Healthcare utilisation and challenges to healthcare access during the COVID-19 pandemic: A cross-sectional study of Australian adults

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Background and objective

Healthcare utilisation was disrupted by the COVID-19 pandemic, adversely affecting population health. This study investigated healthcare access and utilisation during the COVID-19 pandemic.

Methods

The Optimise Study recruited Victorian adults during September 2020–December 2021. This cross-sectional study examined difficulty accessing healthcare, changes experienced in healthcare utilisation and concerns related to healthcare.

Results

Among 779 participants, one-fifth had difficulty accessing healthcare. Participants with chronic illness/es (adjusted odds ratio [aOR]: 2.15, 95% confidence interval [CI]: 1.40–3.30) or earning $1–49,999 per year (aOR: 2.31, 95%CI: 1.14–4.93) or speaking a language other than English at home (aOR: 2.70, 95%CI: 1.38–5.30) had an increased odds of reporting difficulty accessing healthcare. Among 779 participants, the two biggest concerns were delaying or avoiding seeking care (24.4%) and anxiety associated with attending services because of the COVID-19 pandemic (24.0%).

Discussion

Future pandemic planning should consider strategies to ensure clear and timely communication with people about how to continue accessing healthcare in emergency situations.

THE COVID-19 PANDEMIC affected healthcare utilisation worldwide.[1] Although healthcare services generally remained open during the pandemic, lockdowns and stay-at-home orders resulted in disruptions to usual healthcare, with decreases in admissions to hospitals, imaging evaluations and emergency department presentations, and routine primary care attendance in a number of countries.[2–5] An Australian Institute of Health and Welfare (AIHW) report showed that elective admissions decreased by 8.3% in 2019–20 compared to 2018–19 in Australia because of restrictions on elective surgery in early 2020.[6] The AIHW reported the average daily presentations to emergency departments decreased by 26% in a single month (April 2020); although average daily presentations steadily increased in May and June 2020, they remained 8.6% lower than the corresponding period in 2018–19.[7] Additionally, all hospitalisations (public and private) decreased by 2.1% in 2021–22 compared to 2020–21.[7]

A systematic review of healthcare access during the COVID-19 pandemic[8] found that consumer sentiments influenced reductions in access to healthcare services.[9,10] Two Australian studies conducted among adults in 2020 found that despite believing they needed an in-person appointment, some people decided to cancel or postpone their face-to-face health appointments.[10,11] This decision was driven by the fear of COVID-19 infection and hesitation related to the widespread uncertainty surrounding potential changes to travel restrictions and public health messaging. Additionally, during 2020–22 in Australia, there was mandatory isolation for people with the COVID-19 infection, and their close contacts had to quarantine, impeding their ability to access face-to-face healthcare.[12]

Ensuring equitable healthcare access during a pandemic is challenged by pre-existing inequities in access experienced by certain communities, such as those from rural and remote areas,[10,13] and people who speak a language other than English.[14] Medical claims data from 2020–21 on the number of attendances per person for non-hospital, non-referred healthcare services such as general practitioner (GP) visits, showed that people living in remote (4.2 attendances per person) and very remote areas (3.4 attendances per person) had lower attendances compared to people living in metropolitan areas (6.6 attendances per person).[13] Also, a scoping review focusing on culturally and linguistically diverse (CALD) populations in Australia identified challenges such as poor health literacy, multimorbidity and a diminishing 'health migrant' effect that influenced access to health services.[14]

Most studies documenting the impact of COVID-19 on healthcare utilisation in Australia during the pandemic have focused on access (or lack of it) to specific health services (eg emergency healthcare utilisation, dental care) among the general population[15,16] or conducted qualitative interviews only.[10] This study focused on populations at higher risk of COVID-19 infection, severity or unintended consequences of COVID-19 restrictions, providing critical data to examine changes experienced in healthcare access or utilisation across all settings from 2020 to 2021, concerns people had about access to their usual healthcare, the association between sociodemographic factors and difficulty accessing healthcare. Also, the study was conducted in the State of Victoria, which experienced the most stringent and prolonged COVID-19 restrictions in Australia.

Methods

Study design

The Optimise study (Optimise) is a longitudinal cohort study, following participants aged 18 years or older living in Victoria, Australia, who were recruited between September 2020 and December 2021. Optimise was designed to provide in-depth insights into priority populations considered at risk of contracting COVID-19, developing severe COVID-19 or experiencing adverse consequences of the restrictions. Recruitment was conducted through paid and unpaid social media advertisements and flyers promoted through community and industry groups, community-based organisations, and social and professional networks. Further, bilingual research staff were recruited to engage with people who spoke Mandarin, Arabic and Dinka, and a written study advertisement was produced in Mandarin and Arabic. Participants could complete surveys in English or in these languages. A full description of Optimise methods can be found elsewhere.[17–20] Ethics approval for Optimise was provided by The Alfred Human Research Ethics Committee (Approval Number 333/20). At recruitment, Optimise participants completed a baseline survey providing sociodemographic information, information about life before the COVID-19 pandemic and changes experienced since the pandemic. The analysis for this study was cross-sectional, using data from participants' baseline surveys.

Primary outcome

The primary outcome was healthcare access. The baseline survey asked participants 'How easy was it for you to access the healthcare you needed in 2019?' and 'How easy was it for you to access the healthcare you needed in the past three months?'. The response option categories to both questions were 'very difficult', 'somewhat difficult', 'somewhat easy', 'very easy' and 'not applicable (did not access healthcare in the past three months)'. For descriptive analysis and graphical presentation of the data, the five categories were retained. For the purposes of Chi-square tests and regression modelling, categories were combined into a binary variable of difficulty accessing healthcare in the three months prior to the baseline survey (yes/no). 'Very difficult' and 'somewhat difficult' were assigned to yes (difficulty), and 'somewhat easy' and 'very easy' were assigned to no (difficulty). 'Not applicable' was excluded from this variable. 'Difficulty accessing healthcare' was the outcome of interest. Demographic variables from the baseline survey were also included in the analysis (refer to Appendix 1; available only online).

Secondary outcomes

Four secondary outcomes were explored by descriptive analysis: (1) the number of times participants accessed healthcare services in 2019; (2) the number of times participants accessed healthcare services in the three months prior to the baseline survey; (3) changes experienced in healthcare access; and (4) concerns related to usual healthcare (Appendix 2; available online only).

Recall periods

Because the recruitment into Optimise occurred over a 16-month period (September 2020–December 2021), participants completed the baseline survey at different time points, which meant that the 'past three months' was relative to their own baseline survey date. Therefore, the recall period for the baseline survey responses spanned from June 2020 (three months prior to September 2020) to December 2021.

Lockdown periods

The 16-month baseline recruitment period, and therefore recall periods, include five lockdown periods. To explore the association between the key outcomes and lockdown periods, we derived a covariate (lockdown). We included lockdowns 2–6 (detailed time periods available in Appendix 3; available online only) in descriptive analysis as a categorical variable (lockdown 2, 3, 4, 4 and 5, 5, 5 and 6, 6, no lockdown) (refer to Appendix 4; available online only). Lockdown 1 (31 March 2020–12 May 2020) was not included as it was outside the recall period. These categories were then collapsed into one binary variable representing lockdown (yes/no), which was included in the logistic regression model as a model covariate to adjust for confounding.

Statistical methods

Descriptive analysis was conducted on the sociodemographic factors of the study sample, reported as frequencies. To summarise the frequency of accessing healthcare by sociodemographic factors, we reported the mean (total number of times each participant accessed healthcare divided by the total number of participants who accessed healthcare) and standard deviation (SD) of the number of times healthcare services were accessed in 2019 and in the three months prior to participant baseline survey. Descriptive statistics were generated to summarise access to healthcare, changes experienced, alternatives offered, satisfaction with telehealth and concerns.

Chi-square tests were used to test for differences in sociodemographic factors by the outcome of difficulty accessing healthcare among participants who had accessed healthcare during the COVID-19 pandemic. Exposures for the logistic regression modelling were selected from the results of Chi-square tests. Further selection of the best subset of confounders for the association between exposures and the outcome of difficulty accessing healthcare were explored by using directed acyclic graphs (DAGs). The DAGs were developed based on prior literature and theoretical understanding of sociodemographic determinants of healthcare access. Variables identified as common causes of both exposure and outcome, such as age and gender, were adjusted for in the multivariable logistic regression model. Because the DAGs also suggested each exposure required a unique covariate set (refer to Appendices 5–7; available online only), we conducted four separate multivariable logistic regression models to estimate the association between each of the four exposures (selected by the univariable analysis described above): (1) chronic illness/es; (2) household income; (3) employment status; and (4) main language spoken at home) and outcome of difficulty accessing healthcare in the three months prior to the baseline survey. Participants who had missing data for exposure, confounders or outcomes were excluded from analysis.

All statistical analyses were conducted using R version 4.1.3 (R Core Team, Vienna, Austria).[21]

Results

Participants

In total, 779 participants completed the baseline survey – 551 women (70.7%) and 219 men (28.1%). The mean age of participants was 44 years (SD=16.8), most lived in metropolitan Melbourne (80.6%), 19.1% were classified as high-risk workers (including aged care workers, hotel quarantine or COVID-19 border control workers, and healthcare workers), 26.8% reported having chronic illness/es and 18.1% spoke a language other than English at home (Table 1; available online only).

Healthcare access

Of the 779 participants at baseline, 699 (89.7%) reported accessing healthcare services throughout 2019, on average 8.3 times (SD=10.7). A total of 766 (98.3%) participants reported accessing healthcare services in the three months prior to their baseline survey (recall period spanning June 2020 to December 2021), and did so on average 3.3 times (SD=4.2) across the three-month recall period (Appendix 8; available online only). Comparing healthcare access across two time periods (2019 compared to the three months prior to their baseline survey), the proportion of participants who reported it was 'very easy' to access healthcare reduced from 67.7% to 37.2%, whereas the proportion reporting it was 'somewhat difficult' and 'very difficult' increased from 3.7% to 16.6% (Table 2, Appendix 9; available online only). Participants whose 3-month recall period included lockdowns 4 and 5, lockdowns 5 and 6 and lockdown 6 were more likely to report difficulty in accessing healthcare than those whose 3-month recall period included other lockdown periods or were outside of lockdown (Figure 1; available online only).

Changes experienced in healthcare access

Among 657 participants who accessed healthcare during the COVID-19 pandemic (recall period spanning June 2020 to December 2021), 53.4% experienced changes in access or utilisation of healthcare in that period (Table 2 and Appendix 9). Participants whose recall period included lockdowns 5 and 6 were more likely to report changes in healthcare access or utilisation than those whose recall period was outside of lockdown, and the proportion among participants whose recall period included other lockdown periods was lower again (Figure 2; available online only). Among participants who experienced changes in healthcare access or utilisation during the COVID-19 pandemic, the most frequent two changes reported were 'My face-to-face appointments were rescheduled to telehealth appointments' (86.3%) and 'My appointment(s) were cancelled/postponed by the clinic' (29.9%). A higher proportion of participants whose recall period was during lockdowns 2, 4 and 5, 5 and 6, and 6 reported 'I couldn't access my usual healthcare' than those whose recall period was outside of lockdown (Figure 3; available online only). Furthermore, among 351 participants who experienced changes in access or utilisation of healthcare during the COVID-19 pandemic, 284 (80.9%) were offered alternatives to their usual appointments or services. Almost all (97.5%) of these participants chose telehealth as their alternative, and their satisfaction rate was high (33.2% 'very satisfied' and 41.5% 'somewhat satisfied').

All participants completed questions about concerns related to healthcare. Nearly one-quarter of the 779 participants reported 'I delayed or avoided seeking care' and 'I felt anxious about attending due to COVID-19' (Table 2).

Univariate analysis

Chi-square tests identified significant associations between chronic illness/es, employment status, household income and main language spoken at home, and the outcome of difficulty in accessing healthcare. Table 3 (available online only) shows that higher proportions of people with chronic illness/es or lower income or who spoke a language other than English at home had difficulty accessing healthcare than other participants. Higher proportions of people who were full-time carers/had home responsibilities (54.5%), were not employed (29.5%), had part-time jobs (23.9%) or casual jobs (20.4%) had more difficulty accessing healthcare services than other employment types.

Multivariable logistic regression analysis

A total of 649 participants accessed healthcare in the three months prior to their baseline survey and had complete data on all covariates; therefore, they were included in the regression analyses. Of these, 129 (19.9%) reported that it was difficult to access healthcare in the three months prior to their baseline survey (Table 3). Four separate multivariable logistic regression models estimated the associations between exposures of chronic illness, household income, employment status and main language spoken at home, and the outcome of difficulty accessing healthcare after adjusting for multiple factors (Table 4; available online only). Results from adjusted models showed that participants with chronic illness/es had over twice the odds of reporting difficulty accessing healthcare relative to participants without chronic illness/es. Additionally, people who earned \$1–\$49,999 per year had more than twice the odds of reporting difficulty accessing healthcare relative to people earning \$150,000 or more per year. Compared to people who spoke English at home, people who spoke a language other than English had 2.69-fold (95%CI: 1.37–5.27, *P*=0.004) the odds of reporting difficulty accessing healthcare. Employment status was not associated with difficulty accessing healthcare after adjusting for age, gender, education, residence location, household income, chronic illness/es and lockdown.

Discussion

The key finding from this study of 779 highly characterised Victorian adults was that one in five participants had difficulty accessing healthcare services during the COVID-19 pandemic, particularly during longer lockdown periods. Critically, individuals with chronic illness/es, those on a low income or who spoke a language other than English at home had greater difficultly accessing healthcare services. More than half of the participants, and more women than men, reported experiencing changes in access to their usual healthcare during the COVID-19 pandemic. This study also provided key insights into the community's concerns about accessing healthcare, with participants reporting they intentionally delayed or avoided care.

Barriers to healthcare access

The proportion of participants reporting difficulty in accessing healthcare during the COVID-19 pandemic was four-fold that measured pre-pandemic. This finding was consistent with those of previous studies, which found that even when health facilities remained open, the COVID-19 pandemic reduced the accessibility of healthcare services.[22–24] Notably, the obstacles to accessing healthcare were most pronounced during longer lockdown periods, in alignment with previous studies.[23,25]

Importantly, our study identified key subgroups disproportionately affected in accessing healthcare. They included individuals with chronic illness/es, those who spoke a language other than English at home, and people with financial difficulties. A previous study of Australian adults[26] also identified that individuals with ongoing illness/es were more inclined to refrain from seeking healthcare services during the COVID-19 pandemic because of concerns about contracting COVID-19 and their higher risk of severe disease. For CALD communities, the findings of this study might be caused by the delayed implementation or inaccurate translation of public health messages during the COVID-19 pandemic, which was also the case in a US study.[27] This study's finding that related to lower income was aligned with a study conducted in low- and middle-income countries whereby difficulty affording care because of the economic impacts of the COVID-19 pandemic was one of the key barriers to healthcare access.[28] Two Australian studies focusing on families with children[29,30] also highlighted the significant financial impact of the COVID-19 pandemic on families, which could potentially affect their ability to access healthcare services. Although employment status was associated with access difficulties in unadjusted models, this relationship was attenuated after accounting for income, suggesting that financial circumstances plays a more direct role than employment itself. In the event of future COVID-19 waves or another pandemic, it is important to develop processes to ensure equitable access to healthcare, particularly during lockdowns. This might include tailored guidance for individuals known to access healthcare frequently (ie those with chronic health conditions), specific timely messaging about how to access health services translated for CALD communities,[27] and a structuring of services so they can be accessed by people with financial difficulties.

Changes experienced in healthcare utilisation

This study found that over half of participants who accessed healthcare during the COVID-19 pandemic experienced changes in healthcare access or utilisation. Changes such as appointments being cancelled/postponed, inability to access usual healthcare and elective surgery being delayed/cancelled were all consistent with COVID-19 restrictions.[31] Because of the restrictions on unnecessary travel, public transport limitations and mandatory isolation/quarantine following infection/exposure, people experienced difficulty accessing their usual healthcare during the COVID-19 pandemic.[31,32] At the start of the COVID-19 pandemic, non-urgent elective surgery was suspended for one month in Australia, and remained restricted for months thereafter in some regions and for various periods.[33] A narrative review of Victoria's surgical response highlighted that the number of patients on the planned surgery waiting list, as well as waiting times for surgery, doubled between March 2020 and March 2022.[34]

This study further indicated that among individuals who experienced changes in healthcare access or utilisation, the predominant course of action involved rescheduling appointments to telehealth. Concordant with the data presented in an AIHW report,[33] 23% of all Medicare services in 2020 were delivered through telehealth. Particularly in Victoria, there was a discernible escalation in the utilisation of telehealth services, with the state experiencing the highest rate of telehealth use (37.1% of Medicare services) of all states and territories. This was probably attributable to the prolonged and recurrent imposition of public health restrictions in Victoria.[35] Consistent with the Australia Health Consumer Sentiment Survey,[36] our participants reported high satisfaction with telehealth. It provided convenient and timely access to healthcare services that did not require physical contact[37] and reduced the risk of contracting COVID-19 when travelling, especially for those living in rural or remote communities.[35] It is worth noting, however, that 13.7% of participants expressed dissatisfaction with telehealth services. A previous study by Javanparast et al about the pandemic-era telehealth experiences of Australian general practice patients at high risk of poor health outcomes highlighted the obstacles these individuals faced in effectively using telehealth services.[37] These challenges encompassed difficulties in articulating their health concerns and clinicians being unable to conduct physical examinations. Further, Javanparast et al highlighted that the option of telephone (as opposed to video consultation) was important for their participants because some have poor digital literacy.[37] Therefore, for future healthcare preparedness, telehealth services should be extended and improved; patient triage could determine if telehealth consultation is appropriate,[38] clinics' telehealth capacity could be enhanced by upgrading their platforms and improving professionals' skills,[38] and flexible modes of telehealth could be developed to account for varying levels of comfort or access to technology.

Strengths and limitations

This study has many strengths. First, it used detailed individual-level quantitative data to assess the association between sociodemographic factors and healthcare access during the COVID-19 pandemic in Australia. Second, our study participants were recruited because they were at heightened risk of COVID-19 infection, severe COVID-19, or unintended consequences of COVID-19 restrictions. Thus, we have presented critical data on healthcare access from those members of the community most in need of healthcare. Although complete case analysis was used, there was minimal missing data; therefore, the results will have minimal selection bias.

Some limitations were encountered in this study. First, given our deliberate recruitment strategy of sampling high-risk groups, our sample is not representative of the wider population in Victoria. This might have increased the likelihood of our participants already having a higher demand for healthcare services and subsequently encountering more difficulties. However, as outlined above, this could be considered a strength. Second, over the 16-month baseline recruitment period, policies around accessing healthcare services changed, potentially affecting our outcomes. This includes the roll-out of the first COVID-19 vaccines, which began in February 2021. Although most of our data were collected before large uptake of the vaccine, and vaccines were available outside healthcare settings (ie community-based vaccinations centres, workplaces), participants reported healthcare access might have been related to accessing vaccine/s. Third, it is important to highlight that this study used self-report data, and the responses could be subject to recall bias and social desirability bias. Participants might have over- or under-estimated their access to healthcare, and this misclassification might mean we missed important relationships in the data and so the results should be interpreted with some caution. We recommend future studies collect outcome data using self-report alongside administrative data. Fourth, participants might count COVID-19 testing as accessing healthcare, which could result in an over-estimate of the frequency of healthcare access. Fifth, this study used a cross-sectional design, so did not allow for causal interpretations, and the observed associations might be subject to residual confounding. Additionally, the cell sizes of some strata of confounders were small (ie ≤10) with associated lack of precision in the confidence intervals around model estimates; therefore, caution should be used when interpreting model results. Also, the inclusion of a binary variable for ‘lockdown’ in the model might have meant some loss of information (eg it does not account for time spent in lockdown). Finally, our study was not well placed to examine geographical disparities in healthcare access because of the sample being mainly participants residing in a metropolitan area.

Conclusion

This study demonstrated that adults in Victoria, Australia, had difficulty in accessing healthcare services during the COVID-19 pandemic, especially during longer lockdown periods. Most participants experienced changes in healthcare utilisation. Individuals who had chronic illness/es or low income or spoke a language other than English at home had increased odds of reporting difficulty accessing healthcare services. Future pandemic planning should ensure healthcare is universally accessible, especially for the most vulnerable members of our community.

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References

1. Arsenault C, Gage A, Kim MK, et al. COVID-19 and resilience of healthcare systems in ten countries. Nat Med 2022;28(6):1314–24. doi: 10.1038/s41591-022-01750-1.
2. Garcia S, Albaghdadi MS, Meraj PM, et al. Reduction in ST-segment elevation cardiac

catheterization laboratory activations in the United States during COVID-19 pandemic. J Am Coll Cardiol 2020;75(22):2871–72. doi: 10.1016/j.jacc.2020.04.011.

3. Mafham MM, Spata E, Goldacre R, et al. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. Lancet 2020;396(10248):381–89. doi: 10.1016/S0140-6736(20)31356-8.
4. Traeger MW, Patel P, Guy R, Hellard ME, Stoové MA; Australian Collaboration for Coordinated Enhanced Sentinel Surveillance (ACCESS). Changes in HIV preexposure prophylaxis prescribing in Australian clinical services following COVID-19 restrictions. AIDS 2021;35(1):155–57. doi: 10.1097/QAD.0000000000002703.
5. Traeger MW, van Santen DK, Sacks-Davis R, et al; Australia Collaboration for Coordinated Enhanced Sentinel Surveillance of Sexually Transmissible Infections and Blood Borne Viruses (ACCESS). Impact of COVID-19 lockdown restrictions on hepatitis C testing in Australian primary care services providing care for people who inject drugs. J Viral Hepat 2022;29(10):908–18. doi: 10.1111/jvh.13723.
6. Australian Institute of Health and Welfare (AIHW). Australia's hospitals at a glance. AIHW, 2022. Available at www.aihw.gov.au/hospitals/overview/hospitals-at-a-glance [Accessed 10 October 2023].
7. Australian Institute of Health and Welfare (AIHW). Emergency department care. AIHW, 2020. Available at www.aihw.gov.au/reports-data/myhospitals/intersection/activity/ed [Accessed 17 September 2023].
8. Núñez A, Sreeganga SD, Ramaprasad A. Access to healthcare during COVID-19. Int J Environ Res Public Health 2021;18(6):2980. doi: 10.3390/ijerph18062980.
9. Moynihan R, Sanders S, Michaleff ZA, Scott AM, Clark J, To EJ, et al. Impact of COVID-19 pandemic on utilisation of healthcare services: A systematic review. BMJ Open 2021;11(3):e045343. doi: 10.1136/bmjopen-2020-045343.
10. Podubinski T, Townsin L, Thompson SC, Tynan A, Argus G. Experience of healthcare access in Australia during the first year of the COVID-19 pandemic. Int J Environ Res Public Health 2021;18(20):10687. doi: 10.3390/ijerph182010687.
11. Isautier JM, Copp T, Ayre J, et al. People's experiences and satisfaction with telehealth during the COVID-19 pandemic in Australia: Cross-sectional survey study. J Med Internet Res 2020;22(12):e24531. doi: 10.2196/24531.
12. Islam MI, Freeman J, Chadwick V, Martiniuk A. Healthcare avoidance before and during the COVID-19 pandemic among Australian youth: A longitudinal study. Healthcare (Basel) 2022;10(7):1261. doi: 10.3390/healthcare10071261.
13. Australian Institute of Health and Welfare (AIHW). Rural and remote health. AIHW, 2022. Available at www.aihw.gov.au/reports/rural-remote-australians/rural-and-remote-health [Accessed 11 September 2023].
14. Khatri RB, Assefa Y. Access to health services among culturally and linguistically diverse populations in the Australian universal health care system: Issues and challenges. BMC Public Health 2022;22(1):880. doi: 10.1186/s12889-022-13256-z.
15. Hopcraft M, Farmer G. Impact of COVID-19 on the provision of paediatric dental care: Analysis of the Australian Child Dental Benefits Schedule. Community Dent Oral Epidemiol 2021;49(4):369–76. doi: 10.1111/cdoe.12611.
16. Lystad RP, Brown BT, Swain MS, Engel RM. Impact of the COVID-19 pandemic on manual therapy service utilization within the Australian private healthcare setting. Healthcare (Basel) 2020;8(4):558. doi: 10.3390/healthcare8040558.
17. Altermatt A, Heath K, Saich F, et al. Estimating the proportion of Victorians infected with COVID-19 during the Omicron BA.1 epidemic wave of January 2022 in Australia. Aust N Z J Public Health 2023;47(1):100007. doi: 10.1016/j.anzjph.2022.100007.
18. Heath K, Altermatt A, Saich F, et al. Intent to be vaccinated against COVID-19 in Victoria, Australia. Vaccines (Basel) 2022;10(2):209. doi: 10.3390/vaccines10020209.
19. Burnet Institute. The Optimise Study. Burnet Institute, 2022. Available at https://optimisecovid.com.au [Accessed 5 September 2023].
20. Gibbs L, Thomas AJ, Coelho A, et al. Inclusion of cultural and linguistic diversity in COVID-19 public health research: Research design adaptations to seek different perspectives in Victoria, Australia. Int J Environ Res Public Health 2023;20(3):2320. doi: 10.3390/ijerph20032320.
21. The R Foundation. The R Project for statistical computing. The R Foundation, 2021. Available at www.R-project.org [Accessed 3 October 2023].
22. Boro E, Stoll B. Barriers to COVID-19 health products in low-and middle-income countries during the COVID-19 pandemic: A rapid systematic review and evidence synthesis. Front Public Health 2022;10:928065. doi: 10.3389/fpubh.2022.928065.
23. Imlach F, McKinlay E, Kennedy J, et al. Seeking healthcare during lockdown: Challenges, opportunities and lessons for the future. Int J Health Policy Manag 2022;11(8):1316–24.
24. Topriceanu C-C, Wong A, Moon JC, Hughes AD, Bann D, Chaturvedi N, et al. Evaluating access to health and care services during lockdown by the COVID-19 survey in five UK national longitudinal studies. 2021;11(3):e045813. doi: 10.1136/bmjopen-2020-045813.
25. Nshimyiryo A, Barnhart DA, Cubaka VK, et al. Barriers and coping mechanisms to accessing healthcare during the COVID-19 lockdown: A cross-sectional survey among patients with chronic diseases in rural Rwanda. BMC Public Health 2021;21(1):704. doi: 10.1186/s12889-021-10783-z.
26. Czeisler MÉ, Kennedy JL, Wiley JF, et al. Delay or avoidance of routine, urgent and emergency medical care due to concerns about COVID-19 in a region with low COVID-19 prevalence: Victoria, Australia. Respirology 2021;26(7):707–12. doi: 10.1111/resp.14094.
27. Ortega P, Martínez G, Diamond L. Language and health equity during COVID-19: Lessons and opportunities. J Health Care Poor Underserved 2020;31(4):1530–35. doi: 10.1353/hpu.2020.0114.
28. Hunt X, Hameed S, Tetali S, et al. Impacts of the COVID-19 pandemic on access to healthcare among people with disabilities: Evidence from six low- and middle-income countries. Int J Equity Health 2023;22(1):172. doi: 10.1186/s12939-023-01989-1.
29. Bryson H, Mensah F, Price A, et al. Clinical, financial and social impacts of COVID-19 and their associations with mental health for mothers and children experiencing adversity in Australia. PLoS One 2021;16(9):e0257357. doi: 10.1371/journal.pone.0257357.
30. O'Connor M, Greenwood CJ, Letcher P, et al. Inequalities in the distribution of COVID-19-related financial difficulties for Australian families with young children. Child Care Health Dev 2022;48(6):1040–51. doi: 10.1111/cch.13010.
31. Australian Institute of Health and Welfare (AIHW). Health system overview. AIHW, 2022. Available at www.aihw.gov.au/reports/australias-health/health-system-overview [Accessed 31 August 2023].
32. Siette J, Seaman K, Dodds L, et al. A national survey on COVID-19 second-wave lockdowns on older adults' mental wellbeing, health-seeking behaviours and social outcomes across Australia. BMC Geriatr 2021;21(1):400. doi: 10.1186/s12877-021-02352-1.
33. Australian Institute of Health and Welfare (AIHW). Australia's health 2022: Data insights. AIHW, 2022. Available at www.aihw.gov.au/reports/australias-health/australias-health-2022-data-insights/about [Accessed 7 September 2023].
34. Drysdale HRE, Watters DA, Leang Y, Thomson BNJ, Brown WA, Wilson A; Victorian Surgical Directors Group. Victoria's surgical response to the COVID-19 pandemic: The first two years. ANZ J Surg 2023;93(3):476–86. doi: 10.1111/ans.18311.
35. Lee J, Park JS, Wang KN, Feng B, Tennant M, Kruger E. The use of telehealth in Australia during the coronavirus (COVID-19) pandemic for medical practitioners: A retrospective epidemiological analysis. APJHM 2022;17(3):1433. doi: 10.24083/apjhm.v17i3.1433.
36. Zurynski Y, Ellis LA, Dammery G, et al. The Voice of Australian Health Consumers: The 2021 Australian Health Consumer Sentiment Survey. Consumers Health Forum of Australia, 2022. Available at https://healthsystemsustainability.com.au/wp-content/uploads/2022/03/PCHSS_ConsumerSentimentSurveyReport_FINAL3.pdf [Accessed 28 August 2023].
37. Javanparast S, Roeger L, Kwok Y, Reed RL. The experience of Australian general practice patients at high risk of poor health outcomes with telehealth during the COVID-19 pandemic: A qualitative study. BMC Fam Pract 2021;22(1):69. doi: 10.1186/s12875-021-01408-w.
38. National Health and Medical Research Council (NHMRC). Strengthening Australia's health system post COVID-19. NHMRC, 2022. Available at www.nhmrc.gov.au/sites/default/files/2023-02/NCHRAC-Advice-30-Strengthening-Health-systems.pdf [Accessed 6 September 2023].

Table 1. Description of the sociodemographic factors of Optimise study participants, in Victoria, Australia (N=779)

Sociodemographic factors	n	%
Age (years)	**Mean=44.0** **Median=42.9**	**SD=16.8** **IQR=29–58**
Missing	4	
Age group (years)		
18–24	137	17.6
25–34	155	19.9
35–44	121	15.5
45–54	131	16.8
55–64	127	16.3
65+	104	13.4
Missing	4	0.5
Gender		
Man	219	28.1
Woman	551	70.7
Other[A]	6	0.8
Missing	3	0.4
Chronic illness		
Yes	209	26.8
No	558	71.6
Missing	12	1.5
High-risk worker[B]		
Yes	149	19.1
No	629	80.7
Missing	1	0.1
Education		
High school and less	143	18.4
Tertiary education – TAFE/trade certificate	126	16.2
Tertiary education – undergraduate	290	37.2
Tertiary education – postgraduate	213	27.3
Missing	7	0.9
Residential location		
Metro	628	80.6
Region	144	18.5
Missing	7	0.9

Table continued on the next page.

Employment status		
Full time	222	28.5
Part time	140	18.0
Casual	129	16.6
Self-employed	34	4.4
Full-time carer/home responsibilities	14	1.8
Retired	107	13.7
Not employed	105	13.5
Missing	28	3.6
Household income (per year)		
$1–$49,999	218	28.0
$50,000–$99,999	191	24.5
$100,000–$149,999	106	13.6
$150,000 or more	138	17.7
No income	20	2.6
Missing	106	13.6
Main language spoken at home		
English	638	81.9
LOTE	141	18.1

[A] Non-binary/genderfluid, trans men and trans women were grouped together because of small numbers.

[B] High-risk workers include aged care workers, hotel quarantine or COVID-19 border control workers, and healthcare workers.

IQR, interquartile range; LOTE, language other than English; SD, standard deviation; TAFE, Technical and Further Education.

Table 2. Summary of reported healthcare access, changes to, alternatives and concerns about healthcare access (N=779)

	In 2019	In the 3 months prior to baseline (June 2020–December 2021)
Healthcare access		
Very difficult	5 (0.6)	28 (3.6)
Somewhat difficult	24 (3.1)	101 (13.0)
Somewhat easy	182 (23.4)	230 (29.5)
Very easy	527 (67.7)	290 (37.2)
Not applicable (did not access healthcare)	29 (3.7)	122 (15.7)
Missing	12 (1.5)	8 (1.0)
Access or utilisation of healthcare changed (n=657[A])		
Yes	–	351 (53.4)
No	–	279 (42.5)
Do not know	–	27 (4.1)
Changes experienced (N=351[B])		
My face-to-face appointments were rescheduled to telehealth appointments	–	303 (86.3)
My appointment(s) were cancelled/postponed by the clinic	–	105 (29.9)
I could not access my usual healthcare	–	46 (13.1)
I ran out of medication	–	32 (9.1)
I could not contact my usual healthcare provider	–	29 (8.3)
My elective surgery/procedure was delayed or cancelled	–	28 (8.0)
Other	–	38 (10.8)
Offered alternatives to usual appointments or services (N=351[C])		
Yes	–	284 (80.9)
No	–	55 (15.7)
Do not know	–	12 (3.4)
Alternatives offered (N=284[D])		
Telehealth consultation(s)	–	277 (97.5)
Online prescription services	–	103 (36.3)
Repeated prescriptions/multi-month medication	–	39 (13.7)
In-home services	–	3 (1.1)
Other	–	4 (1.4)

Table continued on the next page.

Satisfaction with telehealth (N=277[E])		
Very satisfied	–	92 (33.2)
Somewhat satisfied	–	115 (41.5)
Neutral	–	32 (11.6)
Somewhat dissatisfied	–	33 (11.9)
Very dissatisfied	–	5 (1.8)
Concerns		
I delayed or avoided seeking care	–	190 (24.4)
I felt anxious about attending because of COVID-19	–	187 (24.0)
I could not afford to access my usual healthcare	–	41 (5.3)
I could not access telehealth consultation(s)	–	19 (2.4)
No concerns in relation to my usual healthcare	–	347 (44.5)
Other	–	11 (1.4)

Data are presented as n (%). –, not applicable (ie the question was not asked).

[A] This question was not shown for participants who chose 'Not applicable (did not access healthcare)' for healthcare access.

[B] This question only showed to participants who chose 'Yes' to 'Access or utilisation of healthcare changed'.

[C] This question only showed to participants who chose 'Yes' to 'Access or utilisation of healthcare changed'.

[D] This question only showed to participants who chose 'Yes' to 'Offered alternatives to usual appointments or services'.

[E] This question only showed to participants who used telehealth consultation(s) as alternatives.

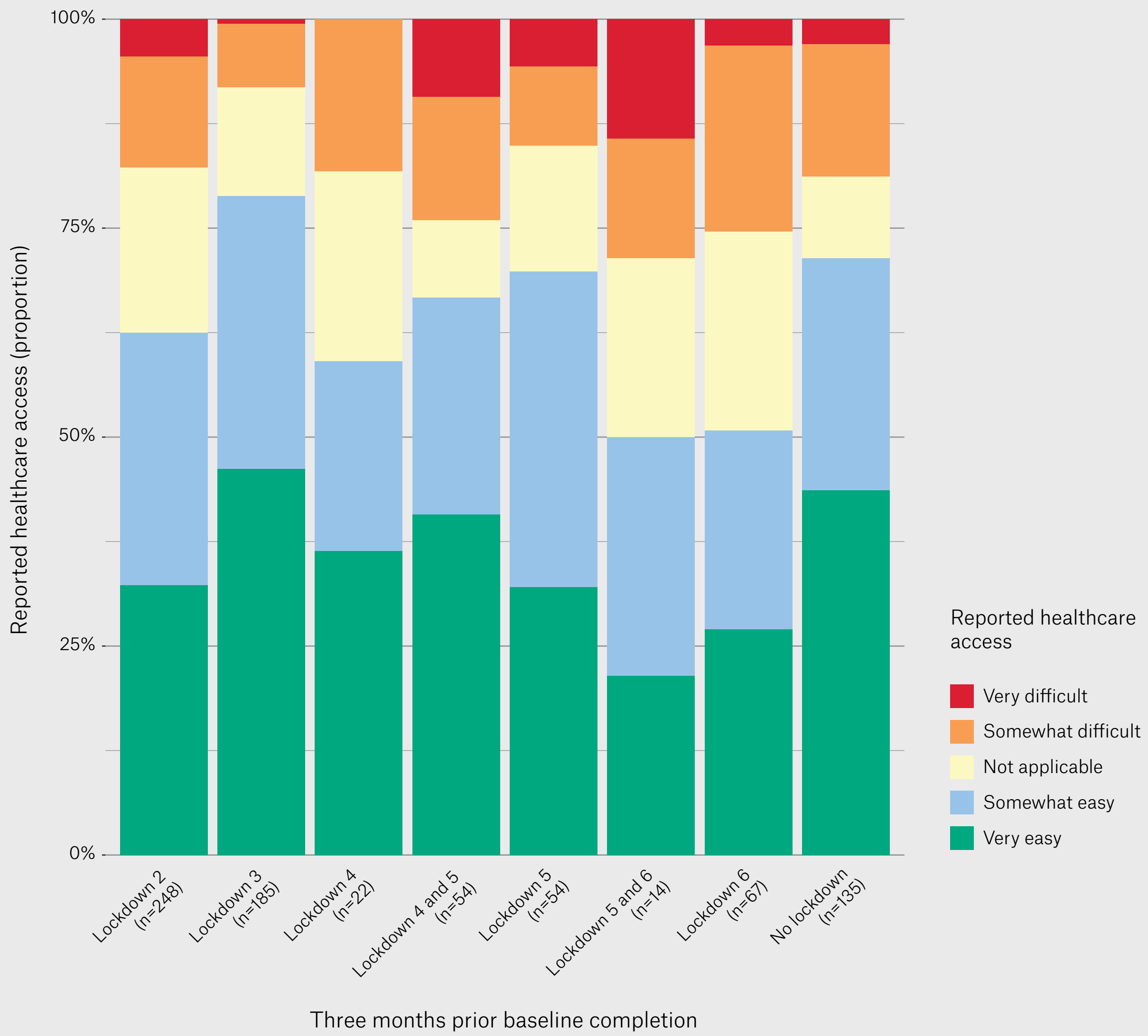

Figure 1. Reported difficulty accessing healthcare during the COVID-19 pandemic (in the 3 months prior to baseline completion),[A–C] Victoria, Australia (N=779).

[A] Lockdown 2: 9 July 2020–27 October 2020; Lockdown 3: 13 February 2021–17 February 2021; Lockdown 4: 29 May 2021–10 June 2021; Lockdown 5: 16 July 2021–27 July 2021; Lockdown 6: 5 August 2021–21 October 2021.

[B] Not applicable: did not access healthcare in the past three months.

[C] Three-month recall period: June 2020 to December 2021.

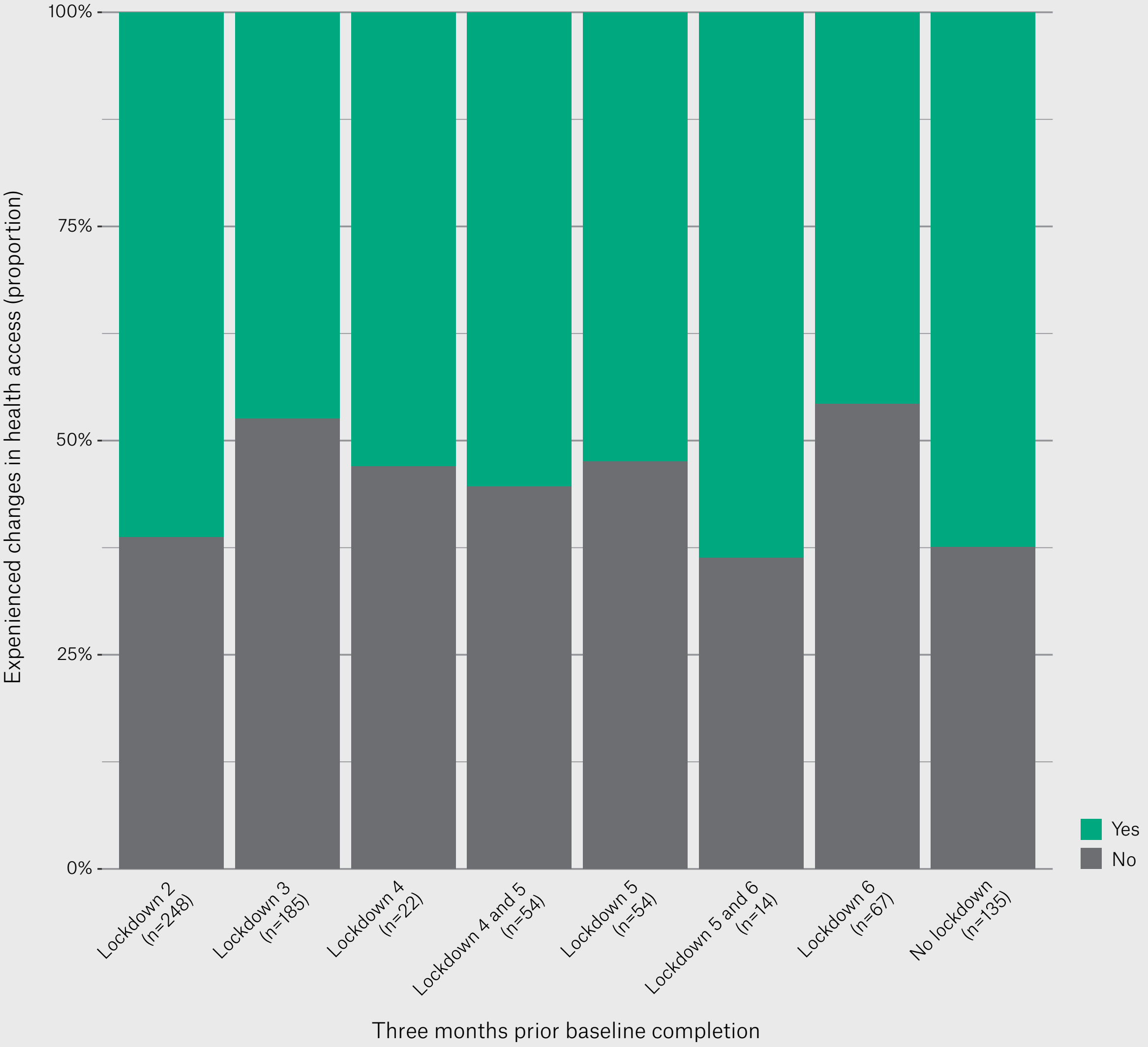

Figure 2. Proportion of participants experiencing changes in healthcare access or utilisation during the COVID-19 pandemic (in the 3 months prior to baseline completion^{A,B}), in Victoria, Australia (N=630^{C}).

[A] Lockdown 2: 9 July 2020–27 October 2020; Lockdown 3: 13 February 2021–17 February 2021; Lockdown 4: 29 May 2021–10 June 2021; Lockdown 5: 16 July 2021–27 July 2021; Lockdown 6: 5 August 2021–21 October 2021.

[B] Three-month recall period: June 2020 to December 2021.

[C] Of 779 participants, 149 chose 'don't know'. They were excluded from this figure.

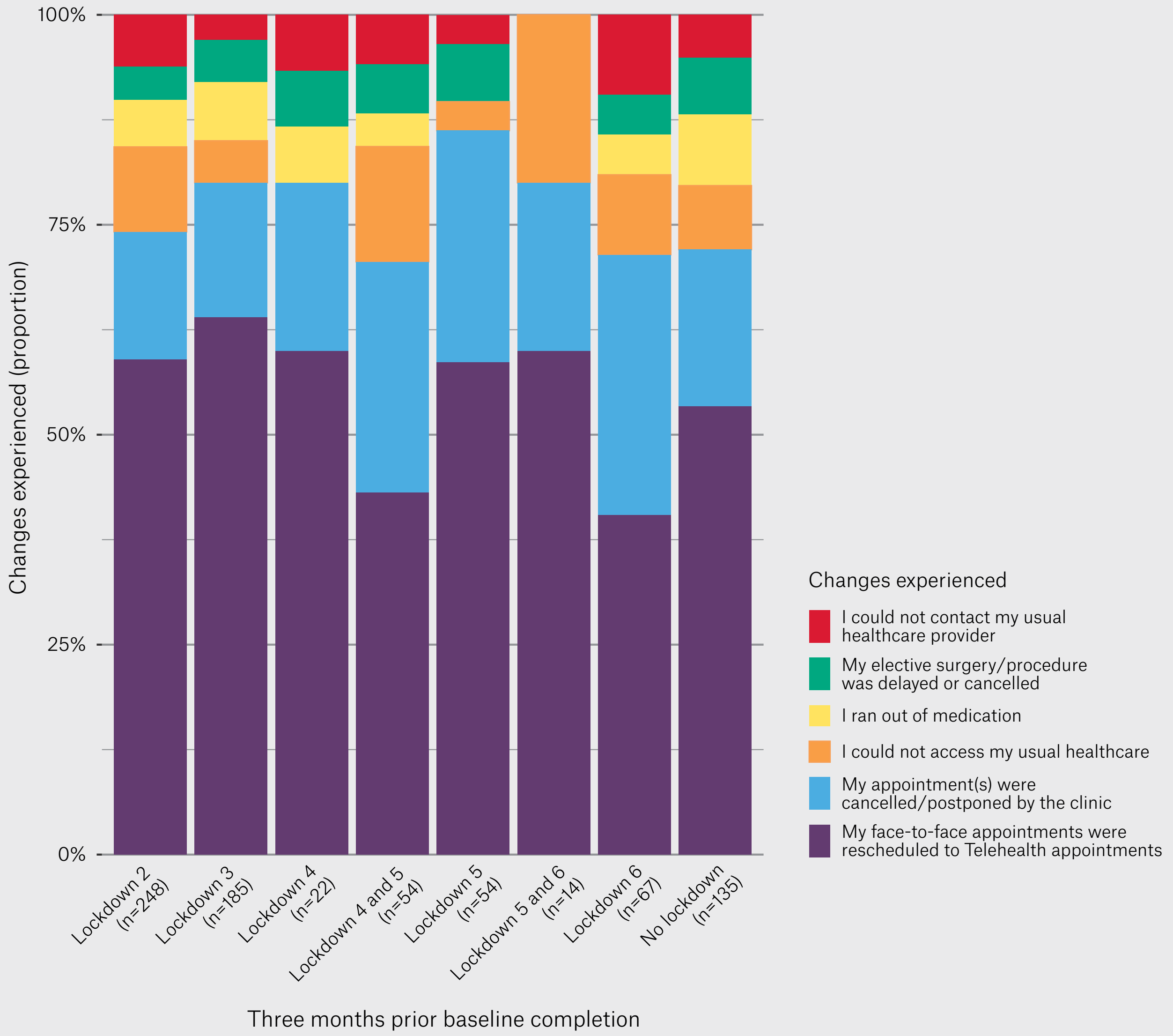

Figure 3. Changes experienced in healthcare access or utilisation during the COVID-19 pandemic (in the 3 months prior to baseline completion),[A,B] in Victoria, Australia (N=351[C]).

[A] Lockdown 2: 9 July 2020–27 October 2020; Lockdown 3: 13 February 2021–17 February 2021; Lockdown 4: 29 May 2021–10 June 2021; Lockdown 5: 16 July 2021–27 July 2021; Lockdown 6: 5 August 2021–21 October 2021.

[B] Three-month recall period: June 2020 to December 2021.

[C] This question was only shown to participants who chose ‘Yes’ to ‘Access or utilisation of healthcare changed’.

Table 3. Univariate analysis for sociodemographic factors related to difficulty accessing healthcare in the 3 months prior to baseline survey[A] (Optimise, Victoria, Australia, 2020–21, N=649)[B]

		Difficulty accessing healthcare		
Sociodemographic factors	**Total**	**Yes, n=129 (19.9%)**	**No, n=520 (80.1%)**	***P* value[C]**
Age-group (years)				**0.39**
18–24	110	27 (24.5)	83 (75.5)	
25–34	121	22 (18.2)	99 (81.8)	
35–44	100	25 (25.0)	75 (75.0)	
45–54	105	17 (16.2)	88 (83.8)	
55–64	110	22 (20.0)	88 (80.0)	
65+	100	16 (16.0)	84 (84.0)	
Gender				**0.69**
Man	162	36 (22.2)	126 (77.8)	
Woman	479	92 (19.2)	387 (80.8)	
Other[D]	6	1 (16.7)	5 (83.3)	
Chronic illness				**0.007**
Yes	202	54 (26.7)	148 (73.3)	
No	436	75 (17.2)	361 (82.8)	
High-risk worker[E]				**0.46**
Yes	128	29 (22.7)	99 (77.3)	
No	520	100 (19.2)	420 (80.8)	
Education				**0.41**
High school and less	120	21 (17.5)	99 (82.5)	
Tertiary education – TAFE/trade certificate	105	25 (23.8)	80 (76.2)	
Tertiary education – undergraduate	235	49 (20.9)	186 (79.1)	
Tertiary education – postgraduate	182	30 (16.5)	152 (83.5)	

Table continued on the next page.

Residential location				**1**
Metro	514	102 (19.8)	412 (80.2)	
Region	128	26 (20.3)	102 (79.7)	
Employment status				**<0.001**
Full time	173	18 (10.4)	155 (89.6)	
Part time	117	28 (23.9)	89 (76.1)	
Casual	108	22 (20.4)	86 (79.6)	
Self-employed	29	5 (17.2)	24 (82.8)	
Full-time carer/home responsibilities	11	6 (54.5)	5 (45.5)	
Retired	98	14 (14.3)	84 (85.7)	
Not employed	88	26 (29.5)	62 (70.5)	
Household income (per year)				**0.018**
$1–$49,999	182	47 (25.8)	135 (74.2)	
$50,000–$99,999	151	25 (16.6)	126 (83.4)	
$100,000–$149,999	95	15 (15.8)	80 (84.2)	
$150,000 or more	113	14 (12.4)	99 (87.6)	
No income	15	5 (33.3)	10 (66.7)	
Main language spoken at home				**<0.001**
English	542	91 (16.8)	451 (83.2)	
LOTE	107	38 (35.5)	69 (64.5)	

Data are presented as n (%).

[A] Three-month recall period: June 2020 to December 2021.

[B] 122 participants responded 'Not applicable (did not access healthcare)' and eight participants responded 'Prefer not to say'. They were excluded from the analysis.

[C] This is an overall Chi-square test for independence.

[D] Non-binary/genderfluid, trans men and trans women were grouped together because of small numbers.

[E] High-risk workers include aged care workers, hotel quarantine or COVID-19 border control workers, and healthcare workers.

LOTE, language other than English; TAFE, Technical and Further Education.

Table 4. Association between sociodemographic variables and difficulty accessing healthcare in the 3 months prior to baseline survey;[A] results of multivariable logistic regression analysis (Optimise, Victoria, Australia, N=649[B])

	Unadjusted		Adjusted[C]	
Variables	**OR (95% CI)**	***P* value**	**OR (95% CI)**	***P* value**
Model 1: chronic illness				
No	Ref		Ref	
Yes	1.76 (1.18–2.61)	0.006	2.06 (1.34–3.17)	<0.001
Model 2: household income (per year)				
$150,000 or more	Ref.		Ref.	
$100,000–$149,999	1.33 (0.60–2.94)	0.48	1.24 (0.54–2.89)	0.61
$50,000–$99,999	1.40 (0.70–2.90)	0.35	1.27 (0.61–2.77)	0.53
$1–$49,999	2.46 (1.31–4.87)	0.007	2.27 (1.12–4.84)	0.027
No income	3.54 (0.99–11.60)	0.041	2.97 (0.79–10.37)	0.09
Model 3: employment status				
Not employed	Ref		Ref	
Full time	0.28 (0.14–0.54)	<0.001	0.41 (0.17–1.03)	0.06
Part time	0.75 (0.40–1.40)	0.37	0.99 (0.43–2.31)	0.98
Casual	0.61 (0.31–1.17)	0.14	0.72 (0.31–1.68)	0.45
Self-employed	0.50 (0.15–1.36)	0.20	0.47 (0.12–1.56)	0.24
Full-time carer/home responsibilities	2.86 (0.80–10.74)	0.11	3.12 (0.69–14.21)	0.13
Retired	0.40 (0.19–0.81)	0.013	0.40 (0.13–1.21)	0.11
Model 4: main language spoken at home				
English	Ref		Ref	
LOTE	2.73 (1.72–4.29)	<0.001	2.69 (1.37–5.27)	0.004

[A] Three-month recall period: June 2020 to December 2021.

[B] 122 participants responded 'Not applicable (did not access healthcare)' and eight participants responded 'Prefer not to say'. They were excluded from the analysis.

[C] For chronic illness, the regression model adjusted for age and gender. For household income, the regression model adjusted for gender, education, chronic illness and residence location. For employment status, the regression model adjusted for age, gender, education, residence location, lockdown, chronic illness and household income. For main language spoken at home, the regression model adjusted for age, gender, chronic illness, high-risk worker, education, residential location, employment status, lockdown and household income.

CI, confidence interval; LOTE, language other than English; OR, odds ratio; Ref, reference.