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Educational attainment and willingness to use technology for health and to share health information – The reimagining healthcare survey

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ABSTRACT

Background: Australia has seen a rapid uptake of virtual care since the start of the COVID-19 pandemic. We aimed to describe the willingness of consumers to use digital technology for health and to share their health information; and explore differences by educational attainment and area of remoteness.

Methods: We conducted an online survey on consumer preferences for virtual modes of healthcare delivery between June and September 2021. Participants were recruited through the study’s partner organisations and an online market research company. Australian residents aged ≥18 years who provided study consent and completed the survey were included in the analysis. We reported the weighted percentages of participants who selected negative response to the questions to understand the size of the population that were unlikely to adopt virtual care. Age-adjusted Poisson regression models were used to estimate the prevalence ratios for selecting negative response associated with education and remoteness.

Results: Of the 1778 participants included, 29% were not aware of digital technologies for monitoring/supporting health, 22% did not have access to technologies to support their health, and 19% were not willing to use technologies for health. Over a fifth of participants (range: 21–34%) were not at all willing to use seven of the 15 proposed alternative methods of care. Between 21% and 36% of participants were not at all willing to share de-identified health information tracked in apps/devices with various not-for-profit organisations compared to 47% with private/for-profit health businesses. Higher proportions of participants selected negative response to the questions in the lower educational attainment groups than those with bachelor’s degree or above. No difference was observed between area of remoteness.

Conclusions: Improving the digital health literacy of people, especially those with lower educational attainment, will be required for virtual care to become an equitable part of normal healthcare delivery in Australia.

1. Introduction

Virtual care is the use of digital technologies for healthcare providers and patients to connect remotely to support and improve one’s health. It ranges from accessing telehealth for medical appointments to wearing sensors to measure fitness, using mobile apps to record and track health trends, storing and accessing medical records electronically, having a drone to deliver prescription medications, and more. Australia has seen a rapid uptake of virtual care since the start of the COVID-19 pandemic [1]. While Australians have reported positive telehealth experience since the pandemic began and indicated telehealth will be useful after the pandemic ends [2], it is unclear if people are ready to incorporate virtual care into their regular care plan beyond accessing telehealth for medical appointments.

A recent survey conducted in the United Kingdom, which assessed the readiness of the population in engaging with COVID-19 digital...
health strategies, reported an ongoing digital divide where people who were older, with lower educational attainment, or lower social grade had lower access to digital devices, were less confident in accessing digital resources, and were less inclined to interact with digital public health approaches compared to their counterparts [3]. In Australia, there is also a digital divide, where people who did not use the internet were older (44.7% aged ≥65 versus 6.5% aged <65 years), less educated (20.9% Year 12 or below versus 3.3% bachelor’s degree or above), or lived in remote locations (20.2% remote/very remote versus 12.1% major cities) [4,5]. We, therefore, aimed to describe the willingness of healthcare consumers to use digital technology for health and to share health information in Australia; and to explore differences by educational attainment and residential area of remoteness as these factors are potentially modifiable.

2. Methods

2.1. Participant recruitment and inclusion

We conducted a national cross-sectional online survey in Australia between 5th June 2021 and 13th September 2021. Adults aged ≥18 years who resided in Australia and provided consent to the study at the start of the survey were eligible to participate in the survey. The survey was rolled out concurrently to a consumer group through Australia’s Health Panel and to residents of Australia through an online link distributed by the study’s partner organisations (Consumers Health Forum of Australia, Curtin University, Deloitte Australia, and Digital Health Cooperative Research Centre) to their subscribed distribution lists and their Facebook and LinkedIn websites. The survey available via the Australia’s Health Panel online platform was divided into two (part 1 contained Questions 1–21 and part 2 contained Questions 22–48), where consumers had the opportunity to commence either part 1, part 2 or both. For participants recruited via the national rollout, the full survey was completed anonymously via the Qualtrics online survey platform. By August, we noticed a high proportion of participants were female, resided in major cities, or had a bachelor’s degree or above. We therefore engaged an online market research company to recruit an additional 1000 participants that comprised 50% male, 50% female, 64% residing in major cities, 36% residing in regional areas of Australia, and 100% with educational attainment below a bachelor’s degree. Individuals participating through this channel received a one-off $10 payment for participation.

For this study, participants were included for analysis if they completed the survey. For participants recruited through Australia’s Health Panel, only those who completed both part 1 and part 2 were included. For participants who completed the survey via the Qualtrics platform, only one entry per IP address was included to avoid including the same participants who have repeated the survey as unique identifier was not collected in the survey. We further excluded participants who selected “prefer not to say” or did not answer questions on age, area of residence, and/or highest level of education completed.

This study was approved by the Curtin University Human Research Ethics Committee (approval number: HRE2021-0248).

2.2. The Reimagining Healthcare Survey

The Reimagining Healthcare Survey was modified from the Deloitte Survey of US Health Care Consumers [5]. The survey was divided into five themes “Experiences with healthcare consultations including telehealth”, “Willingness or ability to use technology to support one’s own health”, “Willingness to share one’s own information on health and conditions to support one’s own health”, “Willingness to share one’s own information on health and conditions to support others”, and “Willingness to adopt alternative methods of care”. Most questions in the survey were Likert scale questions and some questions had sub-sections. The questionnaire is available upon request. Due to space restrictions, this study only focused on the four themes in relation to willingness of consumers.

2.3. Statistical analysis

We only reported the percentages of participants who selected negative response (e.g. not at all willing) to understand the size of the population that were unlikely to adopt virtual care. Weighting was applied to reflect the age, sex, remoteness and education distribution of the Australian population. Weight was derived from national data [7–9]. Age-adjusted Poisson regression models with log link function and robust variance were used to estimate the prevalence ratios for selecting a negative response associated with educational attainment (up to Year 12 graduate, post high school qualifications (i.e. trade/technical/vocational training, diploma, or associate degree), and bachelor’s degree or above), where bachelor’s degree or above was the reference group. The analyses were repeated by residential area of remoteness (major cities, inner regional, outer regional, and remote/very remote), where major cities was the reference group. All statistical analyses were performed using Stata/SE V14.0.

3. Results

We included 1778 participants who consented to and completed the survey after excluding 48 participants who answered “prefer not to say” or did not answer questions on age, area of residence, and/or educational attainment (Fig. 1). Of these participants, 60.9% were female, 20.6% were aged ≥66 years, 65.3% resided in major cities, 63.1% reported good or excellent health, and 32.3% had a bachelor’s degree or above (Table 1).

3.1. Willingness and ability to use technology to support one’s own health

Over a quarter of participants (29.1%) were not aware of digital technologies that can monitor or support their health and a fifth of participants (22.0%) did not have access to any of the listed digital technologies (i.e. websites, smartphone/tablet apps, personal medical devices, fitness monitors) to support their health. While 51.0% of participants were not currently using any of these digital technologies to measure health improvement goals, monitor health issues, receive reminders to take medication, record or send data on medication use, or order a repeat prescription supply, only 19.2% of participants were not willing to use technologies for the listed health purposes. The main reasons for their unwillingness to use technologies for health purposes were “do not feel it is necessary” (42.4%), “does not apply” (28.4%), and “feel uncomfortable using an unknown technology” (17.4%). In addition, 25.7% of participants were not at all willing to access a health coach, 25.2% were not at all willing to use a digital navigator, and 34.7% would not consider using any of the listed home tests.

Compared to participants with a bachelor’s degree or above, higher proportion of participants were unaware of digital technologies (age adjusted prevalence ratio [95% confidence intervals]: 3.04 [2.37, 3.91]), had no access to digital technologies (4.51 [3.18, 6.38]), and were unwilling to use any technologies (5.47 [3.62, 8.29]) for health purposes in those with post high school qualifications (Supplementary Table 1). For the group with education up to Year 12 graduate, the point estimates were greater, but the 95% confidence intervals overlapped those for post high school qualifications. No significant difference was observed between residential area of remoteness (Supplementary Table 2).

3.2. Willingness to share one’s own information on health and conditions to support one’s own health

Only 4.9% of participants were not at all comfortable about sharing health information with their health providers. While 9.1% of
participants were not at all willing to share information tracked in their apps/devices with their general practitioner to assess future risk of becoming unwell, only 5.2% of participants were not at all willing to have their health information shared and linked to health providers involved in their ongoing care should they have a condition that required ongoing monitoring for risk of deterioration. In an emergency health situation, higher percentages of participants were not at all willing to have their apps/devices to share their health information to alert their friends (34.9%) or family (10.1%) compared to themselves (4.4%), the emergency services (4.9%), or their healthcare providers (5.7%).

The proportion of participants who reported not at all comfortable about sharing health information with their health providers were 2.5 times greater in participants with educational attainment below a bachelor’s degree compared to those with a bachelor’s degree or above (Supplementary Table 1). There was no observable difference by residential area of remoteness (Supplementary Table 2).

### 3.3. Willingness to share one’s own information on health and conditions to support others

Substantially more participants were not at all willing to share de-identified health information tracked in their apps/devices with private/for-profit health businesses (46.6%) or profit generating enterprises (52.2%) compared to not-for-profit organisations (20.7%) for universities or other health research organisations, 20.5% for professional medical bodies, 24.9% for governments and other government health agencies, and 36.1% for non-government and advocacy health groups) and not-for-profit purposes (16.0% for health research, 20.3% for quality assurance, 22.9% for policy development, and 23.6% for advocacy efforts). The percentages were similar for not at all willing to share de-identified health information from their medical records.

The proportions of participants unwilling to share their health information and medical records were generally higher in those with educational attainment below a bachelor’s degree than participants with a bachelor’s degree or above (Fig. 2 and Supplementary Fig. 1). However, the proportions were lower in those with lower educational attainment for unwilling to share their information with private/for-profit health businesses (e.g. prevalence ratios for sharing information from apps/devices – up to Year 12 graduate: 0.76 [0.67, 0.85]; post high school qualifications: 0.80 [0.72, 0.88]) and profit generating enterprises (up to Year 12 graduate: 0.77 [0.70, 0.86]; post high school qualifications: 0.79 [0.72, 0.86]). Compared to participants in major cities, lower proportions of participants were unwilling to share their information tracked in their apps/devices with private/for-profit health businesses in those who resided in inner regional (age and education adjusted prevalence ratios: 0.83 [0.72, 0.96]) or remote/very remote (0.77 [0.64, 0.93]) areas even after accounting for educational attainment. Moreover, lower proportion of participants were unwilling to share their information from medical records with professional medical bodies in those who resided in inner regional areas (0.63 [0.46, 0.85]) compared to those in major cities after accounting for educational attainment.

### 3.4. Willingness to adopt alternative methods of care

One in three participants were not at all willing to use facial recognition instead of entering a secure PIN to access medication tracking on their smartphone or device (29.7%), to use voice assistants to prompt them with regular medication reminders (32.8%), or to use a service that utilises a drone to deliver prescription medication to their home (34.1%). In contrast, one in five participants were not at all willing to use a smartphone or device to help them track that they took regular medications as prescribed (18.5%).

A quarter to a third of patients indicated that they were not at all willing to use a virtual/digital assistant or a chatbot to diagnose and suggest treatment option or whether to seek consultation with a health care provider (26.4–28.2%) or to have an independently operating surgical robot to assist their surgeon in a surgical procedure on them (31.3%). In other proposed situations relating to physical and mental

Fig. 1. Flow diagram of participant recruitment.
health care provision, participants who reported “not at all willing” ranged from 8.9% for use of monitoring devices as care giver to their loved one to 21.5% for to have a surgical robot, under the control of the surgeon, assist the surgeon to carry out a surgical procedure on them.

As for most questions, higher proportion of participants were unwilling to adopt alternative methods of care in those with lower educational attainment (Supplementary Table 1). No significant difference was observed between area of remoteness (Supplementary Table 2).

### 4. Discussion

This national study on consumer preferences for virtual modes of healthcare delivery has shed a positive light on the future of virtual care in Australia. Only a small proportion of participants were unwilling to use technologies for health or share health data with their health providers and a modest proportion of participants were unaware of digital technologies for monitoring or supporting health, unwilling to share their own health information to support others, or unwilling to adopt alternative methods of care. The proportions of participants who selected negative response to the questions were generally higher in the groups with lower educational attainment. Nevertheless, there was no difference in selecting negative response to questions by residential area of remoteness despite a digital divide existing in rural and remote areas [5].

One in three participants selected “not at all willing” to most of the alternative methods of care scenarios proposed in the survey. This is likely due to a modest proportion of participants were not already aware of, have access to, or are willing to use current digital technologies for health. It is possibly harder for these participants to be willing to adopt alternative methods of care when they are not exposed to current health technologies. As Australia continues with its implementation of the National Digital Health Strategy [10], there is a need to improve the digital health literacy of people, especially those with lower educational attainment, so that as the normal healthcare delivery transitions to include virtual care, it will not further widen the health inequity gap. Nevertheless, this could be challenging as higher proportion of participants were reluctant to access a health coach or digital navigator, whose roles are to advise and support consumers on the use of technology to monitor/support health and assist consumers with their understanding and use of digital health technologies, in the lower educational attainment groups.

In recent years, the Australian public indicated concern over the national electronic health record system (My Health Record) opt-out scheme [11]. Hence, it was reassuring that only 5% of participants were uncomfortable about sharing health data with their health providers. In regard to sharing health information to support others, we observed over half of the participants were not at all willing to share personal health data with private/for-profit health businesses or profit generating enterprises. Furthermore, it was interesting, but perhaps not surprising, to note that participants with lower educational attainment were generally more unwilling to share information than participants with a bachelor’s degree or above, yet, they were less unwilling to share information with for-profit health businesses or profit generating enterprises. Willingness to provide health data and biological samples for health research have been reported to be lower in those with low education level [12]. But a recent US study on sharing health data with third-party commercial companies suggested the relationship between comfort with sharing data and educational attainment depended on the purpose of data use; comfort in sharing data increased with educational attainment for patient purposes (e.g. to improve care) but decreased with educational attainment for business purposes (e.g. marketing) [13]. Based on our results, there is a need to increase people’s awareness, especially those with low educational attainment, of the potential risk of sharing health information tracked in apps/devices with private/for-profit health businesses, which may use the information to target them with tailored marketing. It may also be worthwhile to promote the societal benefit of sharing de-identified health data with trusted organisations such as universities and government health agencies, which follow best practices, for research or policy development.

A strength of this study was the inclusion of questions on willingness to use new innovations e.g. digital assistant. Nevertheless, there were several limitations. First, the national data used to derive the weighting varied by year and age included (i.e. education was based on 2016 census data for aged >15 years, remoteness, age and sex were based on 2020 data for all ages, and we assumed approximately 1% of the
population neither identify as male or female) [7–9]. Moreover, our survey was only available for completing online but, according to the latest figure, 13.5% of people aged ≥15 years in Australia did not use the internet in 2016–17 [4]. We were unable to determine the willingness to use digital technologies for health and to share health information in people who do not currently use the internet. Our participants were also likely to be more technologically proficient than the general population. Therefore, our results may have underestimated consumers’ unwillingness towards virtual care and may not be generalisable to the Australian population. Second, this was a cross-sectional survey conducted 16 months after the first confirmed COVID-19 case in Australia; 61% of our participants reported to have experienced a telehealth consultation in the past 12 months (69% of those who had a healthcare consultation in the past 12 months). Uptake of telehealth in Australia was low prior to the COVID-19 pandemic [14]. We were uncertain if having experienced virtual care via telehealth influenced participants’ willingness to use digital technologies to communicate with their health providers or adopt alternative methods of care. Third, the number of participants who self-identified as Aboriginal or Torres Strait Islander or culturally and linguistically diverse was small. We were unable to compare their responses with participants who did not identify as members of either group. An Australia study reported culturally and linguistically diverse women were less likely, and less willing, to use mobile apps for health [15].

| Not at all willing to share de-identified health information tracked in their apps/devices with | Prevalence ratio (95% CI) |
|---|---|
| Universities or other health research organisations | 2.49 (1.90, 3.27) |
| Government and other government health agencies | 2.13 (1.62, 2.78) |
| Professional medical bodies | 1.00 |
| Private/for-profit health businesses | 1.18 (0.96, 1.44) |
| Non-government and advocacy health groups | 0.94 (0.75, 1.16) |

| Not at all willing to share de-identified health information tracked in their apps/devices for | Prevalence ratio (95% CI) |
|---|---|
| Health research | 1.11 (0.89, 1.38) |
| Quality assurance | 0.76 (0.67, 0.85) |
| Policy development | 0.80 (0.72, 0.88) |
| Advocacy efforts | 1.29 (1.10, 1.51) |
| Profit generating enterprises | 1.23 (1.06, 1.44) |

![Fig. 2. Age adjusted prevalence ratio for not at all willing to share de-identified health information tracked in their apps/devices by educational attainment.](image-url)
5. Conclusions

In light of the disruptions caused by the COVID-19 pandemic, the majority of the Australian population seems to be open to adopting alternative methods of care. Nevertheless, improving the digital health literacy of people, especially those with lower educational attainment, and raising their awareness towards the risks and benefits of sharing their health information with others are essential for virtual care to be successfully integrated as an equitable part of normal healthcare delivery in the future.

Summary table

What was already known on the topic
Australian studies conducted since the start of the COVID-19 pandemic suggested a large proportion of the population are willing to continue to use telehealth in the future.

There is a digital divide in Australia where people who are older, have lower education, or live further from major cities are less like to use the internet.

What this study added to our knowledge
A portion of the Australian population showed unwillingness to use technology for their health as a result of not having access to current digital technology and/or not understanding its use or how to use it.

People’s willingness to use technology for their health was related to educational attainment but not area of remoteness.

Moving forward, it will be a challenge to improve the digital health literacy in those with lower educational attainment especially people with up to Year 12 graduate as they were almost three times more unwilling to seek help (access health coach or digital navigator) than those with a bachelor’s degree or above.

Author contributions

CMLY analysed the data and drafted the manuscript. ET developed the survey and collected the data. RN and SR conceived the design of the study and secured funding for the study. LW, TS, JN, IF, LB and SB contributed to the survey design and collection of data. All authors contributed to the interpretation of the data and critical revision of the manuscript and approved of the final version of the article to be published.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Financial support for this work was provided by Digital Health Cooperative Research Centre. Luke Baxby, Sabine Bennett reports a relationship with Deloitte that includes: employment.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijmedinf.2022.104803.

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