Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Patient Education and Counseling 105 (2022) 2793–2800

Contents lists available at ScienceDirect

Patient Education and Counseling

journal homepage: www.journals.elsevier.com/patient-education-and-counseling

Main COVID-19 information sources in a culturally and linguistically diverse community in Sydney, Australia: A cross-sectional survey

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ARTICLE INFO

Keywords:
COVID-19
Health literacy
Health information
Ethnicity
Cultural diversity
Social media

ABSTRACT

Objective: Describe COVID-19 information-seeking experiences for culturally and linguistically diverse groups in Sydney, Australia.
Methods: Cross-sectional survey, translated into 11 languages; participants recruited from March 21 to July 9, 2021. Regression models identified factors associated with difficulty finding easy-to-understand COVID-19 information.
Results: Across 708 participants (88% born overseas, 31% poor English proficiency), difficulty finding easy-to-understand COVID-19 information was rated 4.13 for English (95%CI: 3.85–4.41) and 4.36 for non-English language materials (95%CI: 4.07–4.66) (1 easy to 10 hard). Participants who were older ($p < 0.001$), had inadequate health literacy ($p < 0.001$), or poor English proficiency ($p < 0.001$) found it harder to find easy-to-understand English-language COVID-19 information. Those who had greater difficulty finding easy-to-understand non-English COVID-19 information were younger ($p = 0.004$), had poor English proficiency ($p < 0.001$), were university-educated ($p = 0.05$), and had spent longer living in Australia ($p = 0.001$). They were more likely to rely on friends and family for COVID-19 information ($p = 0.02$). There was significant variation in information-seeking experiences across language groups (p's < 0.001).
Conclusions: Easy-to-understand and accessible COVID-19 information is needed to meet the needs of people in culturally and linguistically diverse communities.
Practice implications: COVID-19 communication efforts must involve working alongside these communities to leverage existing communication channels and tailor messages.

1. Introduction

Culturally and linguistically diverse communities have endured a disproportionate burden of the COVID-19 pandemic both in Australia and internationally. This is reflected in direct health impacts (e.g. greater risk of infection and death from COVID-19 [1]) and psychological and socioeconomic impacts. The inequity in these impacts is exacerbated by more crowded living conditions and a larger proportion of people working in industries not easily adapted to distancing or stay-at-home orders, such as care, healthcare, cleaning, and hospitality [2–4]. Adding to this burden, public health communication about COVID-19 has often overlooked the needs of culturally and linguistically communities [5,6]. Collaboratively developing tailored, accessible, and understandable communication with these communities is an important step towards equitable healthcare [7], but continues to be relatively scarce. Public health communication that is clear and effective across diverse communities is needed to ensure widespread understanding, acceptance, and engagement in COVID-19 prevention behaviours [8].

The extent that COVID-19 public health communication efforts fall short of community needs can be clearly observed even through relatively crude methods. For example, a recent study showed that the median grade reading score for Australian government COVID-19 information on vaccination, mask-wearing, and physical distancing ranged from Grade 12 to university level (Grade 14) for resources

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https://doi.org/10.1016/j.pec.2022.03.028
Received 13 December 2021; Received in revised form 28 March 2022; Accepted 28 March 2022
Available online 30 March 2022

collected in April 2021 [9] This is 4–6 grades beyond the recommended Grade 8 reading level for effective communication to the average reader in the community [10]. Similarly, our survey of over 4000 Australians at the start of the pandemic (April 2020) found that even single-item questions that roughly estimate health literacy (skills for accessing, understanding and acting on health information) identified that low health literacy was associated with lower confidence understanding government COVID-19 information, and poorer knowledge of COVID-19 symptoms and prevention behaviours [11]. Similar findings were observed for people who did not people speak English as their main language at home [11]. Even when official COVID-19 messages are translated, in Australia these have been criticized for their poor quality [12] and visibility [13].

Several research, service, and policy groups provide guidance on how health organizations can work with communities to create effective communication [7,14–16]. For example, Wild and colleagues [7] emphasize the role of community collaboration in tailoring COVID-19 messages for specific communities, and delivering these through trusted messengers using appropriate and accessible channels. Collectively these models advise that public health efforts must disseminate information and advice through communication channels that the community can and do access [7,14]. However, there is limited data to inform how health services identify the most appropriate channels. Our Australia-wide survey conducted in April 2020 found most participants obtained information about COVID-19 through public (Australian government) television (68%), social media (64%), and government websites (64%), but that participants with inadequate health literacy reported that information about COVID-19 was more difficult to find [11]. Though this survey is a useful starting point, participants with inadequate health literacy and who speak a language other than English at home represented only a small proportion of the total sample; 549 participants (13%) had inadequate health literacy, and only 274 (6%) reported that they did not speak English as their main language at home. The analysis was also limited by the fact that the survey was only available in English, precluding many people from culturally and linguistically diverse communities from taking part. As a result, the study has limited capacity to inform collaborative efforts to tailor COVID-19 public health communication to specific culturally and linguistically diverse communities.

Other Australian research from focus groups with community representatives and multicultural health services have highlighted the important role of community leaders in disseminating COVID-19 information, and community members' reliance on overseas information sources, particularly when non-English Australian information was unavailable or delayed [17,18]. Another study found that Australian non-English speaking mothers of young children were more likely to rely on social media and family to find out about COVID-19 [19]. Qualitative research with members of 19 different cultural groups in the United Kingdom reported that COVID-19 information was often sourced from friends and family via social media, and that a small proportion of participants obtained their information from overseas [20].

In Australia, the 'Greater Western Sydney' area makes up 28.9% of the New South Wales (NSW) population, and is home to dozens of cultural and language groups, with up to 39% of residents born overseas in non-English speaking countries, and 44% speaking a language other than English at home (respective rates are 28% and 25% across NSW) [21]. This presents real challenges in identifying the most appropriate communication channels as each group may have distinct informational needs and information-seeking behaviours. The current study aimed to explore COVID-19 information-seeking experiences and behaviours in the three adjoining local health districts that make up Greater Western Sydney: Western Sydney, Southwestern Sydney, and Nepean Blue Mountains, between March and July 2021. This paper also examines patterns in information-seeking experiences in relation to COVID-19 risk perception, knowledge, and prevention behaviours. Data on COVID-19 testing and vaccination intentions, and the socioeconomic and psychological impacts of the pandemic are reported elsewhere [22,23].

2. Methods

2.1. Study design

This study used a cross-sectional survey design. The study was approved by Western Sydney Local Health District Human Research Ethics Committee (Project number 2020/ETH03085).

2.2. Setting

Participants were recruited from 21st March to July 9th, 2021. During this period, the COVID-19 vaccine rollout had begun across Australia, and daily cases of community transmission in NSW ranged from 0 to 45 [24]. Restrictions across Greater Sydney began on June 23rd [25], including limitations on the number of people allowed to visit a household, maximum number of people in an exercise class, and reduced seating capacity for outdoor events. On the day the survey closed (July 9th) the NSW daily case count was 45, and NSW Health announced stay-at-home orders for Greater Sydney [26]. The survey was closed at this time despite some recruitment targets not reached so that results could be more readily interpreted.

2.3. Participants

Participants were eligible to take part if they were aged 18 or over and spoke one of the following as their main language at home: Arabic, Assyrian, Croatian, Dari, Dinka, Hindi, Khmer, Chinese, Samoan, Tongan, or Spanish. We selected these ten language groups through iterative discussions with Multicultural Health staff, with the aim of providing broad coverage across different global regions, groups with varying average levels of English language proficiency (based on 2016 Australian census data) [27], varying access to non-English language materials, and varying degrees of reading skill in their main language spoken at home (Appendix 2). As shown in Appendix 2, COVID-19 information was commonly available in Hindi, Arabic and Chinese. Though there are large numbers of Assyrian and Spanish speakers in Greater Western Sydney (in the top 10 in South Western Sydney Local Health District), COVID-19 information was not routinely translated into these languages at the time of recruitment. Each of the language groups selected was an important group within the Greater Western Sydney region (Western Sydney Local Health District, South Western Sydney Local Health District, Nepean Blue Mountains Local Health District). Recruitment targets were based on pragmatic considerations. We considered 100 participants for each language group an achievable number that would allow sufficient data points to observe patterns across age group and gender within a given language group (approximately 15–20 participants per 10-year age group across both genders).

Participants were recruited through bilingual Multicultural Health staff and Health Care Interpreter Service staff. Multicultural Health staff recruited participants through their existing networks, community events and community champions, in-person, and by phone, email, or social media. Health Care Interpreter Service staff recruited participants at the end of a medical appointment. Potential participants were offered two means of taking part: completing the survey themselves online (available in English or translated), or bilingual staff or an interpreter entering responses into the survey platform on the participants' behalf. To ensure consistency in the phrases used for assisted survey completion, translated versions of the survey were provided to the bilingual staff and interpreters. No incentives were provided for survey participation.

2.4. Survey design

Surveys were available in English or translated, using translators

with National Accreditation Authority for Translators and Interpreters (NAATI) accreditation where possible. Surveys were hosted on the web-based survey platform Qualtrics. Items relevant to this manuscript are shown in Table 1 (Survey shown in Appendix 3). Survey items were adapted from McCaffery et al. [11] to improve the accessibility of the survey for people from culturally and linguistically diverse communities with varying levels of health literacy (e.g. by using simpler language), based on feedback from Multicultural Health staff.

2.5. Analysis plan

Frequencies were weighted (using post-stratification weighting) to reflect each language group's gender and age group distribution (18–29 years, 30–49 years, 50–69 years, ≥70 years) based on 2016 census data for Western Sydney, South Western Sydney, and Nepean Blue Mountains' combined populations [27]. All summary statistics presented in the results section are weighted unless otherwise indicated. A single participant indicated their gender as 'other' and was unable to be included in weighted analyses. Survey items about COVID-19 information sources were re-coded to reflect the categories presented in Table 2 to facilitate a more meaningful interpretation of the results. Multiple linear regression models were used to determine factors associated with risk perception, COVID-19 prevention behaviours (averaged across five behaviours), and knowledge. Age group, gender, health literacy, English-language proficiency, years lived in Australia, risk perception, language group, and information sources were included in each model. The regression model also controlled for socioeconomic status of area of residence (based on Index of Relative Socio-economic Advantage and Disadvantage (IRSAD [29]) deciles by postcode), and whether participants completed the survey before or after 23rd June, when restrictions were announced for all of Greater Sydney [25]. The IRSAD decile was not available for some participants (n = 5), for example, because they had entered digits that did not correspond to a current or previously valid Australian postcode. IRSAD decile for these participants was replaced with the median IRSAD decile for speakers of the same language in the sample. Statistical analysis was conducted using Complex Sample procedures in IBM SPSS Statistics 26.

Free-text responses to the question "Are there any cultural practices that you think might mean you are more likely to get COVID-19?" were analyzed using content analysis [30]. After non-English responses were translated by bilingual staff, KP familiarized herself with the content and developed a list of preliminary content categories. These categories were refined through discussion with the other authors. OM and RK coded 305 valid responses according to the final coding framework. The level of agreement was tested with the Cohen Kappa using 40 responses,

Table 1
Survey items.

Category	Items
Socio-demographic	Self-reported age, gender, education, years living in Australia, main language spoken at home, English language proficiency, reading proficiency in language spoken at home, postcode, access to the internet, access to smartphones, chronic disease, and a validated and widely-used single-item health literacy screener[28]
Information sources and information-seeking experiences	• Top 3 information sources for finding out about COVID-19 in the previous 4 weeks, via 8 categories (TV, radio, social media, websites, printed materials, 'family, friends and community', health professionals, and other. Participants were then asked for more specific answers (e.g. which kind of social media), adapted from our previous COVID-19 survey[11] • Which country overseas information came from and the language it was provided in • Perceived difficulty finding easy-to-understand information about COVID-19, both in English and in their main language, on a 10-point scale ranging from 1 (not at all difficult) to 10 (extremely difficult) adapted from our previous COVID-19 survey[11]
Knowledge	Participants asked to identify three signs (symptoms) of COVID-19 and three steps they could take to protect themselves or others from getting COVID-19[11]. Scored out of 6.
Attitudes and intentions	Risk perception: "how serious a problem do you think COVID-19 is currently, in Australia?" with responses ranging from 0 (not serious at all) to 10 (very serious), adapted from our previous COVID-19 survey[11]
Prevention behaviours	Participants reflected on the previous four weeks for the following behaviours: I wash my hands frequently with soap and water (for at least 20 s); I stay 1.5 m away from other people outside my home; I avoid close contact with anyone with cold or flu like symptoms; I have stopped shaking hands; hugging or kissing as a greeting; I wore a mask in places where it was hard to stay 1.5 m away from people. captured using 5-point Likert scales (1 = strongly disagree to 5 =strongly agree).

Table 2
Descriptive statistics (categorical variables).

Variable	n	%
Age group		
18–29	147	20.8
30–49	295	41.7
50–69	193	27.3
> 70	72	10.2
Gender[a]		
Male	344	48.7
Female	363	51.3
Language		
Assyrian	133	18.8
Croatian	121	17.1
Arabic	80	11.3
Chinese	76	10.7
Khmer	63	8.9
Dinka	63	8.9
Dari	44	6.2
Spanish[b]	43	6.1
Hindi	42	5.9
Samoan/Tongan	42	5.9
English language proficiency (How well do you speak English?)		
Very well/ well	487	68.9
Not well/not at all	220	31.1
Literacy in a language other than English (How well do you read in your main language?)		
Very well/ well	589	83.4
Not well/not at all	118	16.6
Adequate health literacy	417	58.9
Highest level of education		
Less than year 12(less than high school)	115	16.2
Year 12 (high school graduate)	133	18.9
Certificate level I to IV / Advanced diploma and diploma level	249	35.3
Bachelor degree level and above	210	29.7
Has a computer with internet access	573	81.1
Has a smartphone	686	97.1
Years living in Australia		
5 years or less	120	16.9
6–10 years	104	14.7
More than 10 years	398	56.4
Born in Australia	85	12.0
COVID-19 knowledge (correctly naming 3 symptoms and 3 steps to prevent COVID-19 infection for self or others)	638	90.3
Total	**707**	

[a] 1 respondent indicated 'other/prefer not to say' and is not included in weighted analysis presented in this table;
[b] Spanish language group had substantial gaps in recruitment across age groups.

which indicated substantial agreement (κ = 0.83) [31]. Discrepancies were discussed with JA before coding the remaining responses.

3. Results

3.1. Sample description

Of the total 708 participants, 442 completed the survey independently (62.4%; unweighted); interpreters or bilingual staff completed the survey on behalf of 266 participants (37.6%; unweighted). One fifth completed the survey in English (n = 151 (unweighted); 21.3%). The mean age was 45.4 years (95% CI: 43.9–47.0; range 18–91 years), and 51% of respondents were female (n = 363; Table 2). Most participants (88%, n = 622) were born in a country other than Australia; 31% reported that they did not speak English well or at all (n = 220); 70% had no undergraduate (bachelor degree or higher) qualifications (n = 497). Inadequate health literacy was identified for 59% of the sample (n = 290). On average, participants rated the difficulty of finding easy-to-understand COVID-19 information in English 4.13 on a scale from 1 (not at all difficult) to 10 (extremely difficult) (95% CI: 3.85–4.41). This was on average 4.36 for finding easy-to-understand COVID-19 information in another language (95% CI: 4.07–4.66). Almost all participants (90.3%; n = 638) could correctly identify 3 symptoms of COVID-19 and 3 steps to prevent the virus' spread (Table 2). The average score for self-reported adherence to COVID-19 prevention behaviours in the last 4 weeks was 4.40 out of 5 (95% CI:4.32–4.47), on a scale from 1 (strongly disagree) to 5 (strongly agree) (Appendix Table S1). When asked to rate how much of a problem COVID-19 is currently in Australia, on average participants responded with 4.37 (where 0 ='not serious at all' and 10 = 'very serious'; 95% CI: 4.10–4.65) (Appendix Table S2).

3.2. Information sources

The most common information sources for finding out about COVID-19 were official Australian sources/public broadcasters (59.5%, n = 421), Australian commercial sources (58.9%, n = 417), and social media (56.2%, n = 397) (Table 3; Appendix Table S3). TV and websites were the most common formats, with 69.4% of the sample (n = 491) reporting that TV was a main information source, and 41.8% reporting using websites (n = 296). Overall, half of participants (55.2%, n = 390) reported that most of this information was presented in English.

Participants aged less than 30 years reported the highest use of social media (78.5%, n = 115) (Table 4). Participants in the oldest age group (70 years or more) reported the highest use of friends or family living in Australia (65.6%, n = 47), community information sources (including religious or community leaders, community TV and radio) (58.8%, n = 42), and overseas information sources (58.6%, n = 42). Younger age groups obtained most of their information in English (e.g. 81% of participants <30 years obtained information mostly in English). Participants with inadequate health literacy obtained most of their information in a language other than English (71.0%, n = 206); this proportion was 25.6% for participants with adequate health literacy (n = 107; Table 4). Participants with inadequate health literacy also reported higher use of friends or family (56.8% vs 20.9%), community (38.4% vs 20.9%) and overseas information (41.8% vs 20.2%).

Use of Australian official sources or public broadcasters ranged from 28.9% (n = 12) for Samoan/Tongan speakers, to 91.7% (n = 58) for Khmer speakers (Appendix Table S3). Reliance on family and friends living in Australia as a main source of COVID-19 information ranged from 14.6% (n = 9) for Dinka speakers, to 63.3% (n = 77) for Croatian speakers; use of community sources (including TV, radio, and community or religious leaders) ranged from 6.8% (n = 5) for Arabic speakers, to 65.3% (n = 79) for Croatian speakers. Use of overseas information sources also varied greatly, from 5.3% (n = 3) for Khmer speakers, to 98.4% (n = 119) for Croatian speakers.

Table 3
Main COVID-19 information sources[a].

Main COVID-19 information sources	Total	
	n	%
Official Australian source / public broadcaster	**421**	**59.5**
Health professional	241	34.1
Australian public TV	237	33.5
Australian government websites	163	23.1
Australian public radio/podcasts	57	8.1
Australian Commercial source	**417**	**58.9**
Australian commercial TV	334	47.2
Australian news/magazine website	140	19.8
Australian commercial radio/podcast	28	3.9
Printed newspapers or magazines	20	2.8
Social media	**397**	**56.2**
Facebook	312	44.1
YouTube	189	26.7
Instagram	136	19.3
WhatsApp	112	15.8
Other (snapchat, twitter, twitch, weibo, wechat)	124	17.6
Friends or family living in Australia	**252**	**35.7**
Living in Australia more years than participant	197	27.9
Living in Australia same years or fewer	162	22.9
Community	**196**	**27.8**
Community leader	99	14.0
Community TV (e.g. Chinese Television Network)	64	9.1
Religious leader	45	6.4
Community radio/podcast	44	6.2
Overseas information sources	**205**	**29.0**
Overseas website	128	18.2
Overseas TV	128	18.0
Friends or family living overseas	109	15.4
Overseas Radio/podcast	8	1.1
Any TV	**491**	**69.4**
Any website	**296**	**41.8**

[a] Categories and subcategories not mutually exclusive.

3.3. Analysis: COVID-19 information-seeking experiences, knowledge, risk perception, and prevention behaviours

3.3.1. Information-seeking experiences

3.3.1.1. Finding easy-to-understand English-language COVID-19 information. Participants experienced significantly greater difficulty finding easy to understand English-language COVID-19 information if they were older ($p < 0.001$), had inadequate health literacy (Mean Difference (MD)= −1.43, 95%CI − 2.03 to − 0.82, $p < 0.001$), or had poor English proficiency (MD=−1.9, 95% CI-2.51 to −1.29, $p < 0.001$) (Table 5). There were also differences across language groups ($p < 0.001$; Table 5). Those who reported using Australian commercial information sources reported less difficulty finding easy-to-understand COVID-19 information in English (MD=−0.51, 95% CI −0.94 to −0.08, $p = 0.02$).

3.3.1.2. Finding easy-to-understand non-English COVID-19 information. Participants who were younger ($p = 0.004$), had poor English proficiency (MD=−1.61, 95% CI −2.29 to −0.9, $p < 0.001$), who had attained a bachelor degree education or higher (MD=0.77, 95% CI 0.00–1.53, $p = 0.05$), and who had spent longer living in Australia ($p = 0.001$) experienced significantly greater difficulty finding non-English COVID-19 information that was easy to understand (Table 5). Those who had greater difficulty finding non-English COVID-19 information that was easy to understand were also more likely to rely on friends and family to find out about COVID-19 (MD=0.70, 95% CI: 0.11–1.28, $p = 0.02$). There were also differences observed across language groups ($p < 0.001$; Table 5).

3.3.2. Knowledge and risk perception

We observed significant differences in COVID-19 risk perception and knowledge across language groups (p's < 0.001, Table 6). Participants

Table 4
Main COVID-19 information sources, by gender, age group and health literacy[a].

Information source	Gender				Age group								Health literacy			
	Male		Female		< 30		30–49		50–69		70 +		Inadequate		Adequate	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Australian official / public broadcaster	204	59.4	217	59.7	89	60.5	168	57.0	115	59.6	49	68.1	160	55.1	261	62.6
Australian Commercial source	208	60.6	208	57.4	85	57.9	197	66.7	116	59.9	19	26.6	138	47.5	279	66.9
Social media	188	54.7	209	57.6	115	78.5	188	63.7	77	39.8	17	23.9	132	45.4	265	63.7
Friends or family living in Australia	111	32.2	142	38.9	44	30.0	76	25.6	85	44.2	47	65.6	165	56.8	87	20.9
Community	93	27.2	103	28.3	19	12.9	56	18.9	79	41.1	42	58.8	111	38.4	85	20.4
Overseas information sources	104	30.4	101	27.8	24	16.4	70	23.7	69	35.9	42	58.6	121	41.8	84	20.2
Mostly in English	186	54.1	204	56.2	119	81.1	189	64.0	74	38.2	9	12.0	84	29.0	306	73.5
Mostly in another language	154	44.7	159	43.8	26	17.8	106	36.0	117	60.6	63	88.0	206	71.0	107	25.6
Total	**344**		**363**		**147**		**295**		**193**		**72**		**290**		**417**	

[a] Differences by language group are reported in Appendix Table S3.

who listed social media as one of their main COVID-19 information sources reported significantly higher knowledge (MD=0.29, 95% CI: 0.05–0.54, p = 0.02) and risk perception (MD =0.56, 95% CI: 0.11–1.02, p = 0.02), compared to those who did not use social media. English-language proficiency, health literacy, and education were not significantly associated with COVID-19 knowledge or risk perception. Female participants obtained lower knowledge scores compared to males (MD=−0.20, 95%CI: −0.40 to 0.00, p = 0.05). Participants who had lived in Australia for more than 10 years had lower risk perception compared to participants who had lived in Australia 5 years or less (MD=0.82, 95%CI: 0.22–1.42, p = 0.01).

3.3.3. *COVID-19 prevention behaviours*

English-language proficiency, health literacy, and education were not significantly associated with adherence to COVID-19 prevention behaviours (Table 6). Years lived in Australia was inversely associated with COVID-19 prevention behaviours (p < 0.001); participants who had lived in Australia for 6–10 years, more than 10 years, or who were born in Australia, reported lower levels of COVID-19 prevention behaviours compared to participants who had moved to Australia in the previous 5 years. We observed differences in self-reported COVID-19 prevention behaviours across language groups (p < 0.001). Relying on family and friends living in Australia as a source of information for COVID-19 was associated with significantly lower self-reported COVID-19 prevention behaviours (MD =−0.13, 95% CI: −0.25 to −0.00, p = 0.04).

Participants were asked to describe what cultural practices might increase the spread of COVID-19. From 305 responses we generated 6 topics (Table 7). For example, 61.4% of the participants who provided a response (n = 188) indicated that typical greeting behaviours made distancing behaviours more challenging, followed by community gatherings (43.8%, n = 134).

4. Discussion and conclusion

4.1. *Discussion*

In this Australian survey of people from culturally and linguistically diverse communities, participants who were older, who had inadequate health literacy and poor self-reported English proficiency found it harder to find English-language COVID-19 information that was easy for them to understand. Those who had greater difficulty finding easy-to-understand non-English COVID-19 information were more likely to rely on friends and family for this information. Using social media to find out about COVID-19 was more common for younger participants, whereas more than half of participants aged over 70 years relied on friends or family living in Australia (66%), community (59%), and overseas information sources (59%). More than half of participants with inadequate health literacy relied on friends or family living in Australia as a main information source (57%). Perceived seriousness of COVID-19 (risk perception), and difficulty finding easy-to-understand information about COVID-19 differed across language groups. Most participants could correctly identify three COVID-19 symptoms and three steps to prevent its spread, and reported high adherence to COVID-19 prevention behaviours. Use of social media as a main COVID-19 information source was associated with greater knowledge and risk perception. More years living in Australian and reliance on Australian friends and family for information about COVID-19 were both associated with lower prevention behaviours.

Two findings from this survey warrant further comment. Firstly, that people who were more educated reported that it was harder to find easy-to-understand non-English COVID-19 information, compared to less educated participants. This could reflect a desire for more detailed or complex Australian COVID-19 information (which is often not translated into other languages), or that this group has less contact with organizations that disseminate more detailed information in another language (e.g. community organizations). Secondly, participants who had lived in Australia for fewer years reported greater adherence to COVID-19 prevention behaviours. One possible interpretation is that more recent migrants are more concerned about fines or legal notices for violating public health orders because of the perceived implications for visa security.

This study is strengthened by recruitment methods that were inclusive and reduced barriers to participation, such as translated versions of the survey, use of interpreters, and use of multiple recruitment methods (including through social media, community events, and through community networks). Further, by including several variables related to culture and language (e.g. English language proficiency, literacy in own language, and years living in Australia), and focusing on 10 specific language groups (more detail provided in our community summaries in Appendix 4), this study provides a more nuanced understanding of the sample, providing more practical avenues of action to support these communities. This is in stark contrast to many studies which are only able to provide data on e.g. language spoken at home or years living in Australia, including our own previous work [11]. Further work could explore experiences within a single language or culture to provide even more specific practical avenues of action.

The limitations of the study are that recruitment for some language groups was lower than anticipated (n < 50). For these language groups, estimates may be less reliable. We acknowledge that this is a convenience sample; response rate data is not available due to the study's practical constraints and the diversity of recruitment channels used. Recruiting participants via health services may also have given an overestimate of reliance on health professionals for COVID-19 information.

In addition there are some limitations of the survey instrument. Using a relatively simple knowledge measure, we observed high levels of knowledge and self-reported COVID-19 prevention behaviours. This may have limited our ability to identify important predictors of these outcomes. Future work could consider more difficult knowledge questions or objectively observe behaviours. Practical constraints also

Table 5
Multiple regression model of factors associated with difficulty finding information about COVID-19 that is easy to understand[a].

Predictor	**English-language information** (1 not at all difficult to 10 extremely difficult)		**Non-English language information** (1 not at all difficult to 10 extremely difficult)	
	Mean difference (95% CI)	**P value**	**Mean difference (95% CI)**	**P value**
Gender				
Male	Reference		Reference	
Female	0.31 (−0.06 to 0.69)	0.10	-0.51 (−1.02 to 0.01)	**0.05**
Age group		**< 0.001**		**0.004**
18–29	Reference		Reference	
30–49	0.27 (−0.33 to 0.88)	0.37	-1.27 (−2.18 to −0.3)	**0.01**
50–69	0.29 (−0.43 to 1.01)	0.43	-1.71 (−2.72 to −0.6)	**< 0.001**
> 70	1.69 (0.74–2.64)	**< 0.001**	-2.23 (−3.47 to −0.9)	**< 0.001**
English-language proficiency				
Low	Reference		Reference	
High	-1.90 (−2.51 to −1.29)	**< 0.001**	-1.61 (−2.29 to −0.9)	**< 0.001**
Health literacy				
Inadequate	Reference			
Adequate	-1.43 (−2.03 to −0.82)	**< 0.001**	0.13 (−0.53 to 0.79)	0.70
Education				
Less than bachelor degree	Reference		Reference	
Bachelor degree or above education	-0.17 (−0.71 to 0.37)	0.54	0.77 (0.00–1.53)	**0.05**
Risk perception (0 low to 10 high)	0.03 (−0.05 to 0.11)	0.42	-0.08 (−0.19 to 0.03)	0.15
Years living in Australia		0.55		**0.001**
5 years or less	Reference		Reference	
6–10 years	0.13 (−0.52 to 0.79)	0.69	0.93 (0.09–1.76)	0.03
More than 10 years	-0.16 (−0.77 to 0.46)	0.61	1.24 (0.48–2.00)	**< 0.001**
Born in Australia	-0.43 (−1.24 to 0.39)	0.30	1.96 (0.73–3.19)	**0.002**
Language^		**< 0.001**		**< 0.001**
Information source†				
Official Australian source/public broadcaster	-0.09 (−0.54 to 0.36)	0.68	0.05 (−0.53 to 0.63)	0.87
Australian commercial source	-0.51 (−0.94 to −0.08)	**0.02**	0.27 (−0.31 to 0.86)	0.36
Social media	-0.36 (−0.81 to 0.08)	0.11	0.01 (−0.53 to 0.55)	0.98
Friends or family living in Australia	-0.23 (−0.69 to 0.23)	0.33	0.70 (0.11–1.28)	**0.02**
Community	0.28 (−0.18 to 0.74)	0.24	0.00 (−0.66 to 0.66)	0.99
Overseas information source	0.31 (−0.29 to 0.91)	0.31	0.02 (−0.72 to 0.75)	0.96

Notes. Both outcome variables ranged from 1 (not at all difficult) to 10 (extremely difficult). A negative mean difference indicates that predictor was associated with less difficulty finding easy-to-understand COVID-19 information. A positive mean difference indicates the predictor was associated with greater difficulty for this task.

^ Individual comparisons for language group not presented, p value refers to main effect of language;

† Information sources entered as separate variables as participants could select more than one.

[a] These models also control for IRSAD decile (as a linear variable) and date of survey completion (binary variable, before/after 23 June when restrictions in Greater Sydney were imposed). 1 respondent indicated 'other/prefer not to say' and is not included in weighted analysis;

limited the number of languages we could include; further research involving other languages and cultures in Greater Western Sydney (and beyond) will deepen our understanding of how people in these communities have experienced the COVID-19 pandemic in Australia.

4.2. Conclusion

Culturally and linguistically diverse communities in Greater Western Sydney each have distinct patterns of COVID-19 risk, behaviours, and information-seeking experiences and preferences. This study highlights that across languages, those who speak English less proficiently and who have inadequate health literacy find it more challenging to find information about COVID-19 that is easy to understand. Community and health professional communication channels could benefit from additional support that increases their capacity to engage and inform people in these communities. Efforts could also focus on ensuring the quality and accuracy of information spread by word of mouth through family and friends.

4.3. Practice implications

The high level of variation across language groups emphasizes the need for tailored public communication efforts that meet the needs of people in the community, not only in terms of translation, but also health literacy (for English and non-English materials) and consideration of communication channel accessibility and preferences. Some communication channels may be underutilized. For example, less than one third of participants listed community resources (including leaders, TV and radio) as a main information source, despite the clear role that these resources play in effective communication and increased engagement. They were also more often used by groups who had difficulty finding information that was easy to understand (older age and inadequate health literacy). Increased funding, resources, policy and infrastructure are needed to establish, support and strengthen community-based communication channels. Similarly, only one-third of participants reported health professionals as a main information source. Actively engaging health professionals and community health to deliver public health messages may be another avenue for improving COVID-19 communication, as suggested by the UK's National Health Service Race and Health Observatory COVID-19 Working Group [15].

There is also opportunity to augment COVID-19 communication channels that are already widely used, for example, social media. Whilst social media is often discussed as a contributor to misinformation [32], in this study, it was associated with greater COVID-19 knowledge and perceived seriousness of COVID-19. Public and commercial TV were also widely used in our sample but could be made more inclusive by consistently incorporating subtitles. Efforts could also ensure that information shared amongst friends and family is of high quality and accuracy, as we found this information source was associated with lower self-reported COVID-19 prevention behaviours.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.; academic authors supported by National Health and Medical Research Council, Heart Foundation, and Western Sydney Local Health District.

CRediT authorship contribution statement

Ayre J.: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Writing – original draft, **McCaffery K.J.**: Conceptualization,

Table 6
Multiple linear regression model of factors associated with knowledge, risk perception and behaviours[a].

Predictor	**Knowledge** (out of 6)		**Risk perception** (0 low to 10 high)		**Behaviours** (1 low to 5 high)	
	Mean difference (95% CI)	**P value**	**Mean difference (95% CI)**	**P value**	**Mean difference (95% CI)**	**P value**
Gender						
Male	Reference		Reference			Reference
Female	-0.20 (−0.40 to 0.0)	**0.05**	0.27 (−0.14 to 0.67)	0.20	0.04 (−0.08 to 0.17)	0.49
Age group		0.53		**0.05**		**< 0.001**
18–29	Reference		Reference		Reference	
30–49	0.11 (−0.18 to 0.40)	0.45	-0.63 (−1.28 to 0.02)	0.06	0.07 (−0.11 to 0.24)	0.44
50–69	0.14 (−0.23 to 0.51)	0.46	-0.77 (−1.56 to 0.02)	0.06	0.32 (0.13–0.51)	**< 0.001**
> 70	-0.08 (−0.56 to 0.41)	0.76	-0.17 (−1.10 to 0.76)	0.72	0.44 (0.21–0.68)	**< 0.001**
English-language proficiency						
Low	Reference		Reference		Reference	
High	0.06 (−0.21 to 0.33)	0.67	-0.19 (−0.77 to 0.40)	0.53	0.07 (−0.07 to 0.22)	0.32
Health literacy						
Inadequate	Reference		Reference		Reference	
Adequate	0.06 (−0.19 to 0.31)	0.65	-0.06 (−0.65 to 0.54)	0.86	0.10 (−0.06 to 0.26)	0.22
Education						
Less than bachelor degree	Reference		Reference		Reference	
Bachelor degree of above	-0.02 (−0.32 to 0.28)	0.91	0.08 (−0.47 to 0.63)	0.79	-0.04 (−0.25 to 0.16)	0.68
Risk perception (0 low to 10 high)	0.05 (0.00–0.10)	**0.04**	—		0.05 (0.02–0.07)	**< 0.001**
Years living in Australia		0.16		**0.001**		**< 0.001**
5 years or less	Reference		Reference		Reference	
6–10 years	-0.04 (−0.63 to 0.55)	0.90	0.19 (−0.50 to 0.88)	0.59	-0.30 (−0.52 to −0.00)	**0.01**
More than 10 years	0.10 (−0.41 to 0.62)	0.69	0.82 (0.22–1.42)	**0.01**	-0.40 (−0.57 to −0.20)	**< 0.001**
Born in Australia	-0.02 (−0.74 to 0.70)	0.96	-0.54 (−1.36 to 0.28)	0.20	-0.45 (−0.71 to −0.20)	**< 0.001**
Language[^]		**< 0.001**		**< 0.001**		**< 0.001**
Information source[†]						
Official Australian source/public broadcaster	0.24 (0.00–0.48)	0.05	0.09 (−0.42 to 0.60)	0.72	0.01 (−0.14 to 0.16)	0.91
Australian commercial source	-0.11 (−0.34 to 0.12)	0.36	0.19 (−0.27 to 0.66)	0.41	0.15 (−0.04 to 0.34)	0.11
Social media	0.29 (0.05–0.54)	**0.02**	0.56 (0.11–1.02)	**0.02**	0.02 (−0.12 to 0.16)	0.74
Friends or family living in Australia	0.16 (−0.06 to 0.37)	0.15	0.68 (0.17–1.19)	**0.01**	-0.13 (−0.25 to −0.00)	**0.04**
Community	0.07 (−0.20 to 0.33)	0.62	0.30 (−0.30 to 0.90)	0.33	0.11 (−0.06 to 0.29)	0.21
Overseas information source	0.01 (−0.28 to 0.3)	0.95	-0.28 (−1.02 to 0.47)	0.47	-0.10 (−0.29 to 0.08)	0.28

[^] Individual comparisons for language group not presented, p value refers to main effect of language;
[†] Information sources entered as separate variables as participants could select more than one
[a] These models also control for IRSAD decile (as a linear variable) and date of survey completion (binary variable, before/after 23 June when restrictions in Greater Sydney were imposed). 1 respondent indicated 'other/prefer not to say' for the survey item about gender and is not included in weighted analysis;

Table 7
Content analysis of practices perceived to increase COVID-19 infection (n = 305)[a].

Topic	Example quote	n	%
Greetings	*"The way we greet each other, lots of contact and physical closeness"*	188	61.4
Gatherings	"*Our soccer games, church gatherings, and the way we greet - hand shaking, kissing and hugging*"	134	43.8
Attending a place of worship	"*Participation in weddings and religious ceremonies*"	30	9.8
Close proximity to others	"*Stay close to the sick people and no mask"*	26	8.6
Not wearing masks	*"Many people refuse to wear masks, and they are unfriendly towards people who do wear masks."*	8	2.8
Social home visit	"*visiting relative and family gathering, and people are hiding any symptoms*"	6	1.9

[a] Responses could be coded to more than 1 Topic.

Methodology, Supervision, Writing – review & editing. **Muscat D.M.**: Investigation, Methodology, Writing – original draft. **Mac O.**: Data curation, Formal analysis, Resources, Writing – review & editing. **Batcup C.**: Data curation, Resources, Writing – review & editing. **Cvejic E**: Conceptualization, Formal analysis, Methodology, Software, Writing – review & editing. **Pickles K.**: Conceptualization, Formal analysis, Methodology, Writing – review & editing. **Dolan H., Bonner C.**: Conceptualization, Methodology, Writing – review & editing. **Mouwad D., Zachariah D., Turalic U., Santalucia Y., Chen T., Vasic G.**: Conceptualization, Investigation, Methodology, Project administration, Resources, Writing – review & editing.

Declaration of Competing Interest

None stated.

Acknowledgements

We would like to acknowledge the efforts of all community health workers, local health district staff, community champions, and community leaders who supported and contributed to this project. We would also like to thank all participants for their involvement.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.pec.2022.03.028.

References

[1] Pan D, Sze S, Minhas JS, Bangash MN, Pareek N, Divall P, et al. The impact of ethnicity on clinical outcomes in COVID-19: A systematic review. EClinicalMedicine 2020:23.
[2] J. van Kooy, COVID-19 and humanitarian migrants on temporary visas: Assessing the public costs. Refugee Council of Australia, 2020. ⟨https://www.refugeecouncil.org.au/covid-19-assessing-the-public-costs/⟩ [accessed 13 September 2021].
[3] Bambra C, Riordan R, Ford J, Matthews F. The COVID-19 pandemic and health inequalities. J Epidemiol Community Health 2020;74:964.
[4] Yaya S, Yeboah H, Charles CH, Otu A, Labonte R. Ethnic and racial disparities in COVID-19-related deaths: Counting the trees, hiding the forest. BMJ Glob Health 2020;5:e002913.
[5] Viaña JN, Raman S, Barber M. From paternalism to engagement: Bioethics needs a paradigm shift to address racial injustice during COVID-19. Am J Bioeth 2021;21:96–8.
[6] S. Dalzell, G. Coote, Australia's official COVID-19 health information translations left to become eight weeks out of date, 2021. ⟨https://www.abc.net.au/news/

2021–08-12/covid-19-information-weeks-out-of-date/100369794⟩ [accessed 13 September 2021].
[7] Wild A, Kunstler B, Goodwin D, Onyala D, Zhang L, Kufi M, et al. Communicating COVID-19 health information to culturally and linguistically diverse communities: Insights from a participatory research collaboration. Public Health Res Pr 2021:31.
[8] Habersaat KB, Betsch C, Danchin M, Sunstein CR, Böhm R, Falk A, et al. Ten considerations for effectively managing the COVID-19 transition. Nat Hum Behav 2020;4:677–87.
[9] Mac OA, Muscat DM, Ayre J, Patel P, McCaffery KJ. The readability of official public health information on COVID-19. Med J Aust 2021;215:373–5.
[10] SA Health. Health Literacy, 2013. ⟨https://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/safety+and+quality/partnering+with+consumers%2C+carers+and+the+community/health+literacy⟩ [accessed 17 May 2021].
[11] McCaffery KJ, Dodd RH, Cvejic E, Ayre J, Batcup C, Isautier JM, et al. Health literacy and disparities in COVID-19-related knowledge, attitudes, beliefs and behaviours in Australia. Public Health Res Pr 2020;30:e30342012.
[12] S. Dalzell, Government coronavirus messages left 'nonsensical' after being translated into other languages, 2020. ⟨https://www.abc.net.au/news/2020–08-13/coronavirus-messages-translatedto-nonsense-in-other-languages/12550520⟩ [accessed 10 August 2021].
[13] A. Grey, Multilingual Australia is missing out on vital COVID-19 information. No wonder local councils and businesses are stepping in, 2020. ⟨https://theconversation.com/multilingual-australia-is-missing-out-on-vital-covid-19-information-no-wonder-local-councils-and-businesses-are-stepping-in-141362⟩ [accessed 10 August 2021].
[14] Levin-Zamir D. Communication, health literacy and a systems approach for mitigating the COVID-19 pandemic: The case for massive vaccine roll-out in Israel. J Health Commun 2020;25:816–8.
[15] NHS Race and Health Observatory, Maximising uptake of the COVID-19 vaccine for Black and minority ethnic people, 2021. ⟨https://www.nhsrho.org/publications/maximising-uptake-of-the-covid-19-vaccine-for-ethnic-minority-people/⟩ [accessed 10 August 2021].
[16] White SJ, Barello S, Cao di San Marco E, Colombo C, Eeckman E, Gilligan C, et al. Critical observations on and suggested ways forward for healthcare communication during COVID-19: pEACH position paper. Patient Educ Couns 2021;104:217–22.
[17] Seale H. , Harris-Roxas B. , Heywood A. , Abdi I. , Mahimbo A. , Chauhan A. et al. Speaking COVID-19: Supporting COVID-19 communication and engagement efforts with people from culturally and linguistically diverse communities. medRxiv, 2022. ⟨https://doi.org/10.21203/rs.3.rs-1277807/v1⟩.
[18] Karidakis M, Woodward-Kron R, Amorati R, Hu B, Pym A, Hajek J. Enhancing COVID-19 public health communication for culturally and linguistically diverse communities: An Australian interview study with community representatives. Qualitative. Health Commun 2022;1:61–83.
[19] Wen LM, Xu H, Jawad D, Buchanan L, Rissel C, Phongsavan P, et al. Ethnicity matters in perceived impacts and information sources of COVID-19 among mothers with young children in Australia: A cross-sectional study. BMJ Open 2021;11:e050557.
[20] Sides E., Jones LF, Kamal A., Thomas A., Syeda RB, Kaissi A. et al. Attitudes towards coronavirus (COVID-19) vaccine and sources of information across diverse ethnic groups in the UK: A qualitative study. medRxiv, 2022. ⟨https://doi.org/10.1101/2022.02.04.22270456⟩.
[21] Public Health Information Development Unit. Social Health Atlas of Australia: Data by Primary Health Network (incl. Population Health Areas); 2019. ⟨http://phidu.torrens.edu.au/current/data/sha-aust/phn_pha_parts/phidu_data_phn_pha_parts_aust.xlsx⟩ [accessed 21 November 2019].
[22] Ayre J., Muscat DM, Mac O., Batcup C., Cvejic E., Pickles K. et al. COVID-19 testing and vaccine willingness: Cross-sectional survey in a culturally diverse community in Sydney, Australia. medRxiv 2021. ⟨https://doi.org/10.1101/2021.10.25.21265503⟩.
[23] Muscat DM, Ayre J., Mac O., Batcup C., Cvejic E., Pickles K. Psychological, social, and financial impacts of COVID-19 on culturally and linguistically diverse communities in Sydney, Australia. BMJ Open (in press). https://doi.org/2021.10.19.21265230.
[24] covid19data.com.au. COVID-19 in Australia, 2021. ⟨https://www.covid19data.com.au/⟩ [accessed August 1 2021].
[25] NSW Health. New COVID-19 restrictions for Greater Sydney, 2021. ⟨https://www.nsw.gov.au/media-releases/new-covid-19-restrictions-for-greater-sydney-23-june-2021⟩ [accessed 10 August 2021].
[26] NSW Health, COVID-19 restrictions tightened across Greater Sydney, 2021. ⟨https://www.nsw.gov.au/media-releases/covid-19-restrictions-tightened-across-greater-sydney⟩ [accessed 16 August 2021].
[27] Australian Bureau of Statistics. 2016 Census of Population and Housing [Census TableBuilder]; 2016 [accessed 12 February 2021].
[28] Wallace LS, Rogers ES, Roskos SE, Holiday DB, Weiss BD. BRIEF REPORT: Screening items to identify patients with limited health literacy skills. J Gen Intern Med 2006;21:874–7.
[29] Australian Bureau of Statistics. 2033.0.55.001 - Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2016; 2018. ⟨https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2033.0.55.001–2016~Main%20Features~IRSAD~20⟩ [accessed 10 September 2021].
[30] Weber RP. Basic Content Analysis. 2nd ed..,. Sage Publications; 1990. https://doi.org/10.4135/9781412983488.
[31] Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159–74.
[32] Islam MS, Sarkar T, Khan SH, Mostofa Kamal AH, Hasan SMM, Kabir A. COVID-19-related infodemic and its impact on public health: A global social media analysis. Am J Trop Med Hyg 2020;103:1621–9.