Socioeconomic status and adherence to COVID-19 preventative measures in Australia: a national cohort study

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Received: 6 April 2024 | Revised: 20 October 2024 | Accepted: 30 October 2024

DOI: 10.1002/hpja.932

Health Promotion Journal of Australia | Australian Health Promotion Association | WILEY

RESEARCH ARTICLE

Socioeconomic status and adherence to COVID-19 preventative measures in Australia: A national cohort study

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Funding information
NHMRC-ARC Dementia Research Development Fellowship, Grant/Award Number: APP1107381

Handling editor: Williams Carmel

Abstract

Issue Addressed: The uptake of recommended preventative measures is a critical concern for protecting the public against COVID-19 outbreaks and future pandemics. However, it is unclear to what extent COVID-19 preventative measures were followed in Australia. This study aims to determine adherence level to COVID-19 preventative measures in 2021, and whether these were associated with socioeconomic status (SES).

Study Design: This was a national cross-sectional study using data from the Household Income and Labour Dynamics in Australia (HILDA) survey.

Methods: This study included 15 457 community-dwelling adults (18 years or older) who participated in the 2021 wave of HILDA survey. SES was assessed by the Socio-Economic Index For Areas (SEIFA) score, split into quintiles. Outcomes included self-reported adherence to COVID-19 preventative measures (mask wearing, keeping distance, staying home; sum score range 3–15) and COVID-19 status (yes/no). Linear and logistic regression were used accordingly to assess the association between SES and the sum score of adherence to COVID-19 measures, and COVID-19 vaccination status.

Results: Adherence to COVID-19 preventative measures and uptake of COVID-19 vaccine in Australia in 2021 were moderate (between 60% and 70%). Regression models showed higher SES was associated with a slightly higher score of adherence ($\beta = .08$, 95% CI = .04–.12) and a higher likelihood of self-reporting receiving COVID-19 vaccination (OR 1.27, 95% CI = 1.23–1.31).

Conclusion: SES was positively associated with the level of adherence to COVID-19 preventative measures and the probability of receiving COVID-19 vaccine. The findings of this study highlight the potential benefits of considering SES, particularly its impact on equity and access, when designing an educational program or awareness campaign in times of crisis.

So What? The findings of this study highlight the importance of considering SES when designing an educational program or an awareness campaign in times of crisis.

KEYWORDS
COVID-19, HILDA, preventative measures, socioeconomic status, vaccine

1 | INTRODUCTION

According to the World Health Organisation, there have been more than 760 million confirmed COVID-19 cases, including close to 7 million deaths.[1] The approach to contain the spread of the infection and mitigate its impact was unprecedented including mandating mask wearing, physical distancing, restrictive lockdowns and travel bans.[2] This multipronged strategy was effective in slowing down infection rates and reducing pressure on the health system.[3–5] Globally, the adherence to these measures varied depending on the country and the practice itself.[6–8] For example, practicing social distancing was reported to be 96% in Germany compared to 74.6% in Hong Kong.[7,9] However, it remains unclear to what extent these measures were followed in Australia especially during 2021. Unlike other countries, Australia had relatively low infection and death rates from COVID-19 up until the end of 2021.[10] The spread of COVID-19 changed markedly in the following year when the more infectious Omicron variant increased the number of infections and deaths.[10]

Although there were various health campaigns promoting adherence to preventative health measures, there were disparities between communities that followed them.[11,12] For example, Alsan et al. found that there were gaps in health-related knowledge of COVID-19 symptoms and social distancing behaviour between different ethnic groups in the United States.[13,14] Socioeconomic status (SES) has long been reported to play a role in health disparity.[15–17] During the COVID-19 pandemic, those with low SES were more likely to be infected and have higher rates of complication.[10,18–20] In Australia, registered deaths due to COVID-19 were three times higher in those in the most socioeconomically disadvantaged quintile compared to those in the most socioeconomically advantaged quintile.[21] There are multiple reasons to explain this, including the association of low SES with higher rates of comorbidities and poorer access to health care.[22–24] Moreover, Black, Hispanic and American Indian persons in the United States were more likely to live under circumstances which put them at a higher likelihood of exposure to COVID-19 such as living with an essential worker.[25,26] Furthermore, when vaccinations against COVID-19 were made available, communities with lower SES had lower willingness to receive the vaccine.[27,28]

There is currently a lack of knowledge around the public's level of adherence to COVID-19 preventative health measures and receiving COVID-19 vaccination, and whether these are associated with SES. Hence, this nationwide study aimed to investigate the association between SES and adherence to COVID-19 measures and receiving a COVID-19 vaccine. We hypothesised that lower SES was associated with lower adherence to preventative measures and uptake of the COVID-19 vaccine.

2 | METHODS

2.1 | Study design and population

This is a cross-sectional study using data from the Household Income and Labour Dynamics in Australia (HILDA) survey. The HILDA is a national annual study of a representative sample of Australian households. It follows participants annually across different stages of their life and collects information spanning from family and education to health and wellbeing.[29] Full details of the survey methodology have been previously reported.[30] The present study included those who were 18 years and older and participated in the 2021 wave of HILDA. The fieldwork for wave 21 was conducted from 27 July 2021 to 14 March 2022.[31]

2.2 | Independent variable of interest: Socioeconomic status

Socioeconomic status (SES) was assessed based on the Socio-Economic Index For Areas (SEIFA) score which is provided by the Australian Bureau of Statistics.[32] It assesses different aspects providing multiple indices such as the Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD).[32] Further explanation of SEIFA and its indices is reported elsewhere.[32] SEIFA-IRSAD, the index used in HILDA, provides a summary measure of relative socio-economic advantages and disadvantages experienced by individuals living in an area.[32] An area with the majority of the households with low income or unskilled occupations, and few households with high income or skilled occupations would have a low score indicating a relative disadvantage.[32] In this analysis, SEIFA-IRSAD quintiles were used and treated as a continuous variable ranking areas from 1 (*most disadvantaged*) to 5 (*most advantaged*).

2.3 | Outcomes: Adherence to COVID-19 preventative measures and vaccination status

Adherence to COVID-19 measures in 2021 was assessed using responses to the following three questions: 'How often did you wear a mask or other face covering when out in public in an indoor space, such as shopping in a supermarket?', 'How often did you keep a distance of at least 1.5 metres from other persons who are not in your household?' and 'How often did you stay at home and only went out for the essentials?'. Possible responses ranged from 1 (*nearly all the time*) to 5 (*none of the time*). Adherence to COVID-19 measure response scores were added together to create a sum score ranging from 3 to 15. COVID-19 vaccination status was assessed based on responses to the self-reported question whether they 'Have had one or more COVID-19 vaccine doses' (yes or no).

2.4 | Other independent variables

Other independent variables included in the models were age, sex, education, location, number of comorbidities, country of birth and self-rated health. These confounders were identified to influence the relationship.[33,34] Education status was divided into three categories: 'high education' which included graduate diploma, tertiary education

TABLE 1 Baseline characteristics of participants during 2021 wave.

	Overall ($n = 15\,457$)	SEIFA lowest quintile ($n = 3011$)	SEIFA highest quintile ($n = 2957$)
Demographics			
Age, mean (SD), years	47.2 (18.4)	48.1 (19.2)	47.1 (18.3)
Female, *n* (%)	8202 (53.1)	1620 (53.8)	1560 (52.8)
Education status, *n* (%)			
Low	2964 (19.2)	951 (31.6)	226 (7.6)
Intermediate	7739 (50.1)	1612 (53.5)	1104 (37.3)
High	4754 (30.8)	448 (14.9)	1627 (55.0)
Comorbidities, median (IQR)	0.0 (0, 1)	1.0 (0, 2)	0.0 (0, 1)
SEIFA, mean (SD)	5.49 (2.8)	1.53 (.5)	9.50 (.5)
Location, *n* (%)			
Metro	10 117 (65.5)	1276 (42.4)	2767 (93.6)
Rural	5340 (34.5)	1735 (57.6)	190 (6.4)
Health rating, mean (SD)	2.63 (1.0)	2.9 (1.04)	2.4 (1.0)
Country of birth, *n* (%)			
Australia	12 410 (80.3)	2501 (83.1)	2271 (76.8)
English speaking	1340 (8.7)	245 (8.1)	296 (10.0)
Others	1707 (11.0)	265 (8.8)	390 (13.2)
Living alone, *n* (%)	2616 (16.4)	616 (20.5)	476 (16.1)
Sum score of adherence to COVID-19 measures in 2021, median (IQR)	14 (11, 15)	13 (10, 15)	15 (12, 15)
Received at least one COVID-19 vaccination in 2021, *n* (%)	9959 (64.4)	1604 (53.3)	2283 (77.2)

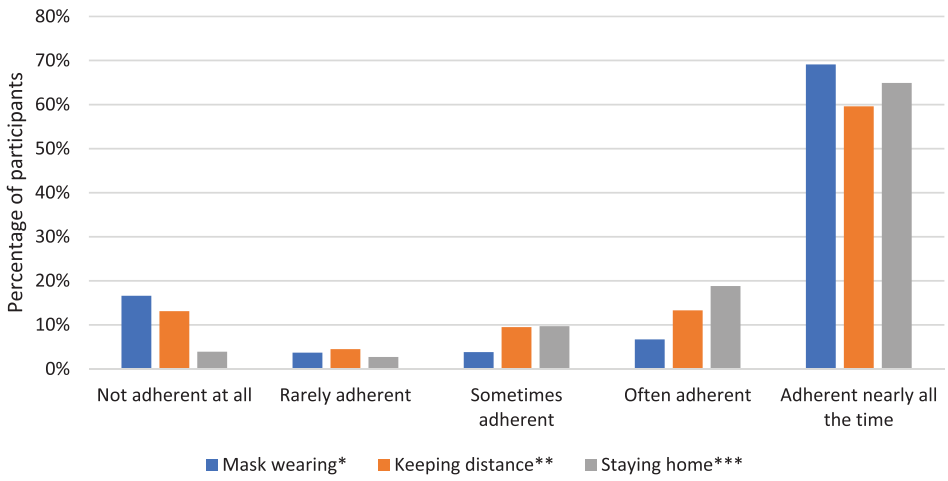

FIGURE 1 Adherence to COVID-19 preventative measures. *Mask wearing is defined as a mask or other face covering when out in public, **keeping a distance of at least 1.5 m from other persons who are not from the same household, ***staying at home and only went out for the essentials.

or higher, 'intermediate education' which included certificate III or IV, or completed high school, and 'low education' which included not completing high school. The classification of educational qualifications used in the survey was based on the Australian Standard Classification of Education.[35] Location was dichotomised into living in a metro area versus a regional/rural area. Number of comorbidities was derived from the number of chronic diagnoses the participants had in 2021 which included arthritis, asthma, any type of cancer, chronic bronchitis and/or emphysema, depression and/or anxiety, Type 1 diabetes, Type 2 diabetes, hypertension, heart disease or other serious circulatory condition, for example, stroke. People with these comorbidities have an increased risk of complications from COVID-19.[10] The total number of comorbidities was included as a continuous variable. Country of birth was categorised into 'Australia', 'countries where English is the main language' and 'other'. Self-rated health was treated as a continuous variable ranging from 1 (*excellent*) to 5 (*poor*).

2.5 | Statistical analysis

Sample characteristics were reported as means and standard deviations (SDs), or frequencies and percentages, as appropriate. Linear

TABLE 2 Association between socioeconomic status, sum score for level of adherence to COVID-19 preventative health measures and receiving COVID-19 vaccine.

	Adherence to preventative measures		Receiving COVID-19 vaccine (yes/no)	
	β (95% CI)	*p* value	OR (95% CI)	*p* value
Socioeconomic status	.08 (.04–.12)	<.001	1.27 (1.24–1.31)	<.001
Age	.01 (.01–.02)	<.001	1.05 (1.04–1.06)	<.001
Sex: female	.32 (.22–.42)	<.001	1.02 (.95–1.01)	.598
Education				
Low	ref		ref	
Intermediate	.18 (.04–.32)	.013	1.47 (1.33–1.63)	<.001
High	.35 (.19–.50)	<.001	2.85 (2.53–3.21)	<.001
Location: regional/rural	−1.08 (−1.20 to −.97)	<.001	.99 (.91–1.07)	.989
Comorbidities	.12 (.07–.17)	<.001	1.08 (1.04–1.13)	<.001
Living alone	−.01 (−.13 to .15)	.866	.90 (.82–1.0)	.05
Country of birth				
Australia	ref			
English speaking	−.42 (−.60 to −.24)	<.001	.96 (.83–1.11)	.57
Other	.38 (.22 to .55)	<.001	.84 (.75–.95)	.006
Self-rated health	.07 (.01 to .12)	.025	.87 (.83–.90)	<.001

regression was used to assess the association between SES and the sum score of adherence to COVID-19 measures. The results of this model were reported as standardised β coefficients and 95% confidence intervals (CIs). Logistic regression was used to estimate odds ratios (ORs) and 95% CIs for the association between SES and COVID-19 vaccination status. All models were adjusted for clinically relevant confounders including age, sex, education, location, number of comorbidities, country of birth and self-rated health. Models were assessed for normality, linearity, homoscedasticity and multicollinearity, and no deviations from the assumptions were observed. Statistical Package for the Social Sciences (SPSS) version 25 (IBM Corp., Armonk, NY) was used to conduct all analyses in this study.

2.6 | Ethics statement

Ethical approval for the HILDA Survey was provided by the Human Research Ethics Committee of The University of Melbourne (Research Project ID no. 1955879). Informed consent to participate in the HILDA Survey was gained through the use of an information letter to all potential respondents. This letter described the voluntary nature of participation in the survey and outlined that informed consent would be implied when participants agreed to be interviewed.

3 | RESULTS

A total of 16 549 participants completed the 2021 Household Income and Labour Dynamics (HILDA) survey. Of these, 15 875 (95.9%) were aged 18 years and older and identified as potential participants. Of these, 15 457 (97.4%) had completed data on SES, COVID-19 preventative measures, vaccine status and all covariates, and were included in the final analytical sample.

The sample mean age was 47.2 (SD 18.4) years, and 53.1% were female (Table 1). Regarding COVID-19 vaccine status, 9959 (64.4%) received at least one vaccine dose (Table 1). Regarding adherence to COVID-19 measures, 10 688 (69.1%) reported adherence to wearing masks nearly all the time whereas 2383 (16.9%) reported no adherence at all, 9215 (59.6%) reported adherence to staying at home and only going out for the essentials nearly all the time whereas 1874 (13.3%) reported no adherence at all, and 10 024 (64.9%) reported adherence to keeping a distance of at least 1.5 m from other people who were not in their household nearly all the time whereas 535 (3.8%) reported no adherence at all (Figure 1). Overall, 6730 (43.5%) participants adhered to all three COVID-19 measures nearly all the time, whilst 340 (2.2%) reported not adhering at all.

Table 2 shows the association between SES and the sum score for the level of adherence to COVID-19 preventative measures and COVID-19 vaccination status. Residing in a higher socioeconomically advantaged area was associated with a higher score of adherence ($\beta = .08$, 95% CI = .04–.012), and higher likelihood of receiving COVID-19 vaccination (OR 1.27, 95% CI = 1.23–1.31). The results also show that older age, higher education status, higher self-rated health, and higher number of comorbidities were associated with having higher adherence score and likelihood of receiving COVID-19 vaccination.

4 | DISCUSSION

Our findings show that adherence to COVID-19 preventative measures and uptake of COVID-19 vaccine in Australia in 2021 were moderate (between 60% and 70%). In addition, the study found a

small but positive association between SES and adherence to COVID-19 preventative measures and the probability of receiving COVID-19 vaccine.

It is difficult to compare the level of adherence across countries since the specific measures and their timing may differ.[36] Despite this, the level of adherence to COVID-19 preventative measures among our sample was similar to that seen in Ireland and Saudi Arabia.[37,38] In a study involving 2008 participants in Belgium, the majority reported high levels of adherence (average scores of 4.00–4.68 on a 5-point scale).[39] Contrary to our result, an earlier study in 2020 involving 1531 participants in Australia reported adherence to preventive measures to be around 88%.[40] This difference may be explained by several reasons including the different time periods (in 2020, Australia had low rates of COVID-19 infections) and differences in sample size. In addition, the previous study only assessed adherence to self-isolation, whilst the current study's measure of adherence was more comprehensive. Another factor that may play a role in the moderate adherence rate observed is pandemic fatigue.[41,42] In a telephone-based survey from April to July 2021 which included more than 60 000 adults in the United States; Agaku et al. reported similar findings.[43] This phenomena can be explained by a change in risk perception over time and a growing economic/social burden caused by the preventative measures.[41]

Our study found an association between SES and adherence to COVID-19 measures, indicating socioeconomical disadvantage is associated with lower score of adherence.[44] Roder et al. noted that incidence of COVID-19 in Victoria rose with household size, unemployment proportion and those from culturally and linguistically diverse communities.[45] Those who are socioeconomically disadvantaged are more likely to have jobs that cannot be performed remotely,[20] or live with an essential worker despite being vulnerable households.[21] Studies found those who cannot work remotely were less likely to adhere to COVID-19 preventative measures.[33,46] Similarly, a longitudinal study in Canada found families with an essential worker in the household to have a lower likelihood of adherence.[47] This may suggest that those who are socioeconomically disadvantaged are unable to optimally adhere to these preventative measures due to systemic inequities. However, poor health-related knowledge and negative attitudes towards COVID-19 preventive measures may also play a role resulting in a lower probability of these measures being followed.[27,48,49] Olapeju et al. showed a clear variation in practicing COVID-19 preventive measures between communities where knowledge of COVID-19 preventive measures was limited, compared to others where public health interventions were implemented to increase awareness and drive behavioural change.[50]

We also found an association between SES and receiving a COVID-19 vaccine. This may be due to issues of equity and access or personal choices towards receiving the vaccine.[51] In Australia, the national vaccine roll-out strategy had five phases beginning on February 2021 with those at higher risk as a priority population, followed by other subgroups based on their risk of COVID-19 complications.[52] We found an overall vaccination rate of 64.4% which is lower than those reported elsewhere. As of November 2021, completion of at least one vaccine was reported to be 73% in Australia according to Our World in Data (OWD).[53] OWD captured their data through methods such as government websites and social media accounts of national authorities whereas this study used direct questioning.[54] Also, our vaccination data does not include those who are not living in the community for example residents of an aged care or a rehabilitation facility. These individuals usually have a higher rate of vaccination as they are at a greater risk of complication if they are infected with COVID-19. During the same period, OWD reported vaccination rates of 80% in Japan, 78% in Canada and 70% in the United States indicating the uptake of vaccination was moderate in Australia, compared to other high-income countries, during 2021.[53] However, by April 2022, Australia had one of the highest vaccination rates worldwide with 83% of the total population receiving two doses.[53] This may be because the vaccine roll-out strategy increased eligibility to receive COVID-19 vaccine to those aged 16 and over from September 2021 onwards.[52] The increased uptake of vaccination from the time of our survey to this period may also be explained by the impact of the Omicron variant starting to affect the Australian community with COVID-19-related deaths rising from .8% in 2021 to 9.6% in February 2022.[52] This in addition to the fact that COVID-19 vaccination became increasingly available and essential with various local or national governments introducing proof-of-vaccination certificates.[55,56]

The findings of this study shine a light on the importance of considering inequities particularly SES as a factor when designing an educational program or an awareness campaign in times of crisis.[57] A recent report showed Australian governments with policies targeting inequalities responded better than others during the pandemic.[58] Future research should focus on developing targeted educational programs that take social and economic inequities into account to support those who are socioeconomically disadvantaged and at increased risk of worse health outcomes.[57,59]

There are several strengths and limitations in this study. It was a large, national study representative of the Australian public. In addition, to the best of our knowledge, this study was the first to explore the association between SES, adherence to COVID-19 preventative measures and receiving COVID-19 vaccination. However, the cross-sectional design means we are unable to infer a causal relationship. Furthermore, this study relied on data from self-reported responses which may be subject to several limitations including an individual's level of understanding, honesty and recall bias. Also, while SES can be measured with individual characteristics, our measure classified participants based on characteristics of an area in which they live reflecting overall characteristics of the population in an area. Hence, the results may be affected by misclassification: inequality estimates using this approach have been shown to underestimate the level of health inequality in previous research.[60] Lastly, it should be noted that public health messages and restrictions have changed regularly and variably across different states in Australia which may have under or overestimated our results. For example, some participants may not have been eligible for some vaccines during the time of data collection, contributing to lower vaccine uptake rates.

5 | CONCLUSION

Our study shows that adherence to COVID-19 preventative measures and uptake of COVID-19 vaccine in Australia in 2021 were moderate. In addition, SES was positively associated with the level of adherence to COVID-19 preventative measures. The findings of this study highlight the potential benefits of considering SES, particularly its impact on equity and access, when designing an educational program or awareness campaign in times of crisis.

ACKNOWLEDGEMENTS

This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the author and should not be attributed to either DSS or the Melbourne Institute. The authors would like to thank the participants and the HILDA team for their time and efforts.

FUNDING INFORMATION

ECKT is supported by a NHMRC-ARC Dementia Research Development Fellowship (APP1107381). The funding body had no role in the study design, collection, analysis and interpretation of data, or preparation of the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The HILDA dataset used and analysed during the current study may be available upon request; for more information please visit: https://melbourneinstitute.unimelb.edu.au/hilda/for-data-users.

ETHICS STATEMENT

Ethical approval for the HILDA Survey was provided by the Human Research Ethics Committee of The University of Melbourne (Research Project ID no. 1955879). Informed consent to participate in the HILDA Survey was gained through the use of an information letter to all potential respondents. This letter described the voluntary nature of participation in the survey and outlined that informed consent would be implied when participants agreed to be interviewed.

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How to cite this article: Aljeaidi MS, Haaksma ML, Tan ECK. Socioeconomic status and adherence to COVID-19 preventative measures in Australia: A national cohort study. Health Promot J Austral. 2025;36(2):e932. https://doi.org/10.1002/hpja.932