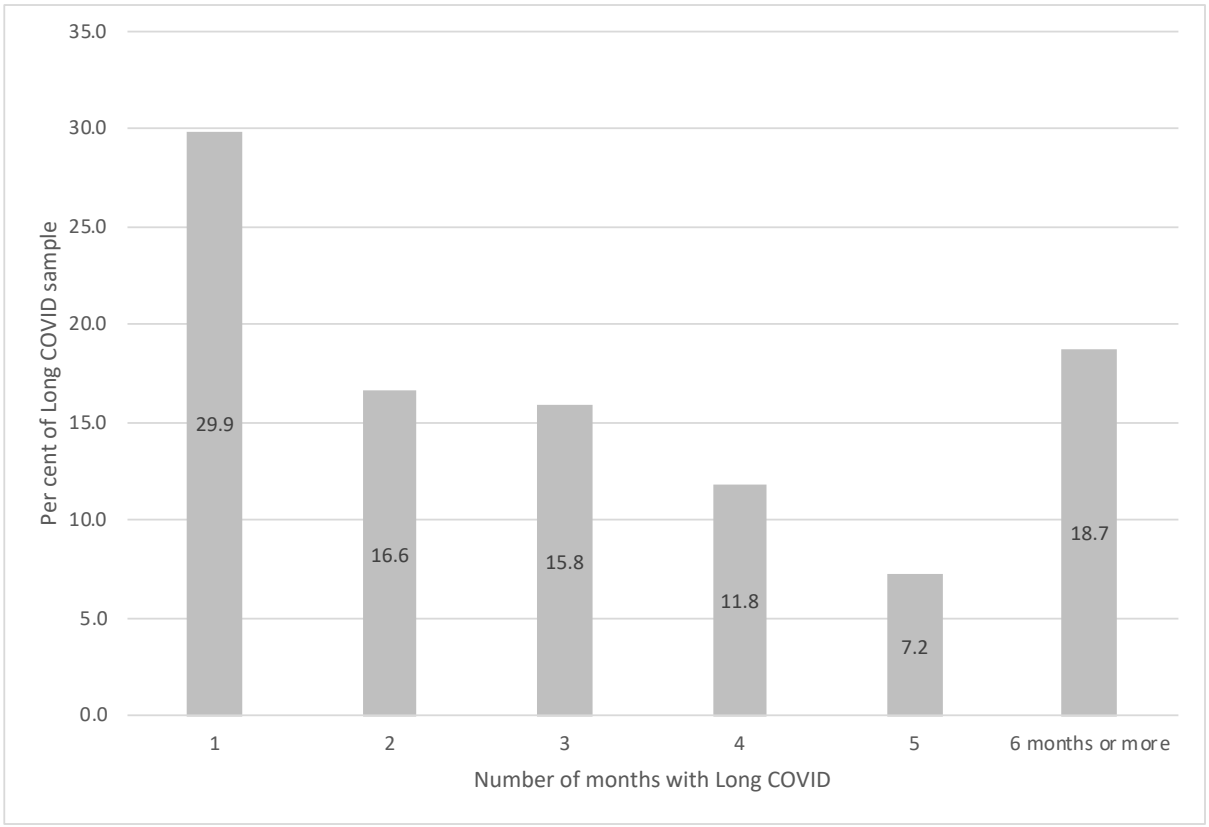
## 4.2 Post-COVID-19 Syndrome

Because most COVID-19 cases in Australia have occurred relatively recently (Figure 1), there have been fewer cases than in other countries that by August 2022 had had long enough to distinguish between ongoing symptomatic COVID-19 and post-COVID-19 syndrome (using the NICE definitions – see Box 1) within the long-COVID grouping.

Among survey respondents who were infected more than 4 weeks ago and who still reported symptoms at the time of the survey, the average number of months with symptoms was 1.97 months. This is the minimum average duration of long-COVID for these individuals, but of course their symptoms may end up lasting well beyond the survey period.

Among those who had had long-COVID (symptoms great than 4 weeks) but were no longer experiencing symptoms, the average number of months with symptoms was 3.53. When we focus on this latter group as being predictive of the expected trajectory of those in Australia, we can see from Figure 9 that around one-third of people (29.9%) with long-COVID had symptoms for one month only, with an additional 16.6% having symptoms for two months. This leaves a little over one-half of those who had long-COVID but no longer do (53.5%) who would classify as having post-COVID-19 syndrome.

**Figure 9** Number of months with COVID-19 symptoms for those who had, but no longer have, long-COVID, August 2022




Notes: 1. Includes adults aged 18 years or older who have had, but no longer have long-COVID (defined as experiencing symptoms for 4 weeks or more) 2. Estimates are weighted.

Source: ANUpoll: August 2022.

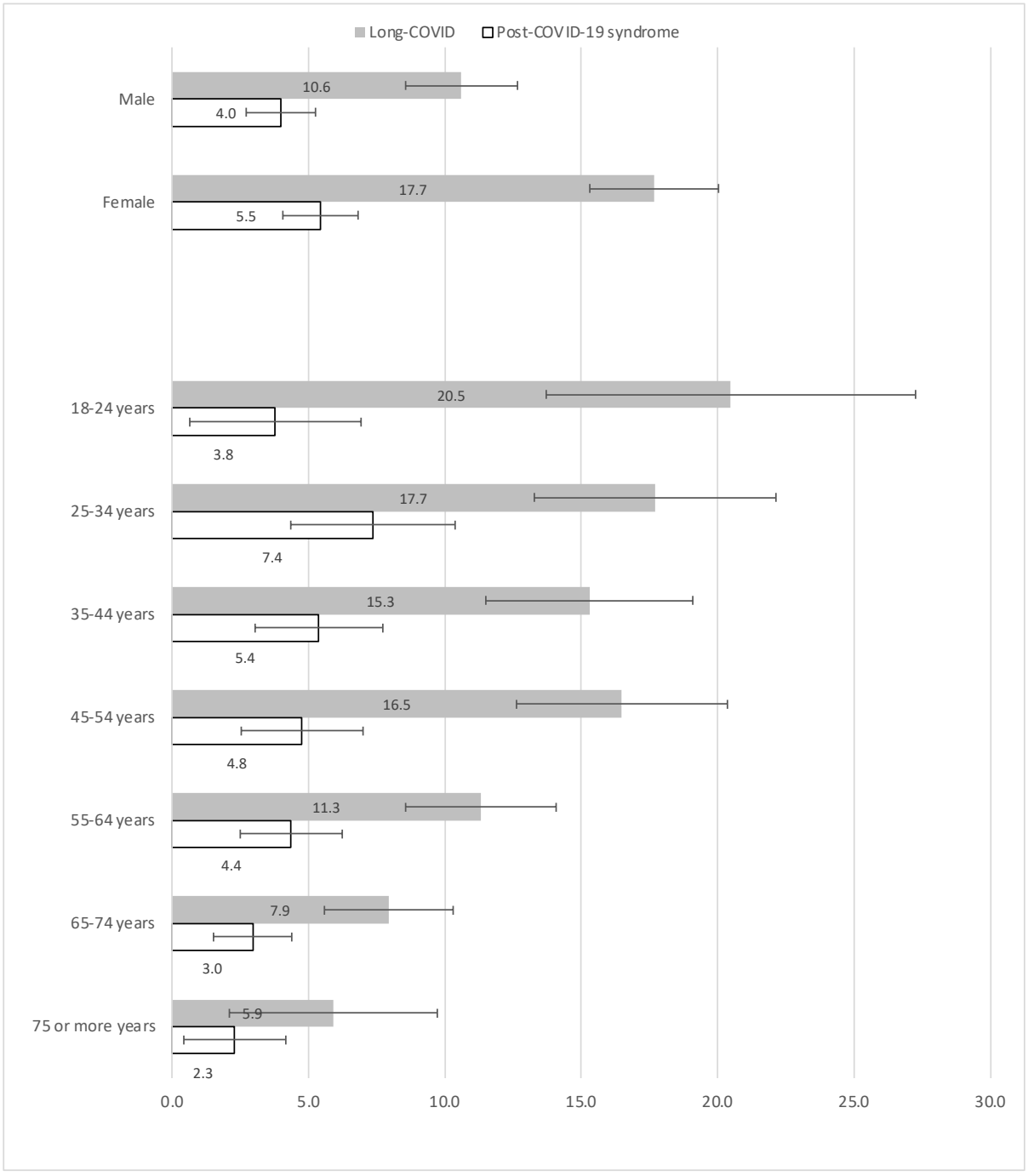
We can use the results from Figure 9 (those who no longer have symptoms) and add in those who still have symptoms to obtain an estimate of the percentage of Australians who have experienced or who are currently experiencing post-COVID-19 syndrome. For this group, the

average number of months with symptoms was 1.97 with around half of the sample (49.4%) in this group only having had symptoms for one month only, with an additional 35.0% having symptoms for two months. This leaves only 15.6% of those who still have long-COVID who would classify as having post-COVID-19 syndrome.

Combing the two groups, we can then estimate how many people had COVID-19 symptoms for three months or more or who still have symptoms at least three months after first infection. We estimate that 34.4% of those who have had or currently have long-COVID (symptoms for at least 4 weeks) had or currently have post-COVID-19 syndrome. This equates to 9.7% of those who have had COVID-19 or 4.7% of Australian adults (excluding those who had COVID-19 in the previous four weeks) that have had or currently have COVID-19 with symptoms lasting for 3 months or more.

Females were more likely to report post-COVID-19 syndrome than males (5.5% compared to 4.0%).; and excluding the youngest age group, the proportion with post-COVID-19 syndrome decreased with age (7.4% for those aged 18 to 24 compared to 2.3% of those aged 75 years or over) (Figure 10).

Figure 10 Whether had long-COVID or post-COVID-19 syndrome, by age and sex, August 2022




Notes: 1. Includes adults aged 18 years or older 2. Long-COVID define as experiencing symptoms for at least 4 weeks; post-COVID syndrome defined as experiencing symptoms for at least 3 months. 2. Estimates are weighted. 3. The "whiskers" on the bars indicate the 95% confidence intervals for the estimate.

Source: ANUpoll: August 2022.

# 5 The relationship between COVID-19 and wellbeing

Many of the symptoms of acute and long-COVID-19 are directly related to mental health and wellbeing. Of those who experienced COVID-19 symptoms (Figure 6), 40.7% said that they

experienced low mood/not enjoying anything with 31.7% reporting worry/anxiety. More broadly though, COVID-19 can have wider implications for a person's level of happiness, life satisfaction, and psychological distress.

## 5.1 Mental health and wellbeing as a predictor of COVID-19

Complicating our ability to understand the relationship between mental health/wellbeing and COVID-19 outcomes is some evidence that suggests that poor mental health and wellbeing prior to the pandemic is associated with a higher risk of hospitalization due to COVID-19 (Wang et al. 2022a) and long-COVID (Wang et al. 2022b).

We find evidence for this predictive relationship in the COVID-19 Impact Monitoring Survey series as well. Although we do not have psychological distress data for a large sample of respondents from pre-COVID, those who were recorded in April 2020 as 'experiencing severe psychological distress consistent with having a probable serious mental illness', based on the Kessler-6 Psychological Distress Scale (K6), had an average of 0.93 episodes of COVID-19 between then and the August 2022 data collection, compared to 0.63 episodes of COVID-19 for those who were not above the K6 threshold for severe psychological distress. Given that the vast majority of Australians who had a COVID-19 infection would have had it after April 2020, this gives some indication from the Australian data that those with low levels of mental health are more likely to develop COVID-19.

In addition to the simple descriptive comparison, there is a positive relationship between the number of COVID-19 infections when we replicate the negative binomial regression analysis with the continuous K6 measure of psychological distress as of April 2020 as an additional explanatory measure and still controlling for demographic, geographic, and socioeconomic factors (Appendix Table 2). The relationship with life satisfaction from prior to COVID-19 (January 2020 and described below) is weaker (p-value = 0.140) but negative as we would expect. Although we do not present results in this paper, the association also holds when we use threshold values for the K6 measure and group individuals based on whether they are above the threshold of 'probable serious mental illness.'

## 5.2 COVID-19 as a predictor of mental health and wellbeing

The results summarised in the previous section do not necessarily show a causal pathway from mental health and wellbeing just prior to or in the early stages of the pandemic and the number of COVID-19 infections over the period. To demonstrate such a relationship, it would be necessary to control for a much richer set of health measures that may predict both mental health outcomes and COVID-19 risk. Such measures are not available on the longitudinal dataset.

What the results do demonstrate though is that in order to begin to measure the impact of the experience of COVID-19 on the wellbeing of the Australian population, it is important to control for pre-COVID-19 wellbeing measures. Doing so does not necessarily mean that we are capturing a direct causal relationship still, as there are other factors that may have changed over the intervening period that are not in the dataset but yet predict COVID-19 risk and change in wellbeing. Nonetheless, the longitudinal data available for this paper gets closer to capturing the extent to which COVID-19 experience has impacted on wellbeing in Australia than any other available datasets.

Specifically, in both January 2020 and August 2022 (as well as each of the COVID-19 Impact Monitoring Surveys), respondents have been asked:

> ‘The following question asks how satisfied you feel about life in general, on a scale from 0 to 10. Zero means you feel 'not at all satisfied' and 10 means 'completely satisfied'. Overall, how satisfied are you with life as a whole these days?’

In Table 4, we present results from a regression analysis with life satisfaction in August 2022 as the dependent variable, life satisfaction as of January 2020 as the main control variable, and a categorical variable that captures different aspects of the COVID-19 experience as the main independent variable. We estimate the relationship using a linear model for ease of interpretability. However, because the dependent variable takes on discrete values, we check robustness by estimating via the ordered probit model with results presented in Appendix Table 3. It should be noted that the relationship is quite similar regardless of which model we use. In Table 4, we present results without, and with controlling for age and sex (Models 1 and 2 respectively). Once again, results do not vary substantially with these additional controls, suggesting that the observed relationship between COVID-19 and wellbeing is not explained by the dual relationship between age and COVID-19/wellbeing that has been shown in this paper and other papers in this series. It is also important to note that the analysis excludes those who died between January 2020 and August 2022 (including as a direct results of COVID-19), as well as those who dropped out of the sample. We are not able to make any conclusions about the wellbeing of these groups.

## Table 4 Relationship between COVID-19 experience and life satisfaction, August 2022

| Explanatory variables | Model 1 | | | | | Model 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | Signifi-cance | Group p-value | Lower bound (95%) | Upper bound (95%) | Coeff. | Signifi-cance | Group p-value | Lower bound (95%) | Upper bound (95%) |
| Life satisfaction in January 2020 | 0.545 | *** | | 0.495 | 0.595 | 0.528 | *** | | 0.477 | 0.578 |
| Has never had COVID-19 | Ref | | 0.029 | — | — | Ref | | 0.001 | — | — |
| Had COVID-19 recently (last 4 weeks) | -0.217 | | | -0.619 | 0.185 | -0.102 | | | -0.513 | 0.309 |
| Had acute-COVID-19 but not recently and not long-COVID | 0.177 | ** | | 0.007 | 0.347 | 0.286 | *** | | 0.113 | 0.460 |
| Had or has long-COVID, without reduction in ability | 0.049 | | | -0.526 | 0.624 | 0.136 | | | -0.413 | 0.684 |
| Had or has long-COVID, with reduction in ability to carry out activities | -0.252 | * | | -0.534 | 0.031 | -0.130 | | | -0.412 | 0.152 |
| Male | | | | | | Ref | | | — | — |
| Female | | | | | | 0.058 | | | -0.098 | 0.213 |
| Aged 18 to 24 years | | | | | | -0.085 | | <0.001 | -0.429 | 0.260 |
| Aged 25 to 34 years | | | | | | 0.117 | | | -0.175 | 0.410 |
| Aged 35 to 44 | | | | | | Ref | | | — | — |
| Aged 45 to 54 years | | | | | | -0.075 | | | -0.349 | 0.199 |
| Aged 55 to 64 years | | | | | | 0.363 | *** | | 0.102 | 0.624 |
| Aged 65 to 74 years | | | | | | 0.506 | *** | | 0.247 | 0.766 |
| Aged 75 years plus | | | | | | 0.776 | *** | | 0.496 | 1.057 |
| Constant | 2.917 | *** | | 2.546 | 3.288 | 2.752 | *** | | 2.324 | 3.179 |
| Sample size | 2,034 | | | | | 2,027 | | | | |

Notes: Linear regression model. Life satisfaction measured on a scale from 0 ('not at all satisfied') to 10 ('completely satisfied'). Ref = reference group. Significance of coefficients: *** p<.0.001; ** p<0.05; * p< 0.10. Source: ANUpoll: August 2022

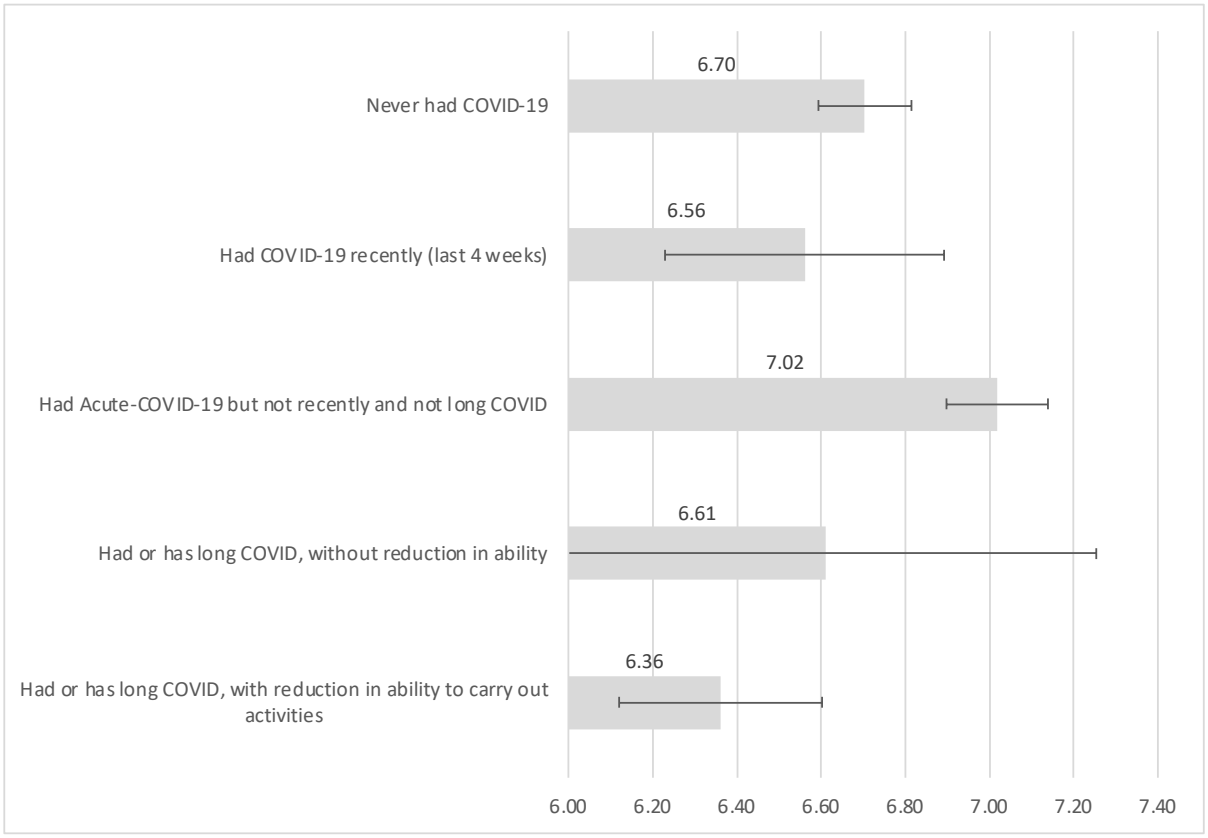
Results from the analysis can be summarised in Figure 11 without any additional controls. However, it should be noted that the conclusions are very similar in the table presented above controlling for life satisfaction prior to the COVID-19 period, as well as controlling for age and sex.

Across the whole population in August 2022, average life satisfaction was 6.76 on the scale of 0 to 10. The base category in the regression analysis is those who have not had COVID-19 at all, and their life satisfaction in August 2022 was 6.70. Those who had acute-COVID-19 but not recently and did not have long-COVID at any stage had the highest level of life satisfaction amongst all the groups (7.02) with a difference that is statistically significant at the 5% level of significance. Keeping in mind that these results hold when we control for life satisfaction pre-COVID, age, and sex, one interpretation of this finding is that people who have a relatively short case of COVID-19, but recover quickly feel a sense of relief that it was not as bad as they may have expected (or they have observed in others) and that there is a feeling that it gives some protection from future exposure.

Those who had long-COVID and who reported that this has led to restrictions on their ability to carry out day to day activities had the lowest level of life satisfaction amongst the five groups considered, with a difference of 0.34 with those who did not have COVID-19 and a difference of 0.66 with those who had Acute-COVID-19 only. The differences are somewhat smaller when we control for life satisfaction as of January 2020.[12] Taken together, the results presented in Figure 11 and in Table 4 show clearly that compared to a short (less than 4 weeks) bout of COVID-19, those who experience long-COVID have significantly and substantially lower life satisfaction, even when we hold constant the level of life satisfaction prior to the pandemic.

The other two categories in the analysis ('Had COVID recently [last 4 weeks]' and 'Had or has long-COVID without reduction in ability') have small sample sizes and are therefore measured with a considerable level of uncertainty meaning it not possible to draw conclusions about these groups. Nonetheless, there was weak evidence that these two groups have lower levels of wellbeing than those who had not had COVID-19.

Figure 11 Life satisfaction and COVID-19 experience, August 2022




Note: 1. Life satisfaction measured on a scale from 0 ('not at all satisfied') to 10 ('completely satisfied').
2. Estimates are weighted 3. The "whiskers" on the bars indicate the 95% confidence intervals for the estimate.

Source: ANUpoll: August 2022.

In the remaining two models, we explore the relationship between COVID-19 and life satisfaction in more detail. First, the results presented in the first model in Table 5 examines the relationship between life satisfaction and the number of COVID-19 symptoms that a person had, controlling for life satisfaction in January 2020 (Appendix Table 4 replicates the analysis using the ordered probit model). Focusing on those with at least one symptom, each additional symptom is associated with a lower level of wellbeing conditional on life satisfaction pre-COVID. That is, a decline in wellbeing. Without controlling for other factors, life satisfaction for those with 1 to 9 symptoms (roughly the median number) was 7.1, whereas life satisfaction for those with 10 or more symptoms was 6.58.

The second model in the table focuses on those with long-COVID and looks at the relationship with the number of months that the person had symptoms or still has symptoms, depending on whether their experience of long-COVID has finished. We find from the regression analysis that an extra month of symptoms is associated with a lower level of life satisfaction. Once again, the descriptive statistics support the regression analysis and are quite telling. Amongst those who had COVID-19 for 1 to 2 months (ongoing symptomatic COVID-19), life satisfaction was 6.57 in August 2022. This is still lower than those who did not experience COVID-19 or had acute-COVID-19 only. However, for those who experienced or are in the middle of experiencing COVID-19 for 3 or more months, life satisfaction in August 2022 was 6.12.

Table 5 Relationship between number of symptoms/number of months with long-COVID and life satisfaction, August 2022

| Explanatory variables | Those who have had COVID-19 symptoms | | Those who have had long-COVID | |
|---|---|---|---|---|
| | Coeff. | Signif. | Coeff. | Signif. |
| Life satisfaction in January 2020 | 0.503 | *** | 0.509 | *** |
| Number of symptoms | -0.037 | ** | | |
| Number of months with long-COVID | | | -0.056 | * |
| Constant | 3.629 | *** | 3.119 | *** |
| Sample size | 852 | | 217 | |

Notes: Linear regression model. Significance of coefficients: *** p<.0.001; ** p<0.05; * p< 0.10. Source: ANUpoll: August 2022

# 6 Concluding comments

For 2020 and much of 2021, Australia's experience of COVID-19 was one of anxiety and worry due to the potential spread of the disease, and hardship for many due to restrictions put in place to stop the spread of the virus. However, very few Australians had a lived experience themselves with COVID-19, as international borders remained closed, and case-levels were a fraction of those experienced in other countries. Since the opening up of international borders, easing of COVID restrictions within Australia and the emergence of the Omicron variant, this situation has changed dramatically. Data presented in this paper, suggest that as of August 2022 nearly half of Australian adults had a confirmed case of COVID-19, consistent with official COVID-19 reporting data, and that there is an additional minority who had not tested positive for COVID-19 but suspect themselves that they had had COVID-19.

The distribution of COVID-19 cases since the end of 2021 has not been uniform across the population. Females, young Australians, and those who live in a household in the middle part of the income distribution have had the highest probability of contracting COVID-19 (or at least being aware of it) as well as the greatest number of infections.

For those who have had COVID-19, the experience has varied as well. Amongst this group of adults who were aware they had had COVID-19, 89.5% reported that they had had symptoms. Of those who had at least one symptom, the average number of symptoms experienced per person was 10.2. This average hides considerable diversity though, as around a quarter of Australians with symptoms experienced 7 or less, whereas another quarter experienced 13 or more.

The length of time that someone experienced COVID-19 also varied. In total, nearly one-third (29%) of Australian adults who have had COVID-19, or 14.2% of all Australian adults, had COVID-19 with symptoms that lasted for longer than 4 weeks (long-COVID). According to our survey data, 4.7% of Australian adults have had COVID-19 symptoms or continue to have COVID-19 symptoms that have lasted for 3 months or more ('post-COVID-19 syndrome'), the threshold used by some to define long-COVID.

In this paper we also present what would appear to be the first estimates in Australia of the relationship between experiences of COVID-19 and changes in wellbeing from prior to the pandemic. While such estimates are methodologically quite challenging, by examining data on the same individual, with wellbeing observed in January 2020 and August 2022, we are able to show that short experiences of COVID-19 or having few symptoms is not associated with a decline in wellbeing compared to not having COVID-19 at all. If anything, wellbeing is somewhat higher. That does not in any way prove that COVID-19 is good for wellbeing. Rather, this group with acute COVID-19 only may be feeling relieved that this potentially devastating

illness did not have a greater impact on them and therefore their wellbeing after all symptoms have cleared may be higher than what it was pre-COVID.

We do present, however, very consistent evidence that having multiple symptoms, or having COVID-19 for many months is associated with a worsening of wellbeing, compared to someone's pre-COVID wellbeing. For example, amongst two people with the same level of wellbeing prior to the pandemic and who has the same age and sex, someone who experiences long-COVID with restrictions on their activities has a level of life satisfaction in August 2022 that is 0.416 lower than someone who had COVID-19 and symptoms for less than four weeks. This is roughly equivalent in magnitude to the change in average wellbeing in Australia between January and April 2020 (when lockdown restrictions were first introduced) or the worsening in wellbeing in Australia between April and August 2021, as the Delta-wave of the virus impacted on much of the south-east of the country (Biddle et al. 2022). COVID-19 has had many impacts on Australia over the last two-and-a-half years. From a wellbeing perspective, the evidence presented in this paper suggests that it is those who have symptoms for multiple months that have been impacted the most.

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# Appendix tables

Appendix Table 1 gives the survey window for the data collection, the sample size, and the% of January 2020 respondents who completed that particular wave.

**Appendix Table 1 Survey participation – January 2020 to April 2022**

| Wave | Survey window | Sample size | Per cent of January 2020 survey that completed wave |
|---|---|---|---|
| January 2020 | 20th January to 3rd February, 2020 | 3,249 | 100 |
| February 2020 | 17th February to 2nd March, 2020 | 3,228 | 91.4 |
| 1 – April 2020 | 14th to 27th April, 2020 | 3,155 | 88.8 |
| 2 – May 2020 | 11th to 25th May, 2020 | 3,249 | 91.0 |
| 3 – August 2020 | 10th to 24th August, 2020 | 3,061 | 85.9 |
| 4 – October 2020 | 12th to 26th October, 2020 | 3,043 | 85.5 |
| 5 – November 2020 | 9th to 23rd November, 2020 | 3,029 | 84.9 |
| 6 – January 2021 | 18th January to 1st February, 2021 | 3,459 | 83.8 |
| 7 – April 2021 | 12th to 26th April, 2021 | 3,286 | 80.8 |
| 8 – August 2021 | 10th to 23rd August, 2021 | 3,135 | 71.1 |
| 9 – October 2021 | 12th to 26th October, 2021 | 3,474 | 68.6 |
| 10 – January 2022 | 17th to 30th January, 2022 | 3,472 | 63.4 |
| 11 – April 2022 | 11th to the 24th April, 2022 | 3,587 | 64.0 |
| 12 – August 2022 | 8th to 22nd August, 2022 | 3,510 | 62.7 |

## Appendix Table 2 Factors associated with number of COVID-19 infections, including pre/early-COVID-19 mental health and wellbeing, August 2022

| Explanatory variables | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | Coeff. | Signif. | Coeff. | Signif. |
| Psychological distress (K6 continuous measure) | 0.017 | ** | | |
| Life satisfaction (0-10) | | | -0.033 | |
| Female | 0.051 | | 0.116 | |
| Aged 18 to 24 years | -0.270 | | -0.293 | * |
| Aged 25 to 34 years | 0.043 | | 0.090 | |
| Aged 45 to 54 years | -0.242 | * | -0.268 | ** |
| Aged 55 to 64 years | -0.350 | ** | -0.360 | ** |
| Aged 65 to 74 years | -0.601 | *** | -0.570 | *** |
| Aged 75 years plus | -0.771 | *** | -0.726 | *** |
| Indigenous | 0.216 | | 0.264 | |
| Born overseas in a main English-speaking country | -0.110 | | -0.143 | |
| Born overseas in a non-English speaking country | -0.137 | | -0.277 | * |
| Speaks a language other than English at home | 0.122 | | 0.289 | ** |
| Has not completed Year 12 or post-school qualification | 0.080 | | 0.074 | |
| Has a post graduate degree | 0.114 | | 0.046 | |
| Has an undergraduate degree | 0.081 | | -0.015 | |
| Has a Certificate III/IV, Diploma or Associate Degree | 0.275 | ** | 0.257 | ** |
| Lives in the most disadvantaged areas (1st quintile) | -0.024 | | -0.172 | |
| Lives in next most disadvantaged areas (2nd quintile) | -0.232 | ** | -0.300 | ** |
| Lives in next most advantaged areas (4th quintile) | 0.042 | | -0.101 | |
| Lives in the most advantaged areas (5th quintile) | 0.028 | | -0.067 | |
| Lives outside of a capital city | -0.160 | | -0.174 | * |
| Lives in lowest income household (1st quintile) | -0.375 | *** | -0.382 | ** |
| Lives in next lowest income household (2nd quintile) | -0.318 | ** | -0.260 | * |
| Lives in next highest income household (4th quintile) | -0.144 | | -0.055 | |
| Lives in highest income household (5th quintile) | -0.188 | | -0.121 | |
| Constant | -0.325 | * | 0.140 | |
| Sample size | 1,813 | | 1,817 | |

Notes: Negative binomial regression model. The base case individual is male; aged 35 to 44 years; non-Indigenous; born in Australia; does not speak a language other than English at home; has completed Year 12 but does not have a post-graduate degree; lives in neither an advantaged or disadvantaged suburb (third quintile); lives in a capital city; lives in neither a high-income or low-income household (third quintile).

Coefficients that are statistically significant at the 1% level of significance are labelled ***; those significant at the 5% level of significance are labelled **, and those significant at the 10% level of significance are labelled *

Source: ANUpoll: August 2022

## Appendix Table 3 Relationship between COVID-19 experience and life satisfaction, August 2022 (ordered probit model)

| Explanatory variables | Coeff. | Signif. | 95% confidence interval | |
|---|---|---|---|---|
| | | | Lower bound | Upper bound |
| Life satisfaction in January 2020 | 0.373 | *** | 0.333 | 0.413 |
| Had COVID-19 recently (last 4 weeks) | -0.171 | | -0.447 | 0.105 |
| Had Acute-COVID-19 but not recently and not long-COVID | 0.117 | * | -0.004 | 0.238 |
| Had or has long-COVID, without reduction in ability | 0.071 | | -0.303 | 0.445 |
| Had or has long-COVID, with reduction in ability to carry out activities | -0.207 | ** | -0.395 | -0.019 |
| Cut-point 1 | -0.584 | | -0.928 | -0.241 |
| Cut-point 2 | -0.469 | | -0.790 | -0.147 |
| Cut-point 3 | 0.207 | | -0.048 | 0.463 |
| Cut-point 4 | 0.682 | | 0.437 | 0.927 |
| Cut-point 5 | 1.085 | | 0.826 | 1.345 |
| Cut-point 6 | 1.655 | | 1.384 | 1.927 |
| Cut-point 7 | 2.165 | | 1.882 | 2.447 |
| Cut-point 8 | 3.014 | | 2.713 | 3.316 |
| Cut-point 9 | 4.081 | | 3.757 | 4.404 |
| Cut-point 10 | 4.937 | | 4.587 | 5.287 |
| Sample size | 2,034 | | | |

Notes: Ordered probit regression. The base case individual had not had COVID-19.

Coefficients that are statistically significant at the 1% level of significance are labelled ***; those significant at the 5% level of significance are labelled **, and those significant at the 10% level of significance are labelled *

Source: ANUpoll: August 2022

## Appendix Table 4 Relationship between number of symptoms/number of months with long-COVID and life satisfaction, August 2022 (ordered probit model)

| Explanatory variables | Those who have had COVID-19 symptoms | | Those who have had long-COVID | |
|---|---|---|---|---|
| | Coeff. | Signif. | Coeff. | Signif. |
| Life satisfaction in January 2020 | 0.348 | *** | 0.379 | *** |
| Number of symptoms | -0.031 | *** | | |
| Number of months with long-COVID | | | -0.037 | * |
| Cut-point 1 | -0.970 | | 0.006 | |
| Cut-point 2 | -0.904 | | 0.682 | |
| Cut-point 3 | -0.138 | | 1.174 | |
| Cut-point 4 | 0.150 | | 1.753 | |
| Cut-point 5 | 0.540 | | 2.287 | |
| Cut-point 6 | 1.094 | | 3.083 | |
| Cut-point 7 | 1.632 | | 4.383 | |
| Cut-point 8 | 2.549 | | 5.819 | |
| Cut-point 9 | 3.604 | | | |
| Cut-point 10 | 4.411 | | | |
| Sample size | 852 | | 217 | |

Notes: Ordered probit regression. In the second model (those with long-COVID), there are only nine observed life satisfaction values and therefore only eight cut-points

Coefficients that are statistically significant at the 1% level of significance are labelled ***; those significant at the 5% level of significance are labelled **, and those significant at the 10% level of significance are labelled *

Source: ANUpoll: August 2022

## Endnotes

1 In Australia, the number of tests conducted per confirmed case of COVID-19 peaked at over 15,000 in February 2021, declining to between 2 and 5 for most of 2022 (https://ourworldindata.org/coronavirus#explore-the-global-situation)

2 https://csrm.cass.anu.edu.au/research/publications/covid-19

3 The ANUpoll series of surveys is collected on a probability-based, longitudinal panel (Life in Australia™). By using probability-based recruiting (predominantly telephone-based) the unknown and unquantifiable biases inherent in opt-in (non-probability) panels are minimised and it is also possible to quantify the uncertainty around the estimates due to sampling error using standard statistical techniques. This is not possible with non-probability surveys.

4 The unit record survey data is available for download through the Australian Data Archive.

5 The contact methodology adopted for the online Life in Australia™ members is an initial survey invitation via email and SMS (where available), followed by multiple email reminders and a reminder SMS. Telephone follow up of panel members who have not yet completed the survey commenced in the second week of fieldwork and consisted of reminder calls encouraging completion of the online survey. The contact methodology for offline Life in Australia™ members was an initial SMS (where available), followed by an extended call-cycle over a two-week period. A reminder SMS was also sent in the second week of fieldwork.

6 Taking into account recruitment to the panel, the cumulative response rate for this survey is around 6.8%.

7 https://www.health.gov.au/health-alerts/covid-19/case-numbers-and-statistics. Note that between drafting this report and its release, the amount of information available through the Department of Health website has changed quite substantially, with generally less information available that previously, at least with regards to age and sex breakdowns of case numbers.

8 https://www.who.int/publications/i/item/WHO-2019-nCoV-Post_COVID-19_condition-Clinical_case_definition-2021.1

9 https://www.nice.org.uk/guidance/ng188/resources/covid19-rapid-guideline-managing-the-longterm-effects-of-covid19-pdf-51035515742

10 This question is taken from the Office of National Statistics (ONS) 'Coronavirus (COVID-19) Infection Survey questionnaire' https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/methodologies/covid19infectionsurveypilotmethodsandfurtherinformation

11 These differences hold in a probit model (that is adjusting for other demographic, socioeconomic, and geographic variables). However, we do not find any other variables that are consistently associated with long-COVID or post-COVID-19 syndrome.

12 In the modelling, when we control for life satisfaction in January 2020 the difference between those with no COVID-19 and long-COVID is significant at the 10% level of significance. However, the difference between those with Acute-COVID-19 and Long-COVID is statistically significant at the 1% level of significance.