

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

Ethnicity matters in perceived impacts and information sources of COVID-19 among mothers with young children in Australia

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-050557
Article Type:	Original research
Date Submitted by the Author:	23-Feb-2021
Complete List of Authors:	Wen, Li Ming; The University of Sydney, Sydney School of Public Health Xu, Huilan; Sydney Local Health District, Population Health Research & Evaluation Hub Jawad, Danielle; Sydney Local Health District, Population Health Research & Evaluation Hub Buchanan, Limin; Sydney Local Health District, Population Health Research & Evaluation Hub Rissel, Chris; The University of Sydney, School of Public Health Phongsavan, Philayrath; The University of Sydney, School of Public Health Baur, Louise; The University of Sydney, The Children's Hospital at Westmead Clinical School Taki, Sarah; Sydney Local Health District, Population Health Research and Evaluation Hub
Keywords:	COVID-19, MENTAL HEALTH, PUBLIC HEALTH

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Title: Ethnicity matters in perceived impacts and information sources of COVID-19 among mothers with young children in Australia

Authors: Li Ming Wen^{*1,2,3,4}; Huilan Xu¹, Danielle Jawad¹, Limin Buchanan^{1,2,3,4}; Chris Rissel^{2,3}, Philayrath Phongsavan², Louise A Baur^{2,3,5} and Sarah Taki^{1,2,3}

Affiliations:

¹Health Promotion Unit, Population Health Research & Evaluation Hub, Sydney Local Health District, Australia

²Sydney School of Public Health, Charles Perkins Centre, Faculty of Medicine and Health, The University of Sydney, Australia

³NHMRC Centre of Research Excellence in the Early Prevention of Obesity in Childhood (EPOCH), Australia

⁴Sydney Institute for Women, Children and Their Families, Sydney Local Health District, Australia

⁵Specialty of Child and Adolescent Health, Sydney Medical School, The University of Sydney, Australia

***Corresponding author:**

Clinical Assoc Prof. Li Ming Wen
Director, Population Research & Evaluation Hub
Sydney Local Health District, NSW
Sydney School of Public Health, Faculty of Medicine and Health
The University of Sydney

Level 9 North, King George V Building,
Camperdown NSW 2050, Australia
Tel: 61-2-9515 9078 | Fax: 61-2- 9515 9056
Email: Liming.Wen@health.nsw.gov.au

ORCID ID: <https://orcid.org/0000-0003-1381-4022>

Abstract

Objectives: This study aimed to investigate perceived impacts, ways of communication with professionals, and information sources related to COVID-19, and explore whether these impacts or information sources were associated with ethnicity i.e. language spoken at home.

Design: A cross-sectional study

Setting: Sydney, Australia during the period from March to October 2020.

Participants: Mothers of young children participating in an existing trial.

Outcome measures: Mothers were asked to respond to a set of survey questions related to COVID-19 via telephone. The questions included a mental health scale, and how they communicated with health professionals and their information sources related to COVID-19 during the COVID-19 pandemic.

Results: Of 537 mothers who completed the survey (81% response rate), 45% reported spoke a language other than English at home. Overall, 136 (26%) reported experiencing mental distress. 234 (44%) reported that COVID-19 affected the way they prefer to receive and communicate health-related information with health professionals, especially for those from non-English speaking backgrounds with an adjusted odds ratio (1.58, 95%CI 1.10 – 2.27). They were less likely to use a face-to-face service (AOR 0.55, 95% CI 0.37 – 0.80) and more likely to use social media (AOR 2.11, 95% CI 1.40 – 3.17) for health related information. Regarding sources of COVID-19 related information, mothers from non-English speaking

1
2
3 backgrounds were more likely to rely on family members (AOR 1.49, 95% CI 1.01 – 2.19)
4
5 and social media (AOR 3.34, 95% CI 2.05 – 5.43).
6
7
8
9

10 **Conclusions:** COVID-19 has significantly impacted mothers with young children in regard
11 to their mental health, means of communicating with health professionals and sources of
12 health information. Mothers from non-English speaking communities were less likely to use a
13 face-to-face service, and more likely to seek information from family members and social
14 media. Appropriate health support for non-English speaking community needs to take these
15 factors into account.
16
17
18
19
20
21
22
23
24
25

26 **Trial registration:** The trial is registered with the Australian Clinical Trial Registry
27 (ANZCTR:12618001571268)
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Strengths and limitations of this study

- This is the very first study to report on the role of ethnicity in perceived impacts and information sources of COVID-19 among mothers with young children in Australia.
- The study highlights the importance of taking ethnicity into account in providing appropriate health support for mothers with young child from various backgrounds during the COVID-19 pandemic.
- The study could be limited by potential sample selection bias as a result of survey participants from an existing trial.
- Further qualitative research is required to understand why there were differences in sources used for information on COVID-19 and healthy lifestyle behaviours.

Introduction

The COVID-19 pandemic has had profound effects on communities globally.¹ Since February 2021 this severe acute respiratory syndrome (SARS-CoV-2) has engulfed the world with approximately 105 million confirmed cases and 2.2 million deaths.¹ In Australia, by January 2021, over 28,000 confirmed cases and 908 deaths have been reported.² As a result, containment measures have included closure of or limited access to government and private offices, schools, shops, parks, and non-essential workplaces.³ This has directly and indirectly impacted people's daily activities, social events, food availability, dietary quality, sleep cycle, screen time, employment, access to recreational locations and financial security.⁴⁻⁸

Recent studies have identified multiple aspects of life that have been influenced by the pandemic. For instance, a study of Canadian families with young children found that COVID-19 restrictions adversely affected daily routines, with reduced physical activity and increased screen time as well as an overall increased consumption of food and snacks.⁹ Such changes, triggered by stress eating, working from home, online home schooling, and limited access to outdoor play areas, are likely to lead to lower quality of life which in turn may lead to long lasting health problems.^{5 10} In addition to the impact on health behaviours, COVID-19 restrictions also present unique stressors that have placed a burden on mental health.¹¹⁻¹⁵ In examining the impacts of social restrictions and distancing measures, a recent meta-analysis of 19 studies with 93,569 participants reported a higher prevalence of stress (8.1% to 81.9%), psychological distress (34.43% to 38%), depression (14.6% to 48.3%), anxiety (6.33% to 50.9%), and post-traumatic stress disorder (7% to 53.8%) during the pandemic when compared to previously estimated one-year prevalence rates prior to the pandemic.¹¹ That review highlighted that more adverse psychological symptoms were exhibited among

1
2
3 women, people under 40 years and those with existing mental health illnesses, unemployment
4
5 and students.¹¹
6
7
8
9

10 Despite the rapid escalation and repercussions of the COVID-19 pandemic across all
11
12 populations, it has disproportionately affected disadvantaged and culturally and
13
14 linguistically diverse (CALD) communities. According to recent provisional analyses,
15
16 COVID-19-related death is significantly higher among CALD communities than those of
17
18 white ethnicity.^{16 17} This finding indicates that the influence of COVID-19 on CALD
19
20 communities can potentially exacerbate health inequalities in already vulnerable
21
22 populations.¹⁸ The higher death rates from COVID-19 among CALD populations may be
23
24 partly due to factors such as lower education, difficulty finding up to date information from
25
26 trustworthy sources, lack of accessibility of translated materials and language barriers to
27
28 access health services.^{19 20 21}
29
30
31
32
33
34

35 Further, within Australia, CALD communities have lower levels of health literacy.²² It is
36
37 therefore possible that these previously mentioned factors may influence the quality of health
38
39 information CALD communities receive about COVID-19 and their ability to respond
40
41 appropriately. An Australian study also showed that people with inadequate health literacy
42
43 and those who spoke a language other than English at home, struggled to find and understand
44
45 information on COVID-19 from government sources compared to those with adequate health
46
47 literacy and who spoke English at home.²³ In contrast, a recent study highlighted government
48
49 websites as one of the most used and trusted sources of COVID-19 related information
50
51 among people of white ethnicity.²⁴ Moreover, the trust and choice of selected sources of
52
53 information are influenced by several demographic factors such as ethnicity, age, religion,
54
55 education, and political affiliation.^{24 25}
56
57
58
59
60

To date, there has been limited research examining the role of ethnicity related to the impacts of COVID-19 and accessing health information. The aims of this study were to investigate perceived impacts, preferred means of communication with professionals and information sources related to COVID-19 among mothers with young children; and further explore whether these impacts or information sources were associated with ethnicity.

Methods

Study design: We conducted a cross-sectional survey of mothers with young children participating in an existing study²⁶ in Sydney, Australia from March to October 2020. The mothers had participated in a longitudinal study since 2017, and the study protocol was published prior to the commencement of this trial.²⁶ The recruitment process and first year outcomes of the original trial have been reported elsewhere.^{27 28} Briefly, the trial aimed to investigate effectiveness of an early childhood obesity prevention using telephone support or text messages. This current study was part of the 3-year follow-up survey and approved by the Ethics Review Committee of Sydney Local Health District (Protocol No. X16–0360 & LNR/16/RPAH/495 and Protocol No X18–0387 & HREC/18/RPAH/545).

Survey respondents and data collection: A total of 662 mothers remained in the existing trial when their children reached 3 years. The survey was conducted by a marketing survey company using Computer Assisted Telephone Interviewing.

Perceived COVID-19 impacts

We measured the impacts that COVID-19 has had on families from four aspects including 1) changes in eating, physical activity and screen time behaviours, 2) mental health, 3)

1
2
3 participating in research, and 4) whether the pandemic influenced their preferred ways of
4 receiving health-related information. The mothers were asked to respond to five statements on
5 whether their family: 1) ate more snacks, fruit and vegetables, 2) had more screen time, 3) had
6 more physical activity, and 4) were more likely to follow mealtime or bedtime routines during
7 the COVID-19 pandemic. We used a 5-level Likert scale, 'Strongly disagree', 'Disagree',
8 'Neither agree nor disagree', 'Agree' and 'Strongly agree'. The responses to each of the
9 statements were further dichotomised into 'having more' if they 'Strongly agree' or 'Agree' to
10 the statement, or 'no changes' (see **Supplementary Document** about questionnaire and coding
11 **frame**).

12
13
14
15
16
17
18
19
20
21
22
23
24
25
26 The Patient Health Questionnaire-4 (PHQ4) was used to assess mothers' mental health.²⁹ The
27 mothers were asked how often they were bothered by the following over the last two weeks:
28 1) nervous and anxious, 2) worrying, 3) depressed or hopeless, 4) little interest or pleasure in
29 doing things. Mothers responded to each of the questions on a 4-point scale, '0' for 'Not at all'
30 to '3' for 'Nearly every day'. The PHQ-4 total score ranges from 0 to 12, with categories of
31 psychological distress being normal (0-2), mild (3-5), moderate (6-8), and severe (9-12). It was
32 further dichotomised into 'psychological distress' (mild to severe) and 'none'. Mothers were
33 also asked how often they worried about family members and close friends on a 4-point scale.
34 Responses were dichotomised into 'worrying about family' (for several days to nearly every
35 day), or 'no worry' (**Supplementary Document**).

36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51 Assessing the impact COVID-19 had on their research participation, mothers were asked
52 whether COVID-19 negatively affected their desire to participate in research. Mothers
53 responded to the question on a 5-level Likert scale, 'Not at all', 'A little bit', 'Moderately',
54 'Quite a bit', and 'Extremely'. We also dichotomised the responses into 'Affecting research
55
56
57
58
59
60

1
2
3 participation' (Moderately to Extremely) and 'No affect' (Not at all or A little bit). The mothers
4
5 were asked whether the COVID-19 pandemic affected the way they prefer to receive and
6
7 communicate health-related information with health professionals. They were also asked how
8
9 likely they would use the following modes to receive and communicate health-related
10
11 information with health professionals: face-to-face, telephone, short message service (SMS),
12
13 videoconference, website, social media, and booklets or pamphlets. Mothers responded to each
14
15 of the modes on a 5-level Likert scale, 'Unlikely', 'Possibly', 'Likely', 'Almost certain', and
16
17 'Certain'. The responses were categorised into 'Yes' and 'No', with 'Yes' referring to 'Likely',
18
19 'Almost certain', or 'Certain'.
20
21
22
23
24
25

26 *Sources of health information for changing behaviours during COVID-19 pandemic*

27
28 We asked about sources of health information related to three areas specific to COVID-19: 1)
29
30 COVID-19 related information, 2) changing food and beverage behaviour, and 3) changing
31
32 physical activity from government officials, health professionals, family members, social
33
34 media, or educators respectively. The question allowed multiple responses (see
35
36 **Supplementary Document**).
37
38
39
40
41

42 *Mothers' demographics*

43
44 Mothers' demographic information, including their language spoken at home, was collected at
45
46 baseline using standard questions from the NSW Adult Population Health Survey.³⁰ All
47
48 mothers' demographic and socioeconomic information were categorized into groups.
49
50
51
52
53

54 **Statistical analysis**

55
56 Statistical analyses were carried out using Stata 13 (StataCorp 2013). All P-values are two
57
58 sided and statistical significance was set at the 5% level. Descriptive analysis was conducted
59
60

1
2
3 to describe mothers' baseline demographic characteristics for those who completed 3 year
4 survey. Pearson's Chi-squared tests were conducted to examine the associations between
5 mothers' demographic characteristics and COVID-19 impact and sources of health information
6 during COVID-19 pandemic. Number and percentage were reported.
7
8
9
10
11
12

13
14 Multiple logistic regression models were built to investigate the associations between mothers'
15 language spoken at home and COVID-19 impact and sources of health information during
16 COVID-19 pandemic. To identify potential confounding factors, mothers' demographic
17 variables that were significant in Pearson's chi-squared tests with $P < 0.25$ were entered in the
18 multiple logistic regression models. The least significant variables were progressively dropped
19 until only those with $P < 0.05$ remained. Variables dropped from the model were then entered
20 into the model individually to assess confounding. Since the survey respondents were involved
21 in an intervention trial, their group allocation was also adjusted in the final model. Adjusted
22 odds ratios (AORs) with 95% confidence intervals (CI) were then calculated as a measure of
23 the association.
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39

40 **Results**

41
42 Of 662 mothers remaining in the follow up study, 537 completed the COVID-19 survey
43 questions with a response rate of 81%. Table 1 shows demographic characteristics of the
44 survey respondents with 45% of the mothers speaking a language other than English at
45 home.
46
47
48
49
50

51
52
53 Table 2 shows that the impacts on mental health were observed across the survey
54 respondents, with 26% reporting psychological distress (including 18% with mild symptoms
55 of mental distress, 5% moderate symptoms and 2% severe mental distress), and 59%
56
57
58
59
60

1
2
3 worrying about their family. There was no significant difference in psychological distress
4
5 between mothers from English or non-English speaking backgrounds. Substantial
6
7 proportions of mothers reported having more snacks (46%) and no increase in fruit and
8
9 vegetable consumption (55%), in particular among English speaking mothers. Overall, 77%
10
11 of the mothers reported having more screen time while 60% reported no increase in physical
12
13 activity, with no significant differences found between English and non-English speaking
14
15 mothers. Significantly higher proportions of English speaking mothers reported impacts of
16
17 the COVID-19 restrictions on their mealtime (71%) or bedtime (76%) routines.
18
19
20
21
22
23

24 Table 2 also shows 44% reported that COVID-19 affected the way they preferred to receive
25
26 and communicate health-related information with health professionals, especially those who
27
28 spoke a language other than English, with an adjusted odds ratio (AOR 1.58, 95%CI 1.10 –
29
30 2.27). They were less likely to use a face-to-face service (AOR 0.55, 95% CI 0.37 – 0.80) and
31
32 more likely to use social media (AOR 2.11, 95% CI 1.40 – 3.17) for health related
33
34 information.
35
36
37
38
39

40 Table 3 shows the sources of COVID-19 related information and information for changes in
41
42 food and beverage consumption and physical activity behaviours during the COVID-19
43
44 pandemic. For the COVID-19 related information almost all of mothers (97%) relied on
45
46 government officials, followed by health professionals (77%), family members (67%),
47
48 educators (52%) and social media (26%). However, mothers who spoke a language other than
49
50 English were more likely to rely on family members (AOR 1.49, 95% CI 1.01 – 2.19) and
51
52 social media (AOR 3.34, 95% CI 2.05 – 5.43).
53
54
55
56
57
58
59
60

1
2
3 Less than half of the survey respondents (48%) reported accessing sources of information for
4
5 changing physical activity from government officials and 27% reported accessing such
6
7 information from health professionals (Table 3). However, non-English speaking mothers
8
9 were more likely to rely on government officials (AOR 2.23, 95%CI 1.49 – 3.32) or health
10
11 professionals (AOR 3.58, 95%CI 2.34 –5.50) compared to English speaking mothers.
12
13
14 Regarding information for changing food and beverages only, about 20% reported accessing
15
16 information from government officials or health professionals. Non-English speaking
17
18 mothers were more likely to rely on government officials (AOR 6.68, 95%CI 3.56 – 12.55) or
19
20 health professionals (AOR 5.26, 95%CI 3.11 –8.89), compared to English speaking mothers.
21
22
23
24
25

26 **Discussion**

27
28 This cross-sectional survey conducted with mothers during the pandemic found that one in
29
30 four reported having psychological distress, with more than half of the respondents being
31
32 worried about their family regardless of ethnicity. The COVID-19 pandemic resulted in more
33
34 snack consumption and more screen time. It also affected the way mothers prefer to receive
35
36 and communicate health-related information with health professionals, especially those who
37
38 spoke a language other than English. Non-English speaking mothers were less likely to use a
39
40 face-to-face service and more likely to use family and social media for health related
41
42 information. The survey also found that the majority of mothers relied on government
43
44 officials and health professionals for COVID-19 related information regardless of ethnicity.
45
46
47
48
49
50
51

52 **Impact of COVID-19 on mental health**

53
54
55 On average, general mental distress among mothers with young child was moderate. Most
56
57 reported feeling normal (74%), or having a mild (18%) degree of mental distress. Similar
58
59 patterns were found among English and non-English speaking mothers. The mental health
60

1
2
3 status of our survey respondents appeared to be better than that of respondents of a survey
4 that examined mental health status of the general Australian population during the pandemic
5 with responses from 5,158 Australian adults.³¹ A possible explanation could be due to the
6 difference in data collection period. That study collected data from 1st to 4th April 2020 while
7 lockdown restrictions were occurring in Australia.³² Our survey collected data from March
8 till October 2020 which covered periods from lockdown to easing of restrictions in Australia.
9
10 The varying results also could be explained by the different tools used for assessing mental
11 health and the age range and gender of our study participants.
12
13
14
15
16
17
18
19
20
21
22
23

24 Our findings are complementary to a previous study conducted in Germany, which showed
25 similar psychological effects of the pandemic using the same PHQ4 tool. Analysis of the
26 survey data collected from (27 March- 6 April) reported that the majority (78.3%) of
27 respondents were concerned of the health consequences for their relatives. The average
28 depressive and anxiety PHQ4 score was mild among participants, similar to our study.
29
30 Additionally, the study highlighted that women had a significantly higher PHQ-4 score than
31 men, highlighting the susceptibility of women to mental illness.³³
32
33
34
35
36
37
38
39
40
41
42

43 Despite the low prevalence of mothers reporting mental distress in our current study, it is
44 intuitive that COVID-19 pandemic restrictions would increase mental distress as evidenced
45 by previous literature on the negative influences of public health crises on mental health.¹¹⁻¹⁵
46
47 More than half of our study participants reported worrying about their family members.
48
49 While government efforts to manage and eradicate COVID-19 continue, our society will also
50 need to continue maintaining physical distancing, some social isolation and dealing with
51 disruptions to life. Thus it is imperative to intervene to protect communities, in particular
52 those in high-risk groups such as women with young children,³¹ and other vulnerable
53
54
55
56
57
58
59
60

1
2
3 communities such as non-English speaking people, where a greater effort to communicate
4 well is needed. Specifically, research needs to focus on better understanding, from a cultural
5 lens, the cultural differences to help CALD communities deal with the changing contexts
6 related to COVID-19, and how they see the role of governments and health professionals to
7 help CALD communities interact with health systems (health literacy).²³ Addressing this will
8 increase the effectiveness of the COVID-19 response such as testing, following physical
9 isolation restrictions and the uptake of vaccinations to effectively and successfully manage
10 subsequent waves of the pandemic.
11
12
13
14
15
16
17
18
19
20
21
22
23
24

25 **Sources used for health information**

26
27
28 Our study findings echo some previous studies in which it was also found that vulnerable
29 populations are less likely to use face-to-face services and more likely to turn to other sources
30 for health information such as religious leaders or family members and community leaders
31 who may be important in many cultures.^{22 24} Social media is an additional platform that has
32 been used substantially by many people including CALD communities for health-related
33 information.²¹ Using social media from non-medical or non-Government sources may be of
34 concern, given the proliferation of readily available misinformation obtained via unreliable
35 and unverified online social applications.^{34 35} Recent evidence showed that two-thirds (66%)
36 of individuals encountered misinformation about COVID-19 on social media,³⁶ an additional
37 one-third (36%) mentioned obtaining false information from news media coverage.³⁶ For
38 instance, in the United States misleading claims of a national lockdown fuelled panic buying
39 of paper products and groceries resulting in food insecurity among vulnerable populations
40 giving rise to mass hysteria and panic.³⁷ While social media is highly used by populations of
41 various backgrounds and can be a beneficial platform to share information, there is a need to
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 improve social media literacy skills. More research needs to be conducted to identify relevant
4 approaches to support CALD communities and improve navigating through credible
5
6 information on digital or social media platforms.
7
8
9

10
11
12
13 Adverse psychosomatic outcomes are expected to increase especially among CALD
14 communities due to social isolation, access barriers to health services, discrimination and
15 racism, limited support networks, low English proficiency, and poor digital literacy.³⁸ These
16 circumstances can potentially exacerbate existing health inequities for these vulnerable
17 groups, thus perpetuating suboptimal health-seeking behaviours, and poor engagement with
18 health care professionals and the broader health system. As identified in our study, there is a
19 cultural tendency to seek information from families, religious leaders, and media, which
20 highlights the importance of mitigating harm from digital “infodemics” and tailoring
21 messages to community values.³⁸ There is a clear case for government agencies to take a
22 leadership role in communicating with CALD communities using culturally appropriate
23 methods, in particular to increase the uptake of COVID-19 vaccinations.
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42

43 This study found that during the pandemic, the majority of people obtained COVID-19
44 related information from government officials and health professionals, but a much smaller
45 proportion of mothers obtained health information for changing health behaviours from these
46 sources. This does not necessarily mean that mothers did not receive diet and physical
47 activity information or advice from government officials or health professionals. Rather, it
48 may indicate that changing lifestyle behaviours was considered to be a low priority during the
49 pandemic compared with navigating the various responses to COVID-19. Another reason
50 might be that the majority of the population in Australia are less likely to have ever lived
51
52
53
54
55
56
57
58
59
60

1
2
3 through a pandemic, and therefore there is a sense of unfamiliarity in how to respond and
4
5 react. Thus the government played a major role in the response including constant changes in
6
7 social restriction laws requiring the population to follow information from government
8
9 officials.

10
11
12
13
14
15
16 Despite this, good nutrition and regular physical activity contribute to improving immunity.
17
18 As such, the World Health Organization released guidelines on diet during the COVID-19
19
20 pandemic stating that “good nutrition is crucial for health, particularly in times when the
21
22 immune system might need to fight back”.³⁹ However, there are currently very few culturally-
23
24 appropriate programs and resources that promote healthy eating and physical activity targeted
25
26 at children aged under 5 years.⁴⁰ Government and various health agencies will need to
27
28 continue developing culturally appropriate resources and health-related behaviour change
29
30 support material to mitigate the likelihood of long term impacts of COVID on chronic disease
31
32 status.
33
34
35
36
37
38
39

40 **Strength and limitations:**

41
42 Our survey is timely and specific to the impacts of COVID-19 during the pandemic. Mental
43
44 health outcomes were measured with the PHQ-4 which is a psychometrically valid instrument
45
46 and has been demonstrated as a valid screening tool in general populations.²⁹ With regards to
47
48 the limitations, our cross-sectional survey design hindered causal inference. The survey
49
50 questions for perceived behaviour change, and information sources as impacted by COVID-
51
52 19 were newly developed for the current study given that no validated instruments were
53
54 available at the time we initiated this study. Additionally, our collection period ranged from
55
56 March to October 2020 and within this period, Australia experienced a range of COVID-19
57
58
59
60

1
2
3 restrictions, from full lockdown to eased restrictions, to having varying levels of restrictions
4
5 in place and in different states.³² We acknowledge that respondents' behavioural data only
6
7 represent their state on the date they completed the survey. Further qualitative research is
8
9 required to understand why there were differences in sources used for information on
10
11 COVID-19 and healthy lifestyle behaviours.
12
13
14
15
16

17 **Conclusion:**

18
19
20 The response to COVID-19 has impacted on mothers with young children in regard to their
21
22 mental health, means of communicating with health professionals and sources of health
23
24 information. Mothers from CALD communities were less likely to use a face-to-face service,
25
26 and more likely to seek information from family members and social media. Appropriate
27
28 health support for CALD community needs to take these factors into account.
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Acknowledgements

We sincerely thank all the participating families in this study. We thank the members of the Steering Committee, Management Committee and working group for their advice and support.

We wish to thank the project partners from the Sydney, South Eastern Sydney, South Western Sydney and Southern NSW Local Health Districts, in NSW, Australia.

Contributors: LMW, CR, LAB conceived of the study. LMW prepared the first draft of the manuscript. HX conducted statistical analyses. DJ and LB contributed to literature review. All authors contributed to revising the manuscript critically and finalising the manuscript.

Conflict of interests: The authors declare that they have no competing interests in this study.

Funding: This trial was funded by the NSW Health Translational Research Grant Scheme 2016 (ID number: TRGS 200) and the Australian National Health and Medical Research Council Partnership Project APP1169823.

Role of funder or sponsor: We declare that the funder (NSW Health and NHMRC) played no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Ethical approval: The trial was granted ethics approval by the Ethics Review Committee of Sydney Local Health District (Protocol No. X16–0360 & LNR/16/RPAH/495 and Protocol No X18–0387 & HREC/18/RPAH/545). Written informed consent was obtained from all study participants.

Patient consent for publication: Not required.

Data availability statement: De-identified data and material can be available on request pending on ethics approval from Dec 30, 2021 to Dec 30, 2026.

References

1. Countries where COVID-19 has spread. Worldometer 2020.
<https://www.worldometers.info/coronavirus/countries-where-coronavirus-has-spread/>
(accessed 10 Dec 2020).
2. Coronavirus (COVID-19) current situation and case numbers. Australian Government Department of Health. Australian Government Department of Health 2020.
<https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-current-situation-and-case-numbers> (accessed 10 Dec 2020).
3. Policy Responses to COVID19. International Monetary Fund 2020.
<https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19>
(accessed 15 Dec 2020).
4. Di Renzo L, Gualtieri P, Pivari F, *et al.* Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey. *J Transl Med* 2020;18(1):229.
5. Moore SA, Faulkner G, Rhodes RE, *et al.* Impact of the COVID-19 virus outbreak on movement and play behaviours of Canadian children and youth: a national survey. *Int J Behav Nutr Phys Act* 2020;17:85.
6. Chopra S, Ranjan P, Singh V, *et al.* Impact of COVID-19 on lifestyle-related behaviours- a cross-sectional audit of responses from nine hundred and ninety-five participants from India. *Diabetes Metab Syndr* 2020;14(6):2021-30.
7. Di Renzo L, Gualtieri P, Cinelli G, *et al.* Psychological Aspects and Eating Habits during COVID-19 Home Confinement: Results of EHLC-COVID-19 Italian Online Survey. *Nutrients* 2020;12(7):2152.
8. Deschasaux-Tanguy M, Druesne-Pecollo N, Esseddik Y, *et al.* Diet and physical activity during the COVID-19 lockdown period (March-May 2020): results from the French NutriNet-Sante cohort study. *medRxiv* Published Online First: 5 June 2020. doi:
<https://doi.org/10.1101/2020.06.04.20121855>
9. Carroll N, Sadowski A, Laila A, *et al.* The Impact of COVID-19 on Health Behavior, Stress, Financial and Food Security among Middle to High Income Canadian Families with Young Children. *Nutrients* 2020;12(8):2352.
10. Dunton GF, Do B, Wang SD. Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the U.S. *BMC Public Health* 2020;20(1):1351.
11. Xiong J, Lipsitz O, Nasri F, *et al.* Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *J Affect Disord* 2020;277:55-64.

12. Serafini G, Parmigiani B, Amerio A, *et al.* The psychological impact of COVID-19 on the mental health in the general population. *QJM* 2020;113(8):531-537.
13. Luo M, Guo L, Yu M, *et al.* The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public - A systematic review and meta-analysis. *Psychiatry Res* 2020;291:113190.
14. Rajkumar RP. COVID-19 and mental health: A review of the existing literature. *Asian J Psychiatr* 2020;52:102066.
15. Dubey S, Biswas P, Ghosh R, *et al.* Psychosocial impact of COVID-19. *Diabetes Metab Syndr* 2020;14(5):779-88.
16. Kirby T. Evidence mounts on the disproportionate effect of COVID-19 on ethnic minorities. *Lancet Respir Med* 2020;8(6):547-8.
17. White C, Nafilyan V. Coronavirus (COVID-19) related deaths by ethnic group, England and Wales: 2 March 2020 to 10 April 2020. Office for National Statistics. 2020. <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/death/articles/coronavirusrelateddeathsbyethnicgroupenglandandwales/2march2020to10april2020>. (accessed 28 Dec 2020).
18. World Health Organization. Health of migrants: Resetting the agenda. Report of the 2nd Global Consultation, Colombo, Sri Lanka, 21-23 Feb 2017. Geneva: International Organization for Migration, 2017. https://publications.iom.int/system/files/pdf/gc2_srilanka_report_2017.pdf (accessed 28 Dec 2020)
19. Goeman D, King J, Koch S. Development of a model of dementia support and pathway for culturally and linguistically diverse communities using co-creation and participatory action research. *BMJ Open* 2016;6(12):e013064.
20. Sze S, Pan D, Nevill CR, *et al.* Ethnicity and clinical outcomes in COVID-19: A systematic review and meta-analysis. *EClinicalMedicine* 2020;29:100630.
21. Wild A, Kunstler B, Goodwin D, *et al.* Communicating COVID-19 health information to culturally and linguistically diverse (CALD) communities: the importance of partnership, co-design, and behavioural and implementation science. *MetaArXiv* Published Online First: 03 Aug 2020. doi:10.31222/osf.io/85h93
22. Australia's health 2018. Culturally and linguistically diverse populations. Australian Institute of Health and Welfare. Australian Government. 2018. <https://www.aihw.gov.au/getmedia/f3ba8e92-afb3-46d6-b64c-ebfc9c1f945d/aihw-aus-221-chapter-5-3.pdf.aspx> (accessed 20 Dec 2020).

- 1
2
3 23. McCaffery KJ, Dodd RH, Cvejic E, *et al.* Health literacy and disparities in COVID-19–
4 related knowledge, attitudes, beliefs and behaviours in Australia. *Public Health Res*
5 *Pract* 2020;30(4):e30342012.
6
7
8
9 24. Ali SH, Foreman J, Tozan Y, *et al.* Trends and Predictors of COVID-19 Information
10 Sources and Their Relationship With Knowledge and Beliefs Related to the Pandemic:
11 Nationwide Cross-Sectional Study. *JMIR Public Health Surveill* 2020;6(4):e21071.
12
13 25. Wang PW, Lu WH, Ko NY, *et al.* COVID-19-Related Information Sources and the
14 Relationship With Confidence in People Coping with COVID-19: Facebook Survey
15 Study in Taiwan. *J Med Internet Res* 2020;22(6):e20021.
16
17
18 26. Wen LM, Rissel C, Baur LA, *et al.* A 3-Arm randomised controlled trial of
19 Communicating Healthy Beginnings Advice by Telephone (CHAT) to mothers with
20 infants to prevent childhood obesity. *BMC Public Health* 2017;17:79.
21
22
23 27. Ekambareshwar M, Mhrshahi S, Wen LM, *et al.* Facilitators and challenges in recruiting
24 pregnant women to an infant obesity prevention programme delivered via telephone calls
25 or text messages. *Trials* 2018;19(1):494.
26
27
28 28. Wen LM, Rissel C, Xu H, *et al.* Effects of telephone support and short message service
29 on infant feeding practices, 'tummy time' and screen time at 6 and 12 months of child
30 age: a 3-arm randomized controlled. *JAMA Pediatr* 2020;174(7):657-64.
31
32
33 29. Kroenke K, Spitzer RL, Williams JBW, *et al.* An ultra-brief screening scale for anxiety
34 and depression: the PHQ-4. *Psychosomatics* 2009;50:613-21.
35
36
37 30. Centre for Epidemiology and Research. 2006 report on Adult Health from the New South
38 Wales Population Health Survey. Sydney: NSW Department of Health, Australia. 2007.
39 <https://www.health.nsw.gov.au/surveys/adult/Publications/adults-06.pdf> (accessed 15
40 Dec 2020)
41
42
43 31. Rossell SL, Neill E, Phillipou A, *et al.* An overview of current mental health in the
44 general population of Australia during the COVID-19 pandemic: Results from the
45 COLLATE project. *Pyschiatry Res* 2021; 296:113660.
46
47
48 32. Lupton, D. Timeline of COVID-19 in Australia: the first year.
49 <https://deborahalupton.medium.com/timeline-of-covid-19-in-australia-1f7df6ca5f23>
50 (accessed 20 Jan 2021).
51
52
53 33. Thibaut1 F, van Wijngaarden-Cremers PJM. Women's Mental Health in the Time of
54 Covid-19 Pandemic. *Front Glob Womens Health* 2020;1:Article588372.
55
56
57 34. Henrich N, Holmes B. Communicating during a pandemic: information the public wants
58 about the disease and new vaccines and drugs. *Health Promot Pract* 2011;12(4):610-9.
59
60

- 1
2
3 35. Perrin A, Anderson M. Share of U.S. adults using social media, including Facebook, is
4 mostly unchanged since 2018. Pew Research Center 2020.
5 [https://www.pewresearch.org/fact-tank/2019/04/10/share-of-u-s-adults-using-social-](https://www.pewresearch.org/fact-tank/2019/04/10/share-of-u-s-adults-using-social-media-including-facebook-is-mostly-unchanged-since-2018/)
6 [media-including-facebook-is-mostly-unchanged-since-2018/](https://www.pewresearch.org/fact-tank/2019/04/10/share-of-u-s-adults-using-social-media-including-facebook-is-mostly-unchanged-since-2018/) (accessed 25 Jan 2021)
7
8
9
10 36. Park S, Fisher C, Lee JY, *et al.* COVID-19: Australian news and misinformation.
11 University of Canberra. [https://apo.org.au/sites/default/files/resource-files/2020-07/apo-](https://apo.org.au/sites/default/files/resource-files/2020-07/apo-nid306728.pdf)
12 [nid306728.pdf](https://apo.org.au/sites/default/files/resource-files/2020-07/apo-nid306728.pdf) (accessed 18 Jan 2021).
13
14
15 37. Spencer SH. False claims of nationwide lockdown for COVID-19. Factcheck
16 2020. [https://www.factcheck.org/2020/03/false-claims-of-nationwide-lockdown-for-](https://www.factcheck.org/2020/03/false-claims-of-nationwide-lockdown-for-covid-19/)
17 [covid-19/](https://www.factcheck.org/2020/03/false-claims-of-nationwide-lockdown-for-covid-19/) (accessed 20 Dec 2020).
18
19
20 38. Understanding experiences and impacts of COVID-19 on individuals with mental health
21 and AOD issues from CaLD communities. Mental Health Commission 2020.
22 [https://www.mhc.wa.gov.au/media/3413/201016-mhc20-80370-impact-of-covid-19-on-](https://www.mhc.wa.gov.au/media/3413/201016-mhc20-80370-impact-of-covid-19-on-individuals-cald-communities-final-attachment.pdf)
23 [individuals-cald-communities-final-attachment.pdf](https://www.mhc.wa.gov.au/media/3413/201016-mhc20-80370-impact-of-covid-19-on-individuals-cald-communities-final-attachment.pdf) (accessed 20 Dec 2020).
24
25
26
27 39. Food and Nutrition tips during self-quarantine. WHO 2020.
28 [http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-](http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov-technical-guidance/food-and-nutrition-tips-during-self-quarantine)
29 [19/novel-coronavirus-2019-ncov-technical-guidance/food-and-nutrition-tips-during-self-](http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov-technical-guidance/food-and-nutrition-tips-during-self-quarantine)
30 [quarantine](http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov-technical-guidance/food-and-nutrition-tips-during-self-quarantine) (Accessed 16 Jan 2021)
31
32
33
34 40. Liu JJ, Davidson E, Bhopal RS, *et al.* Adapting health promotion interventions to meet
35 the needs of ethnic minority groups: mixed-methods evidence synthesis. *Health Technol*
36 *Assess* 2012;16(44):1–469.
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 1 Demographics of the survey respondents in Sydney, Australia, March and October 2020

Mothers' demographics	3 year survey
	Completed n (%)
Age (years)	
<30	143 (27)
≥30	394 (73)
Country of birth	
Australia	211 (39)
Overseas	326 (61)
Language spoken at home	
English	296 (55)
Other	241 (45)
Annual household income	
<\$80,000	316 (64)
≥\$80,000	175 (45)
Employment status	
Employed	365 (68)
Other	172 (32)
Marital status	
Married/de-facto partner	508 (95)
Other	28 (5)
Education level	
University &	381 (71)
Up to HSC/TAFE*	155 (29)
First time mother	
Yes	303 (56)
No	234 (44)

*HSC: High School Certificate; TAFE: Technical and Further Education

Table 2: Perceived impacts of COVID on mothers and associations with mothers' language spoken at home

Covid-19 impacts	Total n (%)	Language spoken at home			
		English n (%)	Other n (%)	P	Other AOR (95% CI)
Perceived behaviour changes					
Having more snacks	244 (46)	154 (52)	90 (38)	0.001	0.52 (0.36 – 0.75)
No increase in fruit & vegetable consumption	293 (55)	200 (68)	93 (39)	<0.0001	0.31 (0.21 – 0.45)
Having more screen time	412 (77)	235 (80)	177 (74)	0.107	0.71 (0.46 – 1.08)
No increase in physical activity	319 (60)	174 (59)	145 (61)	0.728	1.07 (0.75 – 1.55)
Did not follow mealtime routine	304 (57)	210 (71)	94 (39)	<0.0001	0.27 (0.18 – 0.39)
Did not follow bedtime routine	347 (65)	224 (76)	123 (51)	<0.0001	0.34 (0.23 – 0.49)
Mental health					
Psychological distress	136 (26)	72 (24)	64 (27)	0.547	1.03 (0.68 – 1.55)
Worry about their family	321 (59)	164 (56)	148 (62)	0.152	1.27 (0.88 – 1.82)
Participating research					
	91 (18)	26 (9)	65 (28)	<0.0001	2.20 (1.25 – 3.88)*
The way of receiving health info					
	234 (44)	115 (39)	119 (50)	0.014	1.58 (1.10 – 2.27)
The way of communicating with health professionals (multiple responses allowed)					
Face-to-face	344 (65)	207 (71)	137 (57)	0.001	0.55 (0.37 – 0.80)
Telephone	406 (76)	237 (81)	169 (71)	0.006	0.70 (0.44 – 1.11)*
SMS	274 (52)	152 (52)	122 (51)	0.849	0.94 (0.66 – 1.35)
Video conference	313 (59)	200 (68)	113 (47)	<0.0001	0.45 (0.31 – 0.66)
Website	277 (52)	158 (54)	119 (50)	0.342	0.79 (0.55 – 1.13)
Social media	146 (27)	58 (20)	88 (37)	<0.0001	2.11 (1.40 – 3.17)
Booklets	288 (43)	131 (45)	97 (41)	0.322	0.82 (0.57 – 1.19)

AOR: adjusted odds ratio, all models were adjusted for intervention allocations and employment status

* Adjusted for intervention allocations, employment status and annual household income

Table 3: Sources of COVID-19 related information and health information for changing food and beverage and physical activity behaviours during the Covid-19 pandemic and their associations with mothers' language spoken at home

	Total n (%)	Language spoken at home			
		English n (%)	Other n (%)	P	Other AOR (95% CI)
Sources of Covid-19 related information					
Government officials	517 (97)	288 (98)	229 (96)	0.149	0.74 (0.25 – 2.21)
Health professionals	410 (77)	229 (78)	181 (76)	0.556	0.87 (0.57 – 1.33)
Family members	355 (67)	182 (62)	173 (72)	0.011	1.49 (1.01 – 2.19)
Social media	136 (26)	35 (12)	101 (42)	<0.0001	3.34 (2.05 – 5.43)*
Educators	278 (52)	141 (48)	137 (57)	0.031	1.31 (0.91 – 1.88)
Sources of health information for changing food and beverage behaviour					
Government officials	95 (18)	15 (5)	80 (34)	<0.0001	6.68 (3.56 – 12.55)*
Health professionals	99 (19)	23 (8)	76 (32)	<0.0001	5.26 (3.11 – 8.89)
Family members	102 (19)	18 (6)	84 (35)	<0.0001	8.19 (4.65 – 14.43)
Social media	47 (9)	6 (2)	41 (17)	<0.0001	5.46 (2.13 – 14.04)*
Educators	71 (13)	14 (5)	57 (24)	<0.0001	4.01 (2.05 – 7.86)*
Sources of health information for changing physical activity					
Government officials	258 (48)	114 (39)	144 (60)	<0.0001	2.23 (1.49 – 3.32)*
Health professionals	145 (27)	48 (16)	97 (41)	<0.0001	3.58 (2.34 – 5.50)#
Family members	134 (25)	45 (15)	89 (37)	<0.0001	3.13 (2.03 – 4.81)
Social media	60 (11)	12 (4)	48 (20)	<0.0001	5.73 (2.91 – 11.31)
Educators	96 (18)	30 (10)	66 (28)	<0.0001	3.15 (1.93 – 5.16)

AOR: adjusted odds ratio, all models were adjusted for intervention allocations and employment status

* Adjusted for intervention allocations, employment status and annual household income

Adjusted for interventions allocations, employment status and marital status

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Supplementary document: survey questions, variables and coding

Labels	Questions	Responses	Coding
Covid-19 impact			
Perceived behaviour change			
	In what ways has the COVID-19 pandemic affected you and your family:		
Snacks	We are eating more snacks (e.g. crisps, chocolate) than we usually do.	Strongly disagree	0 — No increase
		Disagree	
		Neither agree nor disagree	1 — More
		Agree	
Fruit & vegetable	We are eating more fruit and vegetables than we usually do.	Strongly disagree	1 — No increase
		Disagree	
		Neither agree nor disagree	0 — More
		Agree	
Screen time	We are having more screen time - including television, smart phone, and computer - than we usually do.	Strongly disagree	0 — No increase
		Disagree	
		Neither agree nor disagree	1 — More
		Agree	
Physical activity	We are more physically active -that includes walking and exercise - than we usually do.	Strongly disagree	1 — No increase
		Disagree	
		Neither agree nor disagree	0 — More
		Agree	
Mealtime routine	We are following mealtime routine more than we usually do.	Strongly disagree	1 — No increase
		Disagree	
		Neither agree nor disagree	0 — More
		Agree	
Bedtime routine	We are following bedtime routine more than we usually do.	Strongly disagree	1 — No increase
		Disagree	
		Neither agree nor disagree	0 — More
		Agree	
Mental health			
Psychological distress	Over the last two weeks, how often have you been bothered by the following problems:		
		Feeling nervous, anxious, or on edge	
		Not at all	0
		Several days	1
		More than half the days	2
	Nearly everyday	3	
	Not at all	0	

	Not being able to stop or control worrying	Several days	1	
		More than half the days	2	
		Nearly everyday	3	
	Feeling down, depressed, or hopeless	Not at all	0	
		Several days	1	
		More than half the days	2	
	Little interest or pleasure in doing things	Nearly everyday	3	
		Not at all	0	
		Several days	1	
		More than half the days	2	
		Nearly everyday	3	
		PHQ-4 Score	Ranges from 0-12	
	PHQ-4	4 groups	0-2	0 — None
			3-5	1 — Mild
6-8			2 — Moderate	
9-12			3 — Severe	
2 groups		0-2	0 — None	
		3-12	1 — Yes	
Worry about family	Worried about family members and close friends	Not at all	0	
		Several days	1	
		More than half the days	2	
		Nearly everyday	3	
	Worry about family 2 groups	Not at all	0 — No	
		Several days –nearly everyday	1 — Yes	
Participating research	Has COVID-19 negatively affected your desire to participate in research?	Not at all	0 — No	
		A little bit		
		Moderately	1 — Yes	
		Quite a bit		
Extremely				
The ways of receiving health information	Has COVID-19 affected the way you prefer to receive and communicate health-related information with health professionals?	Yes	1 — Yes	
		No	0 — No	
	How likely is it that you would use the following modes to receive and communicate health-related information with health professionals?	Face-to-face	Unlikely	0 — No
			Possibly	
			Likely	1 — Yes
			Almost certain	
		Telephone	Certain	
			Unlikely	0 — No
			Possibly	
			Likely	1 — Yes
		SMS	Almost certain	
			Unlikely	0 — No
			Possibly	
			Likely	1 — Yes
Almost certain				

		Certain	
	Video conference	Unlikely	0 — No
		Possibly	
		Likely	1 — Yes
		Almost certain	
		Certain	
	Website	Unlikely	0 — No
		Possibly	
		Likely	1 — Yes
		Almost certain	
		Certain	
	Social media	Unlikely	0 — No
		Possibly	
		Likely	1 — Yes
		Almost certain	
		Certain	
	Booklets	Unlikely	0 — No
		Possibly	
		Likely	1 — Yes
		Almost certain	
		Certain	
Sources of information			
Covid-19 related	Since COVID-19 outbreak, have you followed COVID-19 related information based on information or advice from the following individuals?		
	Government officials	Yes	1 — Yes
		No	0 — No
	Health professionals	Yes	1 — Yes
		No	0 — No
	Family members	Yes	1 — Yes
		No	0 — No
	Social media	Yes	1 — Yes
		No	0 — No
	Educators	Yes	1 — Yes
		No	0 — No
	Food & beverage	Since COVID-19 outbreak, have you changed the types of food and beverages that you and your family purchase or eat based on information or advice from the following individuals?	
Government officials		Yes	1 — Yes
		No	0 — No
Health professionals		Yes	1 — Yes
		No	0 — No
Family members		Yes	1 — Yes
		No	0 — No
Social media		Yes	1 — Yes
		No	0 — No
Educators		Yes	1 — Yes
		No	0 — No

Physical Activity	Since COVID-19 outbreak, have you or your family changed your physical activity level e.g. walking, exercise based on information or advice from the following individuals?		
	Government officials	Yes	1 — Yes
		No	0 — No
	Health professionals	Yes	1 — Yes
		No	0 — No
	Family members	Yes	1 — Yes
		No	0 — No
	Social media	Yes	1 — Yes
		No	0 — No
	Educators	Yes	1 — Yes
		No	0 — No

BMJ Open

Ethnicity matters in perceived impacts and information sources of COVID-19 among mothers with young children in Australia: A cross-sectional study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-050557.R1
Article Type:	Original research
Date Submitted by the Author:	01-Sep-2021
Complete List of Authors:	Wen, Li Ming; The University of Sydney, Sydney School of Public Health Xu, Huilan; Sydney Local Health District, Population Health Research & Evaluation Hub Jawad, Danielle; Sydney Local Health District, Population Health Research & Evaluation Hub Buchanan, Limin; Sydney Local Health District, Population Health Research & Evaluation Hub Rissel, Chris; The University of Sydney, School of Public Health Phongsavan, Philayrath; The University of Sydney, School of Public Health Baur, Louise; The University of Sydney, The Children's Hospital at Westmead Clinical School Taki, Sarah; Sydney Local Health District, Population Health Research and Evaluation Hub
Primary Subject Heading:	Public health
Secondary Subject Heading:	Epidemiology
Keywords:	COVID-19, MENTAL HEALTH, PUBLIC HEALTH

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Title: Ethnicity matters in perceived impacts and information sources of COVID-19 among mothers with young children in Australia: A cross-sectional study

Authors: Li Ming Wen^{*1,2,3,4}; Huilan Xu¹, Danielle Jawad¹, Limin Buchanan^{1,2,3,4}; Chris Rissel^{2,3}, Philayrath Phongsavan², Louise A Baur^{2,3,5} and Sarah Taki^{1,2,3}

Affiliations:

¹Health Promotion Unit, Population Health Research & Evaluation Hub, Sydney Local Health District, Australia

²Sydney School of Public Health, Charles Perkins Centre, Faculty of Medicine and Health, The University of Sydney, Australia

³NHMRC Centre of Research Excellence in the Early Prevention of Obesity in Childhood (EPOCH), Australia

⁴Sydney Institute for Women, Children and Their Families, Sydney Local Health District, Australia

⁵Specialty of Child and Adolescent Health, Sydney Medical School, The University of Sydney, Australia

***Corresponding author:**

Clinical Assoc Prof. Li Ming Wen
Director, Population Research & Evaluation Hub
Sydney Local Health District, NSW
Sydney School of Public Health, Faculty of Medicine and Health
The University of Sydney

Level 9 North, King George V Building,
Camperdown NSW 2050, Australia
Tel: 61-2-9515 9078 | Fax: 61-2- 9515 9056
Email: Liming.Wen@health.nsw.gov.au

ORCID ID: <https://orcid.org/0000-0003-1381-4022>

Abstract

Objectives: This study aimed to investigate perceived impacts, ways of communication with professionals, and information sources related to COVID-19, and explore whether these impacts or information sources were associated with ethnicity i.e. language spoken at home.

Design: A cross-sectional study

Setting: Sydney, Australia during the period from March to October 2020.

Participants: Mothers of young children participating in an existing trial.

Outcome measures: Mothers were asked to respond to a set of survey questions related to COVID-19 via telephone. The questions included a mental health scale, and how they communicated with health professionals and their information sources related to COVID-19 during the COVID-19 pandemic.

Results: Of 537 mothers who completed the survey (81% response rate), 45% reported spoke a language other than English at home. Overall, 136 (26%) reported experiencing mental distress. 234 (44%) reported that COVID-19 affected the way they receive and communicate health-related information with health professionals, especially for those from non-English speaking backgrounds with an adjusted odds ratio (1.58, 95%CI 1.10 – 2.27). They were less likely to use a face-to-face service (AOR 0.55, 95% CI 0.37 – 0.80) and more likely to use social media (AOR 2.11, 95% CI 1.40 – 3.17) for health related information. Regarding sources of COVID-19 related information, mothers from non-English speaking backgrounds

1
2
3 were more likely to rely on family members (AOR 1.49, 95% CI 1.01 – 2.19) and social
4
5 media (AOR 3.34, 95% CI 2.05 – 5.43).
6
7
8
9

10 **Conclusions:** COVID-19 has significantly impacted mothers with young children in regard
11
12 to their mental health, means of communicating with health professionals and sources of
13
14 health information. Mothers from non-English speaking communities were less likely to use a
15
16 face-to-face service, and more likely to seek information from family members and social
17
18 media. Appropriate health support for non-English speaking community needs to take these
19
20 factors into account.
21
22
23
24
25

26 **Trial registration:** The trial is registered with the Australian Clinical Trial Registry
27
28 (ANZCTR:12618001571268)
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Strengths and limitations of this study

- This is the first study to report on the role of ethnicity in perceived impacts and information sources of COVID-19 among mothers with young children in Australia.
- The study highlights the importance of taking ethnicity into account in providing appropriate health support for mothers with young child from various backgrounds during the COVID-19 pandemic.
- The study could be limited by potential sample selection bias as a result of survey participants from an existing trial.
- Further qualitative research is required to understand why there were differences in sources used for information on COVID-19 and healthy lifestyle behaviours.

Introduction

The COVID-19 pandemic has had profound effects on communities globally.¹ Since February 2021 this severe acute respiratory syndrome (SARS-CoV-2) has engulfed the world with approximately 105 million confirmed cases and 2.2 million deaths.¹ In Australia, by January 2021, over 28,000 confirmed cases and 908 deaths have been reported.² As a result, containment measures have included closure of or limited access to government and private offices, schools, shops, parks, and non-essential workplaces.³ This has directly and indirectly impacted people's daily activities, social events, food availability, dietary quality, sleep cycle, screen time, employment, access to recreational locations and financial security.⁴⁻⁸

Recent studies have identified multiple aspects of life that have been influenced by the pandemic. For instance, a study of Canadian families with young children found that COVID-19 restrictions adversely affected daily routines, with reduced physical activity and increased screen time as well as an overall increased consumption of food and snacks.⁹ Such changes, triggered by stress eating, working from home, online home schooling, and limited access to outdoor play areas, are likely to lead to lower quality of life which in turn may lead to long lasting health problems.^{5 10} In addition to the impact on health behaviours, COVID-19 restrictions also present unique stressors that have placed a burden on mental health.¹¹⁻¹⁵ In examining the impacts of social restrictions and distancing measures, a recent meta-analysis of 19 studies with 93,569 participants reported a higher prevalence of stress (8.1% to 81.9%), psychological distress (34.43% to 38%), depression (14.6% to 48.3%), anxiety (6.33% to 50.9%), and post-traumatic stress disorder (7% to 53.8%) during the pandemic when compared to previously estimated one-year prevalence rates prior to the pandemic.¹¹ That review highlighted that more adverse psychological symptoms were exhibited among

1
2
3 women, people under 40 years and those with existing mental health illnesses, unemployment
4
5 and students.¹¹
6
7
8
9

10 Despite the rapid escalation and repercussions of the COVID-19 pandemic across all
11
12 populations, it has disproportionately affected disadvantaged and culturally and
13
14 linguistically diverse (CALD) communities. According to recent provisional analyses,
15
16 COVID-19-related death is significantly higher among CALD communities than those of
17
18 white ethnicity.^{16 17} This finding indicates that the influence of COVID-19 on CALD
19
20 communities can potentially exacerbate health inequalities in already vulnerable
21
22 populations.¹⁸ The higher death rates from COVID-19 among CALD populations may be
23
24 partly due to factors such as lower education, difficulty finding up to date information from
25
26 trustworthy sources, lack of accessibility of translated materials and language barriers to
27
28 access health services.^{19 20 21}
29
30
31
32
33
34

35 Further, within Australia, CALD communities have lower levels of health literacy.²² It is
36
37 therefore possible that these previously mentioned factors may influence the quality of health
38
39 information CALD communities receive about COVID-19 and their ability to respond
40
41 appropriately. An Australian study also showed that people with inadequate health literacy
42
43 and those who spoke a language other than English at home, struggled to find and understand
44
45 information on COVID-19 from government sources compared to those with adequate health
46
47 literacy and who spoke English at home.²³ In contrast, a recent study highlighted government
48
49 websites as one of the most used and trusted sources of COVID-19 related information
50
51 among people of white ethnicity.²⁴ Moreover, the trust and choice of selected sources of
52
53 information are influenced by several demographic factors such as ethnicity, age, religion,
54
55 education, and political affiliation.^{24 25}
56
57
58
59
60

1
2
3
4
5
6 To date, there has been limited research examining the role of ethnicity related to the impacts
7
8 of COVID-19 and accessing health information. The aims of this study were to investigate
9
10 perceived impacts, means of communication with professionals and information sources
11
12 related to COVID-19 among mothers with young children; and further explore whether these
13
14 impacts or information sources were associated with ethnicity.
15
16
17
18

19 **Methods**

20
21 **Study design:** We conducted a cross-sectional survey of mothers with young children
22
23 participating in an existing study²⁶ in Sydney, Australia from March to October 2020. The
24
25 mothers had participated in a longitudinal study since 2017, and the study protocol was
26
27 published prior to the commencement of this trial.²⁶ The recruitment process and first year
28
29 outcomes of the original trial have been reported elsewhere.^{27 28} Briefly, the trial aimed to
30
31 investigate effectiveness of an early childhood obesity prevention using telephone support or
32
33 text messages. This current study was part of the 3-year follow-up survey and approved by the
34
35 Ethics Review Committee of Sydney Local Health District (Protocol No. X16–0360 &
36
37 LNR/16/RPAH/495 and Protocol No X18–0387 & HREC/18/RPAH/545).
38
39
40
41
42
43
44

45 **Patient and public involvement:** The survey participants were originally recruited to a
46
47 longitudinal study^{27, 28} from antenatal clinics in eight hospitals of four local health districts in
48
49 Sydney. For this current study the development of the research questions and outcome
50
51 measures was partially informed by the intervention nurses through their telephone support
52
53 consultations with the study participants as part of the original trial.²⁸ The study participants
54
55 played no role in the design of this study, but their informed consent was sought. Not
56
57 participating in this current study did not exclude them from participating in the original study.
58
59
60

1
2
3 The summary results of this study will be disseminated to all the participants through mailouts
4 or the website. The study participants and project team members are acknowledged in the
5
6
7
8 acknowledgements section.
9

10
11
12 **Inclusion and exclusion criteria:** For the original study, women were eligible to participate if
13 they were aged 16 years and over, able to communicate in English, had a mobile phone, and
14
15
16
17 lived in the recruitment areas of a local hospital. Women were excluded from the study if they
18
19
20 had a severe medical condition or known major fetal anomalies based on medical advice.
21

22
23
24 **Survey respondents and data collection:** A total of 662 mothers remained in the existing trial
25
26
27 when their children reached 3 years. The survey was conducted by a marketing survey company
28
29
30 using Computer Assisted Telephone Interviewing.
31

32 33 *Perceived COVID-19 impacts*

34
35 We measured the impacts that COVID-19 has had on families from four aspects including 1)
36
37 changes in eating, physical activity and screen time behaviours, 2) mental health, 3)
38
39 participating in research, and 4) whether the pandemic influenced their ways of receiving
40
41 health-related information. The mothers were asked to respond to five statements on whether
42
43 their family: 1) ate more snacks, fruit and vegetables, 2) had more screen time, 3) had more
44
45 physical activity, and 4) were more likely to follow mealtime or bedtime routines during the
46
47 COVID-19 pandemic. We used a 5-level Likert scale, 'Strongly disagree', 'Disagree', 'Neither
48
49 agree nor disagree', 'Agree' and 'Strongly agree'. The responses to each of the statements were
50
51 further dichotomised into 'having more' if they 'Strongly agree' or 'Agree' to the statement,
52
53
54 or 'no changes' (see **Supplementary Document** about questionnaire and coding frame).
55
56
57
58
59
60

1
2
3 The Patient Health Questionnaire-4 (PHQ4) was used to assess mothers' mental health.²⁹ The
4 mothers were asked how often they were bothered by the following over the last two weeks:
5
6 1) nervous and anxious, 2) worrying, 3) depressed or hopeless, 4) little interest or pleasure in
7
8 doing things. Mothers responded to each of the questions on a 4-point scale, '0' for 'Not at all'
9
10 to '3' for 'Nearly every day'. The PHQ-4 total score ranges from 0 to 12, with categories of
11
12 psychological distress being normal (0-2), mild (3-5), moderate (6-8), and severe (9-12). It was
13
14 further dichotomised into 'psychological distress' (mild to severe) and 'none'. Mothers were
15
16 also asked how often they worried about family members and close friends on a 4-point scale.
17
18 Responses were dichotomised into 'worrying about family' (for several days to nearly every
19
20 day), or 'no worry' (**Supplementary Document**).

21
22
23
24
25
26
27
28 Assessing the impact COVID-19 had on their research participation, mothers were asked
29
30 whether COVID-19 negatively affected their desire to participate in research. Mothers
31
32 responded to the question on a 5-level Likert scale, 'Not at all', 'A little bit', 'Moderately',
33
34 'Quite a bit', and 'Extremely'. We also dichotomised the responses into 'Affecting research
35
36 participation' (Moderately to Extremely) and 'No affect' (Not at all or A little bit). The mothers
37
38 were asked whether the COVID-19 pandemic affected the way they receive and communicate
39
40 health-related information with health professionals. They were also asked how likely they
41
42 would use the following modes to receive and communicate health-related information with
43
44 health professionals: face-to-face, telephone, short message service (SMS), videoconference,
45
46 website, social media, and booklets or pamphlets. Mothers responded to each of the modes on
47
48 a 5-level Likert scale, 'Unlikely', 'Possibly', 'Likely', 'Almost certain', and 'Certain'. The
49
50 responses were categorised into 'Yes' and 'No', with 'Yes' referring to 'Likely', 'Almost
51
52 certain', or 'Certain'.
53
54
55
56
57
58
59
60

Sources of health information for changing behaviours during COVID-19 pandemic

We asked about sources of health information related to three areas specific to COVID-19: 1) COVID-19 related information, 2) changing food and beverage behaviour, and 3) changing physical activity from government officials, health professionals, family members, social media, or educators respectively. The question allowed multiple responses (see **Supplementary Document**).

Mothers' demographics

Mothers' demographic information, including their language spoken at home, was collected at baseline using standard questions from the NSW Adult Population Health Survey.³⁰ All mothers' demographic and socioeconomic information were categorized into groups.

Statistical analysis

Statistical analyses were carried out using Stata 13 (StataCorp 2013). All P-values are two sided and statistical significance was set at the 5% level. Descriptive analysis was conducted to describe mothers' baseline demographic characteristics for those who completed 3 year survey. Pearson's Chi-squared tests were conducted to examine the associations between mothers' demographic characteristics and COVID-19 impact and sources of health information during COVID-19 pandemic. Number and percentage were reported.

Multiple logistic regression models were built to investigate the associations between mothers' language spoken at home and COVID-19 impact and sources of health information during COVID-19 pandemic. To identify potential confounding factors, mothers' demographic variables that were significant in Pearson's chi-squared tests with $P < 0.25$ were entered in the multiple logistic regression models. The least significant variables were progressively dropped

1
2
3 until only those with $P < 0.05$ remained. Variables dropped from the model were then entered
4
5 into the model individually to assess confounding. Since the survey respondents were involved
6
7 in an intervention trial, their group allocation was also adjusted in the final model. Adjusted
8
9 odds ratios (AORs) with 95% confidence intervals (CI) were then calculated as a measure of
10
11 the association.
12
13
14
15
16

17 **Results**

18
19 Of 662 mothers remaining in the follow up study, 537 completed the COVID-19 survey
20
21 questions with a response rate of 81%. Table 1 shows demographic characteristics of the
22
23 survey respondents with 45% of the mothers speaking a language other than English at
24
25 home.
26
27
28
29

30
31 Table 2 shows that the impacts on mental health were observed across the survey
32
33 respondents, with 26% reporting psychological distress (including 18% with mild symptoms
34
35 of mental distress, 5% moderate symptoms and 2% severe mental distress), and 59%
36
37 worrying about their family. There was no significant difference in psychological distress
38
39 between mothers from English or non-English speaking backgrounds. Substantial
40
41 proportions of mothers reported having more snacks (46%) and no increase in fruit and
42
43 vegetable consumption (55%), in particular among English speaking mothers. Overall, 77%
44
45 of the mothers reported having more screen time while 60% reported no increase in physical
46
47 activity, with no significant differences found between English and non-English speaking
48
49 mothers. Significantly higher proportions of English speaking mothers reported impacts of
50
51 the COVID-19 restrictions on their mealtime (71%) or bedtime (76%) routines.
52
53
54
55
56
57
58
59
60

1
2
3 Table 2 also shows 44% reported that COVID-19 affected the way they receive and
4
5 communicate health-related information with health professionals, especially those who
6
7 spoke a language other than English, with an adjusted odds ratio (AOR 1.58, 95%CI 1.10 –
8
9 2.27). They were less likely to use a face-to-face service (AOR 0.55, 95% CI 0.37 – 0.80) and
10
11 more likely to use social media (AOR 2.11, 95% CI 1.40 – 3.17) for health related
12
13 information.
14
15

16
17
18
19 Table 3 shows the sources of COVID-19 related information and information for changes in
20
21 food and beverage consumption and physical activity behaviours during the COVID-19
22
23 pandemic. For the COVID-19 related information almost all of mothers (97%) relied on
24
25 government officials, followed by health professionals (77%), family members (67%),
26
27 educators (52%) and social media (26%). However, mothers who spoke a language other than
28
29 English were more likely to rely on family members (AOR 1.49, 95% CI 1.01 – 2.19) and
30
31 social media (AOR 3.34, 95% CI 2.05 – 5.43).
32
33
34
35

36
37
38 Less than half of the survey respondents (48%) reported accessing sources of information for
39
40 changing physical activity from government officials and 27% reported accessing such
41
42 information from health professionals (Table 3). However, non-English speaking mothers
43
44 were more likely to rely on government officials (AOR 2.23, 95%CI 1.49 – 3.32) or health
45
46 professionals (AOR 3.58, 95%CI 2.34 –5.50) compared to English speaking mothers.
47
48

49
50 Regarding information for changing food and beverages only, about 20% reported accessing
51
52 information from government officials or health professionals. Non-English speaking
53
54 mothers were more likely to rely on government officials (AOR 6.68, 95%CI 3.56 – 12.55) or
55
56 health professionals (AOR 5.26, 95%CI 3.11 –8.89), compared to English speaking mothers.
57
58
59
60

Discussion

This cross-sectional survey conducted with mothers during the pandemic found that one in four reported having psychological distress, with more than half of the respondents being worried about their family regardless of ethnicity. The COVID-19 pandemic resulted in more snack consumption and more screen time. It also affected the way mothers receive and communicate health-related information with health professionals, especially those who spoke a language other than English. Non-English speaking mothers were less likely to use a face-to-face service and more likely to use family and social media for health related information. The survey also found that the majority of mothers relied on government officials and health professionals for COVID-19 related information regardless of ethnicity.

Impact of COVID-19 on mental health

On average, general mental distress among mothers with young child was moderate. Most reported feeling normal (74%), or having a mild (18%) degree of mental distress. Similar patterns were found among English and non-English speaking mothers. The mental health status of our survey respondents appeared to be better than that of respondents of a survey that examined mental health status of the general Australian population during the pandemic with responses from 5,158 Australian adults.³¹ A possible explanation could be due to the difference in data collection period. That study collected data from 1st to 4th April 2020 while lockdown restrictions were occurring in Australia.³² Our survey collected data from March till October 2020 which covered periods from lockdown to easing of restrictions in Australia. The varying results also could be explained by the different tools used for assessing mental health and the age range and gender of our study participants.

1
2
3 Our findings are complementary to a previous study conducted in Germany, which showed
4 similar psychological effects of the pandemic using the same PHQ4 tool. Analysis of the
5 survey data collected from (27 March- 6 April) reported that the majority (78.3%) of
6 respondents were concerned of the health consequences for their relatives. The average
7 depressive and anxiety PHQ4 score was mild among participants, similar to our study.
8
9
10
11
12
13
14 Additionally, the study highlighted that women had a significantly higher PHQ-4 score than
15 men, highlighting the susceptibility of women to mental illness.³³
16
17
18
19
20

21
22 Despite the low prevalence of mothers reporting mental distress in our current study, it is
23 intuitive that COVID-19 pandemic restrictions would increase mental distress as evidenced
24 by previous literature on the negative influences of public health crises on mental health.¹¹⁻¹⁵
25
26
27 More than half of our study participants reported worrying about their family members.
28
29
30 While government efforts to manage and eradicate COVID-19 continue, our society will also
31 need to continue maintaining physical distancing, some social isolation and dealing with
32 disruptions to life. Thus it is imperative to intervene to protect communities, in particular
33 those in high-risk groups such as women with young children,³¹ and other vulnerable
34 communities such as non-English speaking people, where a greater effort to communicate
35 well is needed. Specifically, research needs to focus on better understanding, from a cultural
36 lens, the cultural differences to help CALD communities deal with the changing contexts
37 related to COVID-19, and how they see the role of governments and health professionals to
38 help CALD communities interact with health systems (health literacy).²³ Addressing this will
39 increase the effectiveness of the COVID-19 response such as testing, following physical
40 isolation restrictions and the uptake of vaccinations to effectively and successfully manage
41 subsequent waves of the pandemic.
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Sources used for health information

Our study findings echo some previous studies in which it was also found that vulnerable populations are less likely to use face-to-face services and more likely to turn to other sources for health information such as religious leaders or family members and community leaders who may be important in many cultures.^{22 24} Social media is an additional platform that has been used substantially by many people including CALD communities for health-related information.²¹ Using social media from non-medical or non-Government sources may be of concern, given the proliferation of readily available misinformation obtained via unreliable and unverified online social applications.^{34 35} Recent evidence showed that two-thirds (66%) of individuals encountered misinformation about COVID-19 on social media,³⁶ an additional one-third (36%) mentioned obtaining false information from news media coverage.³⁶ For instance, in the United States misleading claims of a national lockdown fuelled panic buying of paper products and groceries resulting in food insecurity among vulnerable populations giving rise to mass hysteria and panic.³⁷ While social media is highly used by populations of various backgrounds and can be a beneficial platform to share information, there is a need to improve social media literacy skills. More research needs to be conducted to identify relevant approaches to support CALD communities and improve navigating through credible information on digital or social media platforms.

Adverse psychosomatic outcomes are expected to increase especially among CALD communities due to social isolation, access barriers to health services, discrimination and racism, limited support networks, low English proficiency, and poor digital literacy.³⁸ These circumstances can potentially exacerbate existing health inequities for these vulnerable groups, thus perpetuating suboptimal health-seeking behaviours, and poor engagement with

1
2
3 health care professionals and the broader health system. As identified in our study, there is a
4 cultural tendency to seek information from families, religious leaders, and media, which
5 highlights the importance of mitigating harm from digital “infodemics” and tailoring
6 messages to community values.³⁸ There is a clear case for government agencies to take a
7 leadership role in communicating with CALD communities using culturally appropriate
8 methods, in particular to increase the uptake of COVID-19 vaccinations. In addition, a
9 cross-sectional survey of Pennsylvania adults found that COVID-19 knowledge correlates
10 with using trusted news sources (i.e. government health websites). The study called for the
11 use of government health websites, as well as monitoring and correcting misinformation
12 presented by other sources (e.g. Facebook) in order to maximize information dissemination
13 and compliance with COVID-19-related public health recommendations.³⁹
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

32 This study found that during the pandemic, the majority of people obtained COVID-19
33 related information from government officials and health professionals, but a much smaller
34 proportion of mothers obtained health information for changing health behaviours from these
35 sources. This does not necessarily mean that mothers did not receive diet and physical
36 activity information or advice from government officials or health professionals. Rather, it
37 may indicate that changing lifestyle behaviours was considered to be a low priority during the
38 pandemic compared with navigating the various responses to COVID-19. Another reason
39 might be that the majority of the population in Australia are less likely to have ever lived
40 through a pandemic, and therefore there is a sense of unfamiliarity in how to respond and
41 react. Thus the government played a major role in the response including constant changes in
42 social restriction laws requiring the population to follow information from government
43 officials.
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6 Despite this, good nutrition and regular physical activity contribute to improving immunity.
7
8 As such, the World Health Organization released guidelines on diet during the COVID-19
9
10 pandemic stating that “good nutrition is crucial for health, particularly in times when the
11
12 immune system might need to fight back”.⁴⁰ However, there are currently very few culturally-
13
14 appropriate programs and resources that promote healthy eating and physical activity targeted
15
16 at children aged under 5 years.⁴¹ Government and various health agencies will need to
17
18 continue developing culturally appropriate resources and health-related behaviour change
19
20 support material to mitigate the likelihood of long term impacts of COVID on chronic disease
21
22 status.
23
24
25
26
27
28
29

30 **Strength and limitations:**

31
32 Our survey is timely and specific to the impacts of COVID-19 during the pandemic. Mental
33
34 health outcomes were measured with the PHQ-4 which is a psychometrically valid instrument
35
36 and has been demonstrated as a valid screening tool in general populations.²⁹ With regards to
37
38 the limitations, our cross-sectional survey design hindered causal inference. The survey
39
40 questions for perceived behaviour change, and information sources as impacted by COVID-
41
42 19 were newly developed for the current study given that no validated instruments were
43
44 available at the time we initiated this study. Additionally, our collection period ranged from
45
46 March to October 2020 and within this period, Australia experienced a range of COVID-19
47
48 restrictions, from full lockdown to eased restrictions, to having varying levels of restrictions
49
50 in place and in different states.³² We acknowledge that respondents’ behavioural data only
51
52 represent their state on the date they completed the survey with limited generalisability.
53
54
55 Further qualitative research is required to understand why there were differences in sources
56
57 used for information on COVID-19 and healthy lifestyle behaviours.
58
59
60

Conclusion:

The response to COVID-19 has impacted on mothers with young children in regard to their mental health, means of communicating with health professionals and sources of health information. Mothers from CALD communities were less likely to use a face-to-face service, and more likely to seek information from family members and social media. Appropriate health support for CALD community needs to take these factors into account.

For peer review only

Acknowledgements

We sincerely thank all the participating families in this study. We thank the members of the Steering Committee, Management Committee and working group for their advice and support.

We wish to thank the project partners from the Sydney, South Eastern Sydney, South Western Sydney and Southern NSW Local Health Districts, in NSW, Australia.

Contributors: LMW, CR, LAB conceived of the study. LMW prepared the first draft of the manuscript. HX conducted statistical analyses. DJ and LB contributed to literature review. CR, PP, LAB and ST contributed to revising the manuscript critically. All authors contributed to finalising the manuscript and approved the manuscript.

Conflict of interests: The authors declare that they have no competing interests in this study.

Funding: This trial was funded by the NSW Health Translational Research Grant Scheme 2016 (ID number: TRGS 200) and the Australian National Health and Medical Research Council Partnership Project APP1169823.

Role of funder or sponsor: We declare that the funder (NSW Health and NHMRC) played no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Ethical approval: The trial was granted ethics approval by the Ethics Review Committee of Sydney Local Health District (Protocol No. X16–0360 & LNR/16/RPAH/495 and Protocol No X18–0387 & HREC/18/RPAH/545). Written informed consent was obtained from all study participants.

Patient consent for publication: Not required.

Data availability statement: De-identified data and material can be available on request pending on ethics approval from Dec 30, 2021 to Dec 30, 2026.

References

1. Countries where COVID-19 has spread. Worldometer 2020.
<https://www.worldometers.info/coronavirus/countries-where-coronavirus-has-spread/>
(accessed 10 Dec 2020).
2. Coronavirus (COVID-19) current situation and case numbers. Australian Government Department of Health. Australian Government Department of Health 2020.
<https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-current-situation-and-case-numbers> (accessed 10 Dec 2020).
3. Policy Responses to COVID19. International Monetary Fund 2020.
<https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19>
(accessed 15 Dec 2020).
4. Di Renzo L, Gualtieri P, Pivari F, *et al.* Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey. *J Transl Med* 2020;18(1):229.
5. Moore SA, Faulkner G, Rhodes RE, *et al.* Impact of the COVID-19 virus outbreak on movement and play behaviours of Canadian children and youth: a national survey. *Int J Behav Nutr Phys Act* 2020;17:85.
6. Chopra S, Ranjan P, Singh V, *et al.* Impact of COVID-19 on lifestyle-related behaviours- a cross-sectional audit of responses from nine hundred and ninety-five participants from India. *Diabetes Metab Syndr* 2020;14(6):2021-30.
7. Di Renzo L, Gualtieri P, Cinelli G, *et al.* Psychological Aspects and Eating Habits during COVID-19 Home Confinement: Results of EHLC-COVID-19 Italian Online Survey. *Nutrients* 2020;12(7):2152.
8. Deschasaux-Tanguy M, Druesne-Pecollo N, Esseddik Y, *et al.* Diet and physical activity during the COVID-19 lockdown period (March-May 2020): results from the French NutriNet-Sante cohort study. *medRxiv* Published Online First: 5 June 2020. doi:
<https://doi.org/10.1101/2020.06.04.20121855>
9. Carroll N, Sadowski A, Laila A, *et al.* The Impact of COVID-19 on Health Behavior, Stress, Financial and Food Security among Middle to High Income Canadian Families with Young Children. *Nutrients* 2020;12(8):2352.
10. Dunton GF, Do B, Wang SD. Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the U.S. *BMC Public Health* 2020;20(1):1351.
11. Xiong J, Lipsitz O, Nasri F, *et al.* Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *J Affect Disord* 2020;277:55-64.

12. Serafini G, Parmigiani B, Amerio A, *et al.* The psychological impact of COVID-19 on the mental health in the general population. *QJM* 2020;113(8):531-537.
13. Luo M, Guo L, Yu M, *et al.* The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public - A systematic review and meta-analysis. *Psychiatry Res* 2020;291:113190.
14. Rajkumar RP. COVID-19 and mental health: A review of the existing literature. *Asian J Psychiatr* 2020;52:102066.
15. Dubey S, Biswas P, Ghosh R, *et al.* Psychosocial impact of COVID-19. *Diabetes Metab Syndr* 2020;14(5):779-88.
16. Kirby T. Evidence mounts on the disproportionate effect of COVID-19 on ethnic minorities. *Lancet Respir Med* 2020;8(6):547-8.
17. White C, Nafilyan V. Coronavirus (COVID-19) related deaths by ethnic group, England and Wales: 2 March 2020 to 10 April 2020. Office for National Statistics. 2020. <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/death/articles/coronavirusrelateddeathsbyethnicgroupenglandandwales/2march2020to10april2020>. (accessed 28 Dec 2020).
18. World Health Organization. Health of migrants: Resetting the agenda. Report of the 2nd Global Consultation, Colombo, Sri Lanka, 21-23 Feb 2017. Geneva: International Organization for Migration, 2017. https://publications.iom.int/system/files/pdf/gc2_srilanka_report_2017.pdf (accessed 28 Dec 2020)
19. Goeman D, King J, Koch S. Development of a model of dementia support and pathway for culturally and linguistically diverse communities using co-creation and participatory action research. *BMJ Open* 2016;6(12):e013064.
20. Sze S, Pan D, Nevill CR, *et al.* Ethnicity and clinical outcomes in COVID-19: A systematic review and meta-analysis. *EClinicalMedicine* 2020;29:100630.
21. Wild A, Kunstler B, Goodwin D, *et al.* Communicating COVID-19 health information to culturally and linguistically diverse (CALD) communities: the importance of partnership, co-design, and behavioural and implementation science. *MetaArXiv* Published Online First: 03 Aug 2020. doi:10.31222/osf.io/85h93
22. Australia's health 2018. Culturally and linguistically diverse populations. Australian Institute of Health and Welfare. Australian Government. 2018. <https://www.aihw.gov.au/getmedia/f3ba8e92-afb3-46d6-b64c-ebfc9c1f945d/aihw-aus-221-chapter-5-3.pdf.aspx> (accessed 20 Dec 2020).

- 1
- 2
- 3 23. McCaffery KJ, Dodd RH, Cvejic E, *et al.* Health literacy and disparities in COVID-19–
- 4 related knowledge, attitudes, beliefs and behaviours in Australia. *Public Health Res*
- 5 *Pract* 2020;30(4):e30342012.
- 6
- 7
- 8 24. Ali SH, Foreman J, Tozan Y, *et al.* Trends and Predictors of COVID-19 Information
- 9 Sources and Their Relationship With Knowledge and Beliefs Related to the Pandemic:
- 10 Nationwide Cross-Sectional Study. *JMIR Public Health Surveill* 2020;6(4):e21071.
- 11
- 12 25. Wang PW, Lu WH, Ko NY, *et al.* COVID-19-Related Information Sources and the
- 13 Relationship With Confidence in People Coping with COVID-19: Facebook Survey
- 14 Study in Taiwan. *J Med Internet Res* 2020;22(6):e20021.
- 15
- 16 26. Wen LM, Rissel C, Baur LA, *et al.* A 3-Arm randomised controlled trial of
- 17 Communicating Healthy Beginnings Advice by Telephone (CHAT) to mothers with
- 18 infants to prevent childhood obesity. *BMC Public Health* 2017;17:79.
- 19
- 20 27. Ekambareshwar M, Mahrshahi S, Wen LM, *et al.* Facilitators and challenges in recruiting
- 21 pregnant women to an infant obesity prevention programme delivered via telephone calls
- 22 or text messages. *Trials* 2018;19(1):494.
- 23
- 24 28. Wen LM, Rissel C, Xu H, *et al.* Effects of telephone support and short message service
- 25 on infant feeding practices, 'tummy time' and screen time at 6 and 12 months of child
- 26 age: a 3-arm randomized controlled. *JAMA Pediatr* 2020;174(7):657-64.
- 27
- 28 29. Kroenke K, Spitzer RL, Williams JBW, *et al.* An ultra-brief screening scale for anxiety
- 29 and depression: the PHQ-4. *Psychosomatics* 2009;50:613-21.
- 30
- 31 30. Centre for Epidemiology and Research. 2006 report on Adult Health from the New South
- 32 Wales Population Health Survey. Sydney: NSW Department of Health, Australia. 2007.
- 33 <https://www.health.nsw.gov.au/surveys/adult/Publications/adults-06.pdf> (accessed 15
- 34 Dec 2020)
- 35
- 36 31. Rossell SL, Neill E, Phillipou A, *et al.* An overview of current mental health in the
- 37 general population of Australia during the COVID-19 pandemic: Results from the
- 38 COLLATE project. *Psychiatry Res* 2021; 296:113660.
- 39
- 40 32. Lupton, D. Timeline of COVID-19 in Australia: the first year.
- 41 <https://deborahalupton.medium.com/timeline-of-covid-19-in-australia-1f7df6ca5f23>
- 42 (accessed 20 Jan 2021).
- 43
- 44 33. Thibaut1 F, van Wijngaarden-Cremers PJM. Women's Mental Health in the Time of
- 45 Covid-19 Pandemic. *Front Glob Womens Health* 2020;1:Article588372.
- 46
- 47 34. Henrich N, Holmes B. Communicating during a pandemic: information the public wants
- 48 about the disease and new vaccines and drugs. *Health Promot Pract* 2011;12(4):610-9.
- 49
- 50
- 51
- 52
- 53
- 54
- 55
- 56
- 57
- 58
- 59
- 60

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
35. Perrin A, Anderson M. Share of U.S. adults using social media, including Facebook, is mostly unchanged since 2018. Pew Research Center 2020.
<https://www.pewresearch.org/fact-tank/2019/04/10/share-of-u-s-adults-using-social-media-including-facebook-is-mostly-unchanged-since-2018/> (accessed 25 Jan 2021)
 36. Park S, Fisher C, Lee JY, *et al.* COVID-19: Australian news and misinformation. University of Canberra. <https://apo.org.au/sites/default/files/resource-files/2020-07/apo-nid306728.pdf> (accessed 18 Jan 2021).
 37. Spencer SH. False claims of nationwide lockdown for COVID-19. Factcheck 2020. <https://www.factcheck.org/2020/03/false-claims-of-nationwide-lockdown-for-covid-19/> (accessed 20 Dec 2020).
 38. Understanding experiences and impacts of COVID-19 on individuals with mental health and AOD issues from CaLD communities. Mental Health Commission 2020.
<https://www.mhc.wa.gov.au/media/3413/201016-mhc20-80370-impact-of-covid-19-on-individuals-cald-communities-final-attachment.pdf> (accessed 20 Dec 2020).
 39. Sakya SM, Scoy LJV, Garman JC, Miller EL, Snyder B, Wasserman E, Chinchilli VM, Lennon RP. The impact of COVID-19-related changes in media consumption on public knowledge: results of a cross-sectional survey of Pennsylvania adults. *Curr Med Res Opin.* 2021 Jun;37(6):911-915
 40. Food and Nutrition tips during self-quarantine. WHO 2020.
<http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov-technical-guidance/food-and-nutrition-tips-during-self-quarantine> (Accessed 16 Jan 2021)
 41. Liu JJ, Davidson E, Bhopal RS, *et al.* Adapting health promotion interventions to meet the needs of ethnic minority groups: mixed-methods evidence synthesis. *Health Technol Assess* 2012;16(44):1-469.

Table 1 Demographics of the survey respondents in Sydney, Australia, March and October 2020

Mothers' demographics	3 year survey
	Completed n (%)
Age (years)	
<30	143 (27)
≥30	394 (73)
Country of birth	
Australia	211 (39)
Overseas	326 (61)
Language spoken at home	
English	296 (55)
Other	241 (45)
Annual household income	
<\$80,000	316 (64)
≥\$80,000	175 (45)
Employment status	
Employed	365 (68)
Other	172 (32)
Marital status	
Married/de-facto partner	508 (95)
Other	28 (5)
Education level	
University &	381 (71)
Up to HSC/TAFE*	155 (29)
First time mother	
Yes	303 (56)
No	234 (44)

*HSC: High School Certificate; TAFE: Technical and Further Education

Table 2: Perceived impacts of COVID on mothers and associations with mothers' language spoken at home

Covid-19 impacts	Total n (%)	Language spoken at home			
		English n (%)	Other n (%)	P	Other vs English AOR (95% CI)
Perceived behaviour changes					
Having more snacks	244 (46)	154 (52)	90 (38)	0.001	0.52 (0.36 – 0.75)
No increase in fruit & vegetable consumption	293 (55)	200 (68)	93 (39)	<0.0001	0.31 (0.21 – 0.45)
Having more screen time	412 (77)	235 (80)	177 (74)	0.107	0.71 (0.46 – 1.08)
No increase in physical activity	319 (60)	174 (59)	145 (61)	0.728	1.07 (0.75 – 1.55)
Did not follow mealtime routine	304 (57)	210 (71)	94 (39)	<0.0001	0.27 (0.18 – 0.39)
Did not follow bedtime routine	347 (65)	224 (76)	123 (51)	<0.0001	0.34 (0.23 – 0.49)
Mental health					
Psychological distress	136 (26)	72 (24)	64 (27)	0.547	1.03 (0.68 – 1.55)
Worry about their family	321 (59)	164 (56)	148 (62)	0.152	1.27 (0.88 – 1.82)
Participating research					
	91 (18)	26 (9)	65 (28)	<0.0001	2.20 (1.25 – 3.88)*
The way of receiving health info					
	234 (44)	115 (39)	119 (50)	0.014	1.58 (1.10 – 2.27)
The way of communicating with health professionals (multiple responses allowed)					
Face-to-face	344 (65)	207 (71)	137 (57)	0.001	0.55 (0.37 – 0.80)
Telephone	406 (76)	237 (81)	169 (71)	0.006	0.70 (0.44 – 1.11)*
SMS	274 (52)	152 (52)	122 (51)	0.849	0.94 (0.66 – 1.35)
Video conference	313 (59)	200 (68)	113 (47)	<0.0001	0.45 (0.31 – 0.66)
Website	277 (52)	158 (54)	119 (50)	0.342	0.79 (0.55 – 1.13)
Social media	146 (27)	58 (20)	88 (37)	<0.0001	2.11 (1.40 – 3.17)
Booklets	288 (43)	131 (45)	97 (41)	0.322	0.82 (0.57 – 1.19)

AOR: adjusted odds ratio, all models were adjusted for intervention allocations and employment status

* Adjusted for intervention allocations, employment status and annual household income

Table 3: Sources of COVID-19 related information and health information for changing food and beverage and physical activity behaviours during the Covid-19 pandemic and their associations with mothers' language spoken at home

	Total n (%)	Language spoken at home			
		English n (%)	Other n (%)	P	Other vs English AOR (95% CI)
Sources of Covid-19 related information					
Government officials	517 (97)	288 (98)	229 (96)	0.149	0.74 (0.25 – 2.21)
Health professionals	410 (77)	229 (78)	181 (76)	0.556	0.87 (0.57 – 1.33)
Family members	355 (67)	182 (62)	173 (72)	0.011	1.49 (1.01 – 2.19)
Social media	136 (26)	35 (12)	101 (42)	<0.0001	3.34 (2.05 – 5.43)*
Educators	278 (52)	141 (48)	137 (57)	0.031	1.31 (0.91 – 1.88)
Sources of health information for changing food and beverage behaviour					
Government officials	95 (18)	15 (5)	80 (34)	<0.0001	6.68 (3.56 – 12.55)*
Health professionals	99 (19)	23 (8)	76 (32)	<0.0001	5.26 (3.11 – 8.89)
Family members	102 (19)	18 (6)	84 (35)	<0.0001	8.19 (4.65 – 14.43)
Social media	47 (9)	6 (2)	41 (17)	<0.0001	5.46 (2.13 – 14.04)*
Educators	71 (13)	14 (5)	57 (24)	<0.0001	4.01 (2.05 – 7.86)*
Sources of health information for changing physical activity					
Government officials	258 (48)	114 (39)	144 (60)	<0.0001	2.23 (1.49 – 3.32)*
Health professionals	145 (27)	48 (16)	97 (41)	<0.0001	3.58 (2.34 – 5.50)#
Family members	134 (25)	45 (15)	89 (37)	<0.0001	3.13 (2.03 – 4.81)
Social media	60 (11)	12 (4)	48 (20)	<0.0001	5.73 (2.91 – 11.31)
Educators	96 (18)	30 (10)	66 (28)	<0.0001	3.15 (1.93 – 5.16)

AOR: adjusted odds ratio, all models were adjusted for intervention allocations and employment status

* Adjusted for intervention allocations, employment status and annual household income

Adjusted for interventions allocations, employment status and marital status

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Supplementary document: survey questions, variables and coding

Labels	Questions	Responses	Coding
Covid-19 impact			
Perceived behaviour change			
	In what ways has the COVID-19 pandemic affected you and your family:		
Snacks	We are eating more snacks (e.g. crisps, chocolate) than we usually do.	Strongly disagree	0 — No increase
		Disagree	
		Neither agree nor disagree	1 — More
		Agree	
Fruit & vegetable	We are eating more fruit and vegetables than we usually do.	Strongly disagree	1 — No increase
		Disagree	
		Neither agree nor disagree	0 — More
		Agree	
Screen time	We are having more screen time - including television, smart phone, and computer - than we usually do.	Strongly disagree	0 — No increase
		Disagree	
		Neither agree nor disagree	1 — More
		Agree	
Physical activity	We are more physically active -that includes walking and exercise - than we usually do.	Strongly disagree	1 — No increase
		Disagree	
		Neither agree nor disagree	0 — More
		Agree	
Mealtime routine	We are following mealtime routine more than we usually do.	Strongly disagree	1 — No increase
		Disagree	
		Neither agree nor disagree	0 — More
		Agree	
Bedtime routine	We are following bedtime routine more than we usually do.	Strongly disagree	1 — No increase
		Disagree	
		Neither agree nor disagree	0 — More
		Agree	
Mental health			
Psychological distress	Over the last two weeks, how often have you been bothered by the following problems:		
		Feeling nervous, anxious, or on edge	
		Not at all	0
		Several days	1
		More than half the days	2
	Nearly everyday	3	
	Not at all	0	

	Not being able to stop or control worrying	Several days	1	
		More than half the days	2	
		Nearly everyday	3	
	Feeling down, depressed, or hopeless	Not at all	0	
		Several days	1	
		More than half the days	2	
	Little interest or pleasure in doing things	Nearly everyday	3	
		Not at all	0	
		Several days	1	
		More than half the days	2	
		Nearly everyday	3	
		PHQ-4 Score	Ranges from 0-12	
	PHQ-4	4 groups	0-2	0 — None
			3-5	1 — Mild
			6-8	2 — Moderate
			9-12	3 — Severe
		2 groups	0-2	0 — None
			3-12	1 — Yes
Worry about family	Worried about family members and close friends	Not at all	0	
		Several days	1	
		More than half the days	2	
		Nearly everyday	3	
Worry about family 2 groups		Not at all	0 — No	
		Several days –nearly everyday	1 — Yes	
Participating research	Has COVID-19 negatively affected your desire to participate in research?	Not at all	0 — No	
		A little bit		
		Moderately	1 — Yes	
		Quite a bit		
Extremely				
The ways of receiving health information	Has COVID-19 affected the way you prefer to receive and communicate health-related information with health professionals?	Yes	1 — Yes	
		No	0 — No	
	How likely is it that you would use the following modes to receive and communicate health-related information with health professionals?	Face-to-face	Unlikely	0 — No
			Possibly	
			Likely	1 — Yes
			Almost certain	
			Certain	
		Telephone	Unlikely	0 — No
			Possibly	1 — Yes
			Likely	
			Almost certain	
			Certain	
	SMS	Unlikely	0 — No	
Possibly				
Likely		1 — Yes		
Almost certain				

		Certain	
	Video conference	Unlikely	0 — No
		Possibly	
		Likely	1 — Yes
		Almost certain	
		Certain	
	Website	Unlikely	0 — No
		Possibly	
		Likely	1 — Yes
		Almost certain	
		Certain	
	Social media	Unlikely	0 — No
		Possibly	
		Likely	1 — Yes
		Almost certain	
		Certain	
	Booklets	Unlikely	0 — No
		Possibly	
		Likely	1 — Yes
		Almost certain	
		Certain	
Sources of information			
Covid-19 related	Since COVID-19 outbreak, have you followed COVID-19 related information based on information or advice from the following individuals?		
	Government officials	Yes	1 — Yes
		No	0 — No
	Health professionals	Yes	1 — Yes
		No	0 — No
	Family members	Yes	1 — Yes
		No	0 — No
	Social media	Yes	1 — Yes
		No	0 — No
	Educators	Yes	1 — Yes
		No	0 — No
	Food & beverage	Since COVID-19 outbreak, have you changed the types of food and beverages that you and your family purchase or eat based on information or advice from the following individuals?	
Government officials		Yes	1 — Yes
		No	0 — No
Health professionals		Yes	1 — Yes
		No	0 — No
Family members		Yes	1 — Yes
		No	0 — No
Social media		Yes	1 — Yes
		No	0 — No
Educators		Yes	1 — Yes
		No	0 — No

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Physical Activity	Since COVID-19 outbreak, have you or your family changed your physical activity level e.g. walking, exercise based on information or advice from the following individuals?		
	Government officials	Yes	1 — Yes
		No	0 — No
	Health professionals	Yes	1 — Yes
		No	0 — No
	Family members	Yes	1 — Yes
		No	0 — No
	Social media	Yes	1 — Yes
		No	0 — No
	Educators	Yes	1 — Yes
		No	0 — No

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page and line numbers
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Page 1, title page
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Pages 2 and 3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Pages 5&6
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 7
Methods			
Study design	4	Present key elements of study design early in the paper	Page 7 Study Design
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Pages 7-9
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	Page 8
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Pages 8-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Pages 8-10
Bias	9	Describe any efforts to address potential sources of bias	Page 10 Analysis
Study size	10	Explain how the study size was arrived at	Page 11 Results
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	n/a
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions	Page 10 Analysis n/a

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

(c) Explain how missing data were addressed n/a

(d) *Cohort study*—If applicable, explain how loss to follow-up was addressed

Case-control study—If applicable, explain how matching of cases and controls was addressed

Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy n/a

(e) Describe any sensitivity analyses

Continued on next page

For peer review only

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page 11 Results
		(b) Give reasons for non-participation at each stage	n/a
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	Pages 11 & 12 Tables 2&3
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tables 2&3
		(b) Report category boundaries when continuous variables were categorized	n/a
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page 13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Pages 13&16
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 17 the last 2 sentences
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page 19 Funding

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

For peer review only