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Community knowledge of Australia's national preventive health strategy focus areas: a nationally representative survey of 1509 adults

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Abstract

Background While some general patterns and trends of health information seeking and literacy in the Australian population are known, there is a need to understand these behaviours and skills specific to the focus areas outlined in the National Preventive Health Strategy (NPHS).

Methods In response, this study employed a cross-sectional online survey of adults in the Australian general population ($n=1509$) to investigate their knowledge and health information seeking behaviour regarding the NPHS' seven focus areas. It also explored primary care practitioners as a preventive health information source. The survey consisted of 135 core items and 15 adaptive items including the Health Literacy Questionnaire (HLQ). The degree to which accessing information about a preventive health focus area from one of the three categories of health professional predicted the accuracy of the participant's knowledge about that focus area was determined using logistic regression.

Results A total of 1,535 complete responses were recorded, 26 of which were removed due to data integrity concerns, resulting in a final sample of $n=1,509$. Participants were typically above mid-range for each of the HLQ scales. The sample was broadly representative of the Australian general population. Preventive health knowledge items about *cancer screening and prevention* were scored accurately by the most participants (85.2%), while the highest number of completely incorrect responses were *immunisation* (5.3%), *alcohol intake* (5%) and *tobacco and nicotine addiction* (4.9%). Participants who provided correct responses to both items about *tobacco and nicotine addiction* had decreased odds by of having accessed information about tobacco from a medical doctor (aOR 0.30), while those who answered items about *immunisation* correctly had lower odds of accessing information about immunisation from complementary medicine providers (aOR 0.30). Reporting completely correct responses to *alcohol intake* items was associated with lower odds of accessing information about alcohol from either medical doctors (aOR 0.46) or complementary medicine providers (aOR 0.17).

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Conclusions This research highlights the need for future research to investigate and understand some key issues challenging efforts to optimise effective preventive health initiatives with a view to informing better community health and wellbeing outcomes.

Keywords Health promotion, Preventive health, Primary care, Complementary therapies, Health literacy

Introduction

Preventable illness in Australia costs an estimated $840 million in lost productivity per year [1] and such significant burden has partly driven the federal government to develop its inaugural National Preventive Health Strategy (NPHS) in 2021 [2]. The NPHS outlines critical enablers for shifting the health system to address gaps in health information and health literacy in the community, and for integrating prevention into the health system such as via health care providers. It also highlights key principles to be considered when implementing prevention in Australia, such as enabling the workforce and embracing the digital revolution. The strategy further outlines seven focus areas (see Fig. 1) that, while the public health and health promotion community have made significant and longstanding efforts at improvement (e.g. tobacco and nicotine use [3–5], healthy eating [6, 7], physical activity [8, 9], cancer screening and prevention [10], immunisation [11], alcohol, cannabis and other drug use [12–15], and mental health [16]), require more coordinated, powerful action to reduce the risk of poor health in Australia.

The desired action in these focus areas involves promoting preventive health behaviours, which are influenced by the options – perceived or real – available to individuals [17]. These options are informed by a range of structural determinants including but not limited to economic stability, educational and employment opportunity, societal or systemic equity and access to healthy food, physical activity spaces and health care [18]. An individual's health decisions are limited to options framed by these factors but also driven by their own health knowledge and literacy [19] as well as perceptions of the risk associated with each health behaviour in relation to their own personal health outcomes [20]. Health knowledge, in turn, is further influenced by an individual's exposure to health information. Yet health promotion experts are challenged to support the public in light of increasing awareness of the importance of social networks in knowledge dissemination [21, 22] coupled with variable accuracy and reliability of the health information disseminated through channels such as social media [23]. While for consumers, accessing information online may meet certain needs for social and emotional support from peers, there are also risks of poor-quality information and lack of authoritative sources which may decrease consumer engagement overall [23]. This challenge is further exacerbated by the current era of 'Dr Google' [24], which is characterised by public distrust of mainstream public health information sources (including government agencies and, to a lesser degree, medical professionals) which drives consumers to look more broadly for public health information before making health decisions [21, 22, 25]. These risks highlight the critical importance of adequate digital health literacy in the general population [26]. Overall, this landscape means ensuring the public has access to and engages with reliable health information is increasingly complex.

Such complexity in preventive health information is particularly relevant in Australia, where the public have access to health information from diverse sources [27, 28] and dissemination channels, reflected in the increasing popularity of social media, blogs and mass media [29, 30]. Most health information-seeking in Australia occurs in the community, beyond the clinical encounter and the gaze of health providers [31]. In the context of preventive health, an estimated ten million Australians practice self-care behaviours, 20% of whom inform such self-care via healthcare books, specialised health magazines and websites [31]. Interestingly, more than 90% of Australians believe they have a leading role in managing their own health and a further two thirds identify a substantial role for primary care practitioners in such management [32]. For those Australians accessing primary care, one in four seek health information online prior to visiting a GP [33–35]. Such information-seeking does not disregard clinicians but rather emphasizes the complex landscape of information sources and information-seeking in Australia which is reflected in the NPHS' acknowledgement that effective preventive health promotion requires coordinated multisectoral activities encompassing policy change, mass/social media communication and primary healthcare initiatives [2].

While some general patterns and trends of health information seeking and literacy in the Australian population are known, there is a need to understand these behaviours and skills specific to the focus areas outlined in the NPHS and in the context of primary care practitioners' role in providing preventive health information to the community. In response, this study investigates the Australian general population's knowledge and health information seeking behaviour regarding tobacco and nicotine use, consumption of a healthy diet, physical activity, cancer screening and prevention, immunization, alcohol use, recreational use of cannabis and other drugs, and mental health. It also explores primary care practitioners as

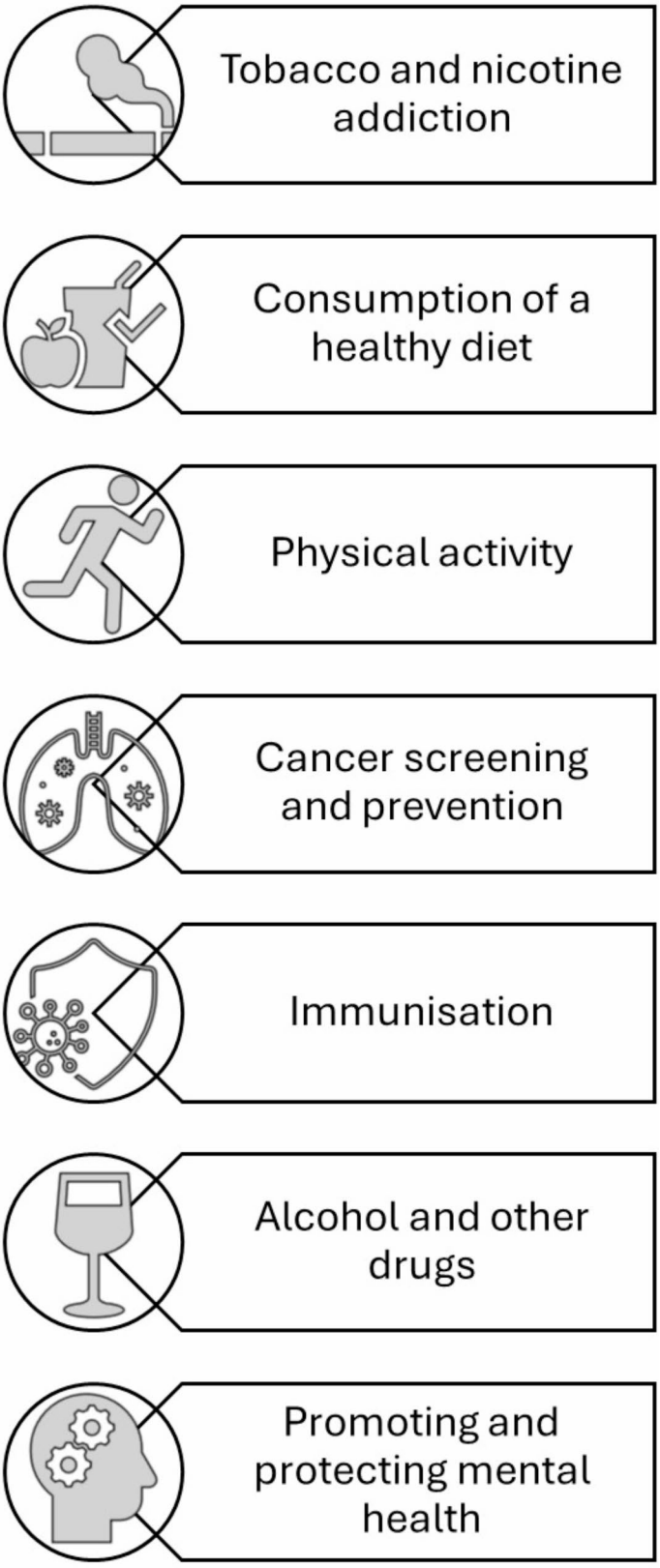

Fig. 1 Preventive health focus areas identified in the National Preventive Health Strategy

a preventive health information source in the Australian community.

Methods

Study design and setting

This study employed a cross-sectional survey design, administered online.

Participants and recruitment

A sample was sought of $n = 1500$ adults (aged 18 years and over) living in Australia, who were representative of the general population regarding age, gender and State of residence. This sample size was considered adequate for inferential analysis based on previous studies investigating health behaviours and health service utilisation in Australia [36].

Participants were recruited via closed invitations to individuals registered on survey participation panels accessed via the Qualtrics research recruitment company. Purposive convenience sampling was used, with survey access closed to participants from each demographic category once the required numbers for that representative strata were reached. Recruitment and data collection were undertaken between 24 August and 17 September 2023. Participation was voluntary and respondents were provided a small incentive equivalent to approximately AUD$3–4, based on survey completion time. The incentive value is determined by Qualtrics and consistent with other opportunities to participate in online research.

Survey instrument

Development and pre-testing

The survey development was directly informed by the constructs and domains of the NPHS, particularly the seven focus areas identified in the Strategy as priorities for health promotion action. Once developed on the online survey platform, the survey was tested for face validity and technical functionality by five individuals known to the research team with diverse gender and education levels, and no prior health training.

Instrument structure

The survey consisted of 135 core items and an additional 15 adaptive items, covering the domains of: Demographics, Health locus of control and wellbeing, Health service utilisation, Preventive self-care, Health literacy, Preventive health knowledge, and Health information-seeking. Adaptive items were displayed based on responses to base questions regarding health information-seeking, with 13 of the adaptive items repeating for each information type participants reported accessing. Completion time for the survey ranged from approximately 10–35 min, depending on the number of adaptive items displayed. The analysis presented in this paper employed items from domains of Demographics, Health service utilisation, Health literacy, Preventive health knowledge, and Health information-seeking.

Demographics Items captured participant gender, age, financial manageability, highest level of education, employment status, health insurance or reimbursement cover, and relationship status.

Health service utilisation Participants were asked to provide information about their consultations with 15 types of health care providers in the previous 12 months.

Health literacy Health literacy was measured using the Health Literacy Questionnaire (HLQ) [37], a two-part instrument previously developed and validated within the Australian general population, comprising 44 items across nine subscales. Part one utilises a four-point scale of 'Strongly disagree' to 'Strongly agree' over five subscales: Feeling understood and supported by healthcare providers; Having sufficient information to manage my health; Actively managing my health; Social support for health; and Appraisal of health information. Part two utilises a five-point scale from 'Cannot do/always difficult' to 'Always easy' over four subscales: Ability to actively engage with healthcare providers; Navigating the healthcare system; Ability to find good health information; and Understanding health information well enough to know what to do. Each subscale is summarised to a mean score between 1 and 4 for subscales in part one and between 1 and 5 for subscales in part two.

Preventive health knowledge A series of 16 true/false statements were employed to assess participants' preventive health knowledge specific to the Australian health promotion context. 'Key facts' outlined in the NPHS were used to develop two statements for each of the seven focus areas (tobacco and nicotine use; consumption of a healthy diet; physical activity; cancer screening and prevention; immunisation; alcohol, cannabis and other drugs; and promotion of mental health), with two additional statements to allow differential examination of alcohol (2 items), recreational cannabis (1 item) and other recreational drugs (1 item).

Health information seeking Participants were asked whether they accessed information about the seven preventive health focus areas in the previous 12 months, and which types of information sources (e.g. verbal interactions, websites, pamphlets) they used to access health information. For each of these focus area topics and information source types used, they were also asked whether they accessed this information through a healthcare provider or elsewhere, with the ability to select both options.

Data handling and statistical analysis

The primary outcome of this analysis was accuracy of preventive health knowledge regarding the seven focus areas outlined in the NPHS. Secondary outcomes were the proportion of respondents who accessed health information relevant to those topics, the types of health information materials accessed, and the sources of that health information. The degree to which accessing health information from different categories of health provider (e.g. medical, allied and complementary health) predicted respondent's accuracy of preventive health knowledge was also investigated.

Statistical analysis was undertaken using Stata SE 18 and SPSS. The participation rate was calculated as the number of respondents who completed the survey relative to the total number of individuals who accessed the survey (clicked through to the online information sheet and consent form). Complete surveys were those with responses to core items (demographics, health literacy) and items relevant to the primary outcome (health knowledge, health care providers consulted), allowing missing responses for other variables. However, observations with missing values were excluded from analyses where required for statistical integrity (e.g., analyses using validated instruments with standardised scoring).

To ensure adequate cell sizes for inferential analyses, variables regarding financial manageability and educational qualification were collapsed into suitable categories. Regarding the healthcare providers consulted by participants, and those from whom information was sourced, variables were generated to reflect categories of 'medical doctors' (GP or specialist), 'allied health providers' (e.g., physiotherapist, community nurse) and 'CM practitioners' (e.g., massage therapist, yoga teacher). The items investigating participant preventive health knowledge were recoded from True/False to reflect Correct/Incorrect responses, and two binary variables were generated for each focus area topic to identify participants who responded with only correct responses or only incorrect responses to that topic. In addition, a count variable was generated to produce a cumulative score of correct responses for participants who had responded to all 16 items (excluding observations with missing responses). Scoring for the nine HLQ subscales was undertaken using an expectation maximisation algorithm, in line with HLQ scoring instructions, which weighted all items equally and allowed for two missing values in scales containing up to five items, and three missing values for scales containing six items (responses exceeding these limits were excluded from analysis).

National representativeness of the sample was calculated by comparing participant age, state of residence, and gender against national census data using chi-square tests and Cramer's V. Descriptive statistics were calculated for all variables. Frequencies and percentages were calculated for categorical variables, means and standard deviation were summarised for HLQ subscales, while the median and interquartile range was determined for health knowledge using the count variable of cumulative scores for the preventive health knowledge items. The degree to which accessing information about a preventive health focus area from one of the three categories of health professional predicted the accuracy of the participant's knowledge about that focus area was determined using logistic regression and adjusted for demographics, other health professionals from whom information was accessed, and health literacy.

Ethics approval and consent

Participants were provided with information about the study and were then required to provide informed consent prior to accessing the survey instrument. Survey participation was anonymous. Ethics approval was granted by the University of Technology Sydney Human Research Ethics Committee (approval no. ETH23-8633).

Results

A total of 1,535 complete responses were recorded, 26 of which were removed due to data integrity concerns (e.g., straight-lining, disengaged and non-sensical open-text responses), resulting in a final sample of $n = 1{,}509$. An additional 450 individuals accessed the survey information sheet without completing the survey, producing a participation rate of 75.9%.

The sample was broadly representative of the Australian general population. Chi-square tests found no statistically significant differences between the sample and national census data regarding age, and while a difference was seen regarding gender ($p = 0.001$) and State of residence ($p = 0.017$), Cramer's V found the effect size of these differences to be very weak ($V = 0.0009$ and $V = 0.0008$ respectively). National representativeness is shown in Table 1.

Participant characteristics

Table 2 provides details of participant demographics, healthcare provider utilisation and health literacy scores. A slight majority of participants were female ($n = 838$, 55.5%) and representation across age groups ranged from 14.5% (50 to 59 years) to 27.3% (60 years or more). Participants most commonly reported their financial manageability as 'It is difficult some of the time' ($n = 591$, 39.2%). It was common for participants to have completed university ($n = 568$, 37.6%) or high school education ($n = 472$, 31.3%) and to be engaged in full time work ($n = 589$, 39%) or not in the paid workforce ($n = 413$, 27.4%). Participants were typically married ($n = 793$, 43.5%) or single ($n = 452$, 30.8%), with *de facto* relationships ($n = 191$, 13%)

Table 1 Assessment of national representativeness

	Survey respondents		National data		Chi2	Effect size*
	n	%	*n*	%	*p*	V
Gender						
Female	838	55.83	10,056,618	50.91	*0.001*	0.0009
Male	663	44.17	9,697,117	49.09		
Age						
18–29	322	21.34	4,286,391	21.70	*0.051*	0.0008
30–39	290	19.22	3,675,357	18.61		
40–49	267	17.69	3,275,971	16.58		
50–59	218	14.44	3,083,937	15.61		
60–69	212	14.05	2,619,452	13.26		
70 and over	174	11.53	2,812,627	14.24		
State						
NSW/ACT	471	31.22	6,646,660	33.65	*0.017*	0.0008
Vic	409	27.10	5,175,932	26.21		
Qld	307	20.34	3,916,682	19.83		
SA/NT	148	9.81	1,568,506	7.94		
WA	135	8.95	2,020,128	10.23		
Tas	39	2.58	422,093	2.14		

*0 = no effect, ≤ 0.1 = weak effect, ≤ 0.3 = moderate effect, ≤ 0.5 = strong effect

and separation/divorce/widowhood ($n = 186$, 12.7%) less common.

Slightly more than half of participants held private health insurance ($n = 848$, 56.2%) or a Health Care Card ($n = 793$, 52.6%). Most participants had consulted a medical doctor ($n = 1{,}348$, 89.3%) or allied health provider ($n = 1{,}143$, 75.8%) within the previous 12 months, while just over one-fifth of participants had consulted a CM practitioner ($n = 323$, 21.4%). Seventy-seven participants (5.1%) had not consulted with any type of health care provider.

Participants typically rated above mid-range for each of the HLQ scales. The highest means were recorded for the *Healthcare provider support* (3.13, SD 0.64) and *Having sufficient information* (3.03, SD 0.51) four-point scales in part one, and the *Reading and understanding health information* (4.03, SD 0.64) five-point scale in part two. The lowest mean was recorded for the item relating to *Critical appraisal* of health information (2.9, SD 0.52), a four-point scale from part one.

Preventive health knowledge

Table 3 outlines responses to the true/false statements relating to the NPHS preventive health focus area topics. The items which attracted the greatest number of accurate responses were *Eating a healthy diet can reduce your risk of physical and mental health conditions* (true, $n = 1{,}444$, 96%), and *The number of deaths caused by cancer can be reduced through screening programs that routinely test for common cancers* (true, $n = 1{,}441$, 96%). The lowest scoring items were *In Australia, alcohol accounts for less than half of all drug-related hospitalisation* (false, $n = 812$, 54%), *The health risks associated with smoking cannot be reduced by quitting* (false, $n = 1087$, 72%) and *Most Australian adults and children eat enough vegetables for a healthy diet* (false, $n = 1150$, 76%). All other items were selected accurately by ≥ 80% of participants.

When items were grouped by topic, the topics for which participants most commonly selected all responses correctly were *Cancer screening and prevention* ($n = 1276$, 85.2%) and *Other recreational drugs* (single item, $n = 1195$, 80.9%). The single-item topics of *Recreational Cannabis* and *Other recreational drugs* attracted the highest rates of completely incorrect responses ($n = 302$, 20.4% and $n = 283$, 19.2%, respectively), while the double-item topics attracting the highest number of completely incorrect responses were *Immunisation* ($n = 78$, 5.3%), *Alcohol* ($n = 75$, 5%) and *Tobacco and nicotine addiction* ($n = 74$, 4.9%). The cumulative score calculated for participants who answered all 16 preventive health knowledge items ($n = 1400$) provided a median of 14 correct answers (min 4, max 16; Q1: 12, Q3: 15. Data not shown).

Preventive health information-seeking

A total of 1,064 (70.5%) participants accessed information about at least one preventive health topic within the preceding 12 months, the most popular being *Physical activity and exercise* ($n = 716$, 47.5%), *Consumption of a healthy diet* ($n = 671$, 44.5%) and *Promoting mental health* ($n = 609$, 40.4%). The topics least commonly accessed were *Other recreational drugs* ($n = 151$, 10%), *Recreational Cannabis* ($n = 205$, 13.6%) and *Tobacco and nicotine addiction* ($n = 275$, 18.2%). For all topics, it was more common for participants to access information

Table 2 Participant characteristics ($n = 1509$)

Participant characteristics		All ($n = 1509$)
		n **(%)**
Gender	*Female*	838 (55.5)
	Male	663 (43.9)
	Non-binary	8 (0.5)
Age	*18 years to 29 years*	322 (21.3)
	30 years to 39 years	290 (19.2)
	40 years to 49 years	267 (17.7)
	50 years to 59 years	218 (14.5)
	60 years or more	412 (27.3)
Financial management	*It is impossible/difficult all of the time*	349 (23.1)
	It is difficult some of the time	591 (39.2)
	It is not too bad/It is easy	569 (37.7)
Education	*Year 10 qualification or less*	163 (10.8)
	Trade/apprenticeship or Certificate/Diploma	306 (20.3)
	Year 12 qualification,	472 (31.3)
	University qualification	568 (37.6)
Employment	*Full time work (35 h or more per week)*	589 (39.0)
	Part time work (less than 35 h per week)	291 (19.3)
	Casual or temporary work (irregular hours)	94 (6.2)
	Looking for work	122 (8.1)
	Not in the paid workforce nor looking	413 (27.4)
Relationship status	*Single/never married*	452 (30.8)
	Married	638 (43.5)
	De facto	191 (13.0)
	Separated/divorced/widowed	186 (12.7)
Health cover	*Private health insurance cover*	848 (56.2)
	Health care card cover	793 (52.6)
Health care providers consulted (previous 12 months)*	*Medical doctor*	1,348 (89.3)
	Allied health care	1,143 (75.8)
	Complementary medicine	323 (21.4)
	None	77 (5.1)
Health Literacy Questionnaire sub-scale summary scores	HLQ Part One: 4-point scale	**Mean (SD)**
	Healthcare provider support	3.13 (0.64)
	Having sufficient information	3.03 (0.51)
	Actively managing health	2.95 (0.52)
	Social support	2.93 ((0.64)
	Critical appraisal	2.9 (0.52)
	HLQ Part Two: 5-point scale	**Mean (SD)**
	Active engagement with healthcare providers	3.8 (0.79)
	Navigating the healthcare system	3.71 (0.73)
	Ability to find good health information	3.87 (0.63)
	Reading and understanding health information	4.03 (0.64)

*Medical doctor: General practitioner, family doctor or specialist;

Allied health care: Pharmacist, physiotherapist, psychologist, counsellor or other mental health professional, community nurse or nurse practitioner, dietician;

Complementary medicine provider: Massage therapist, chiropractor, yoga teacher, acupuncturist or traditional Chinese medicine practitioner, naturopath or Western herbalist, osteopath or homeopath

outside of health care consultations, rather than receiving information from a health care provider. The topics that health care providers were most frequently reported as the source of information for were *Cancer screening and prevention* ($n = 220$, 56.3%), *Immunisation* ($n = 283$, 55.4%) and *Physical activity and exercise* ($n = 381$, 53.2%). Information was most frequently accessed elsewhere for the topics of *Consumption of a healthy diet* ($n = 541$, 80.6%), *Promoting mental health* ($n = 490$, 80.5%) and *Alcohol* ($n = 244$, 80%). The topics for which respondents most commonly reported accessing information from both healthcare providers and elsewhere were *Promoting mental health* ($n = 185$, 30.4%), *Physical activity* ($n = 206$,

Table 3 Participant preventive health knowledge

	Correct answer	Item correct *n* (%)	Topic correct *n* (%)	Topic incorrect *n* (%)
Tobacco and nicotine addiction				
Tobacco smoking is the leading cause of preventable disease in Australia (n = 1504)	True	1243 (83)	898 (59.8)	74 (4.9)
The health risks associated with smoking cannot be reduced by quitting (n = 1504)	False	1087 (72)		
Consumption of a healthy diet				
Most Australian adults and children eat enough vegetables for a healthy diet (n = 1506)	False	1150 (76)	1111 (74.0)	23 (1.5)
Eating a healthy diet can reduce your risk of physical and mental health conditions (n = 1502)	True	1444 (96)		
Physical activity				
Most Australian adults and children do not perform enough physical activity for a healthy lifestyle (n = 1481)	True	1318 (89)	1096 (74.4)	46 (3.1)
Physical activity is only important for weight management and has no impact on health conditions (n = 1475)	False	1214 (82)		
Cancer screening and prevention				
At least one-third of cancer cases are preventable (n = 1505)	True	1316 (87)	1276 (85.2)	26 (1.7)
The number of deaths caused by cancer can be reduced through screening programs that routinely test for common cancers (e.g., mole checks, pap smears, breast cancer screening) (n = 1500)	True	1441 (96)		
Immunisation				
Vaccines are not necessary for healthy people (n = 1485)	False	1238 (83)	1138 (76.9)	78 (5.3)
Vaccines are most effective when a large proportion of the community are fully immunised (n = 1482)	True	1310 (88)		
Alcohol				
In Australia, alcohol accounts for less than half of all drug-related hospitalisations (n = 1505)	False	812 (54)	753 (50.1)	75 (5.0)
It is common for Australian adults to exceed the healthy limit for drinking alcohol and consume too much (n = 1502)	True	1371 (91)		
Recreational cannabis				
People in Australia are more accepting of cannabis use than other recreational drugs (n = 1483)	True	1181 (80)	1181 (79.6)	302 (20.4)
Other recreational drugs				
Illicit drug use has been decreasing in Australia over recent years (n = 1478)	False	1195 (81)	1195 (80.9)	283 (19.2)
Promoting and protecting mental health				
Almost half of the people in Australia will experience a mental health disorder at some point in their lives (n = 1506)	True	1369 (91)	1196 (79.7)	31 (2.1)
Mental health has no impact on physical health, the two are completely separate (n = 1501)	False	1302 (87)		

28.8%) and *Consumption of a healthy diet* (*n* = 186, 27.7%).

Information about health was accessed from any source type by a total of 1,132 (75.1%) of participants. Verbal conversations (*n* = 729, 48.4%) and websites (*n* = 702, 46.6%) comprised the most commonly accessed sources, while the least commonly accessed were magazines/newspapers (*n* = 117, 7.8%), books (*n* = 135, 9%) and podcasts (*n* = 151, 10%). The information source types most frequently reported as being received from healthcare providers were verbal conversations (*n* = 607, 83.3%) and pamphlets/brochures (*n* = 260, 71.6%) while the least frequently reported were social media interactions (*n* = 27, 12.5%) and television/radio (*n* = 36, 13%). The information sources that were accessed most frequently outside of health care consultations were television/radio (*n* = 241, 87%), blogs/online articles (*n* = 188, 85.8%) and online videos (*n* = 203, 84.9%), while those which were more commonly accessed via both health care providers and elsewhere were verbal conversation (*n* = 98, 13.4%) and websites (*n* = 55, 7.8%). Full details about health information-seeking are shown in Table 4.

Associations between preventive health knowledge and receiving information from a healthcare provider

After logistic regression models were adjusted for demographics, health literacy and information sourced from other health care providers, three of the preventive health topics were found to have a negative association between participants' knowledge of that topic and whether they had accessed information on the topic from a healthcare provider. Participants who provided correct responses to both items about *Tobacco and nicotine addiction* had decreased odds by 70% of having accessed information about tobacco from a medical doctor (aOR 0.30, 95% CI 0.13, 0.74). Similarly, participants with correct responses to both items about *Immunisation* were found to have lower odds by 70% of accessing information about

Table 4 Frequency of participants accessing information on preventive health topics and source of information (health care provider or self-accessed)

Preventive health topic	Accessed any		Health care provider*		Accessed elsewhere*		Accessed both*	
	n	%	*n*	%	*n*	%	*n*	%
Physical activity and exercise	716	47.5	381	53.2	541	75.6	206	28.8
Consumption of a healthy diet	671	44.5	316	47.1	541	80.6	186	27.7
Promoting mental health	609	40.4	304	49.9	490	80.5	185	30.4
Immunisation	511	33.9	283	55.4	365	71.4	137	26.8
Cancer screening and prevention	391	25.9	220	56.3	273	69.8	102	26.1
Alcohol	305	20.2	130	42.6	244	80.0	69	22.6
Tobacco and nicotine addiction	275	18.2	128	46.6	206	74.9	59	21.5
Recreational cannabis	205	13.6	93	45.4	155	75.6	43	21.0
Other recreational drugs	151	10	61	40.4	112	74.2	22	14.6
Accessed information on any topic	*1064*	*70.5*	*732*	*68.8*	*818*	*76.9*	*486*	*45.7*
Information source type	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Verbal / conversations	729	48.4	607	83.3	218	29.9	98	13.4
Websites	702	46.6	157	22.4	559	79.6	55	7.8
Pamphlets or brochures	363	24.1	260	71.6	107	29.5	24	6.6
Television or radio	277	18.4	36	13.0	241	87.0	10	3.6
Online videos	239	15.9	43	18.0	203	84.9	16	6.7
Blogs or online articles	219	14.5	36	16.4	188	85.8	14	6.4
Social media interactions	216	14.3	27	12.5	175	81.0	6	2.8
Scientific research papers	198	13.1	56	28.3	149	75.3	12	6.1
Podcasts	151	10	27	17.9	125	82.8	7	4.6
Books	135	9	25	18.5	107	79.3	6	4.4
Magazines or newspapers	117	7.8	26	22.2	97	82.9	8	6.8
Accessed any source type	*1132*	*75.1*	*831*	*73.5*	*856*	*75.8*	*557*	*49.2*

*Percentage of respondents who access any information of this type

immunisation from complementary medicine providers (aOR 0.30, 95% CI 0.13, 0.74). For the topic of *Alcohol*, reporting completely correct responses was associated with lower odds of accessing information about alcohol from either medical doctors (aOR 0.46, 95% CI 0.27, 0.78) or complementary medicine providers (aOR 0.17, 95% CI 0.04, 0.76). No associations were seen with accessing information from an allied health provider in adjusted models. Full details of unadjusted and adjusted odds ratios are shown in Table 5.

Discussion

This paper reports the first examination of Australian's preventive health knowledge and literacy with direct reference to the priority areas outlined in the recent NPHS. Our results highlight several significant findings of consequence for the future development of the NPHS and the ongoing examination and understanding of preventive health initiatives and interventions more broadly. Overall, our sample reported strong health literacy and a high level of accuracy in their preventive health knowledge across the bulk of NPHS preventive health priority areas with only the exception of alcohol consumption and tobacco consumption. In broad terms, this is a good preventive health news story suggesting a solid basis with which to make further inroads on preventive health literacy across the Australian population. Certainly, numerous health promotion initiatives have been implemented in Australia at a state and federal level in recent decades to address various areas of preventive health addressed by the strategy (e.g. [3–16]), and our study findings suggest those efforts have been broadly successful in educating the community. However, the findings also highlight some areas where additional efforts are needed.

While the majority of participants correctly identified Australian adults as exceeding the healthy limit for drinking alcohol, nearly half of our sample were unaware that alcohol currently accounts for the majority of all drug-related hospitalisations [2]. Our results appear to suggest adequate preventive health literacy relating to the *extent* of alcohol consumption but not necessarily the *severity of the outcomes* of alcohol consumption upon health. While previous Australian research examining the risk perceptions amongst alcohol drinkers has identified similar trends [38] our study did not restrict to alcohol users and as such may have broader implications. Certainly, the Australian harm minimisation strategy for alcohol use has involved key health promotion activities such as alcohol labelling as well as campaigns run through mass media and social media. Unfortunately, while international evidence does suggest warning labels for alcohol

Table 5 Logistic regression results – odds of selecting completely correct responses for knowledge items on preventive health topics if sourcing information on that topic from a health care provider

Preventive Health Topic	Information on topic sourced from											
	Medical Doctor[a]				Allied Health Provider[b]				Complementary Medicine Provider[c]			
	OR	CI	aOR	CI	OR	CI	aOR	CI	OR	CI	aOR	CI
Tobacco and nicotine addiction	***0.64***	***0.43, 0.94***	***0.30***	***0.13, 0.74***	0.55	0.30, 1.01	0.90	0.44, 1.85	0.38	0.11, 1.31	0.50	0.13, 1.85
Consumption of a healthy diet	0.88	0.65, 1.19	0.96	0.68, 1.35	0.67	0.45, 1.00	0.78	0.50, 1.23	0.59	0.29, 1.18	0.79	0.37, 1.69
Physical activity	0.89	0.67, 1.19	0.92	0.66, 1.28	0.81	0.56, 1.17	1.02	0.66, 1.57	0.74	0.44, 1.27	1.08	0.59, 1.96
Cancer screening and prevention	1.11	0.72, 1.73	1.05	0.65, 1.70	0.75	0.36, 1.56	0.88	0.38, 2.03	0.52	0.19, 1.43	0.40	0.12, 1.32
Immunisation	1.02	0.73, 1.42	1.07	0.71, 1.61	0.59	0.40, 0.89	0.72	0.44, 1.20	***0.21***	***0.10, 0.47***	***0.30***	***0.13, 0.74***
Alcohol	***0.37***	***0.23, 0.60***	***0.46***	***0.27, 0.78***	***0.35***	***0.20, 0.61***	0.74	0.38, 1.42	***0.08***	***0.02, 0.33***	***0.17***	***0.04, 0.76***
Recreational Cannabis use	1.71	0.76, 3.82	2.25	0.93, 5.46	0.74	0.39, 1.41	0.58	0.26, 1.29	0.94	0.38, 2.33	1.08	0.93, 5.46
Other recreational drugs	0.56	0.26, 1.18	0.76	0.27, 2.13	0.44	0.22, 0.90	0.70	0.28, 1.75	***0.36***	***0.15, 0.84***	1.01	0.37, 2.80
Promoting mental health	***1.55***	***1.07, 2.26***	1.54	0.99, 2.39	0.97	0.63, 1.50	0.72	0.43, 1.22	0.87	0.32, 2.36	1.14	0.43, 1.22

a. Model adjusted for: receiving information from allied health providers, receiving information from complementary medicine providers, gender, age, financial manageability, education level, employment status, and health literacy scores from each of the nine subscales in the Health Literacy Questionnaire

b. Model adjusted for: receiving information from medical doctors, receiving information from complementary medicine providers, gender, age, financial manageability, education level, employment status, and health literacy scores from each of the nine subscales in the Health Literacy Questionnaire

c. Model adjusted for: receiving information from medical doctors, receiving information from allied health providers, gender, age, financial manageability, education level, employment status, and health literacy scores from each of the nine subscales in the Health Literacy Questionnaire

may be effective [39], Australian research suggests this approach is not effectively transmitting health information to the public [15] and is not having the desired impacts on key subpopulations such as young adults [14]. In contrast, historical mass media health promotion campaigns targeting alcohol use have been found to be recognised by the target population but may not be improving their knowledge levels as much as desired [40]. Less is known about the effectiveness of social media campaigns to influence alcohol consumption [41]. Further research is needed to understand this nuance between community knowledge regarding the extent and severity of alcohol-related harm and to explore relevant messaging and specific features or issues in which future health prevention strategy and initiatives targeting alcohol use can address this gap.

In contrast to health knowledge about alcohol intake, our study reveals a substantial number of respondents were unaware of *both* the severe impacts of tobacco consumption upon health outcomes and the significance of quitting smoking in reducing such health outcomes. While Australian anti-smoking health promotion campaigns have been evaluated in the past these evaluations have primarily focused on changes in smoking use [42] or attitudes [43] rather than health knowledge about smoking. Where the impact of social and mass media campaigns on smoking health literacy has been evaluated, notable differences have been reported across subpopulations. One study of socio-economically disadvantaged smokers found that such campaigns had limited effect as the smokers actively avoided exposure to the campaign material where possible, in part due to their belief that the content was not relevant to them [44]. Meanwhile, a campaign targeting Aboriginal and Torres Strait Islander people in South Australia reported achieving their message communication objectives and attributed their success to their focus on culturally appropriate content [45]. In the case of Australian adolescents, strategies targeting smoking have found smoking health literacy may be unrelated to uptake or cessation of smoking behaviour [46], suggesting other factors may affect smoking behaviour in this group. These variable outcomes may be further challenged by the recent increased popularity and access to e-cigarettes, particularly given even brief exposure to misinformation about e-cigarettes on social media can reduce the accuracy of an individual's knowledge about both smoking and e-cigarettes [47]. Given this complexity, we require further empirical investigation to fully interpret these findings, particularly as it relates to understanding the results across different subpopulations. Equally, additional research is required to inform effective strategy and policy development on this topic for the various target audiences that need to be reached [48].

Reflections upon both the findings from our study relating to tobacco use and those relating to alcohol use need to be cognisant of the commercial determinants of health relating to these behaviours [49, 50]. In the case of smoking, while Australian policy has significantly curtailed commercial influences on traditional tobacco products (e.g. labelling laws, advertising regulations), the controls regarding e-cigarettes is lagging as recently introduced legislation focuses on restricting access to e-cigarettes rather than on curtailing advertising [51]. Meanwhile, recent research has identified that retailers and manufacturers of e-cigarettes are employing several key messages – including health 'benefits' of e-cigarettes - disseminated via promotional material on social media platforms [52]. For alcohol use, the Australian alcohol industry has undertaken its own campaign, 'Drinkwise', under the pretence of harm minimisation. However, research to date suggests it is primarily effective in achieving an industry-friendly framing of the alcohol use that supports continuation of drinking [53]. Indeed, one key consideration for improving preventive health literacy on these topics moving forward will need to, in part at least, address the challenge of how to mitigate these commercial determinants. The substantial number of respondents in our study who report accessing sources other than health care professionals for their preventive health information raises issues around reliability and potential risks – particularly given the degree to which companies and other vested interests use social media to disseminate misinformation – and may reflect the lower levels of confidence in critical appraisal of health information reported by participants in our study [51]. While our research did not identify the specific sources accessed beyond health care professionals, it may well be that external commercial interests play some role in informing participants' preventive health knowledge and there is a need to explore and address the challenges such commercial interests may play in shaping community perspectives around prevention, health and wellbeing.

Our study shows important findings relating to the role of health care providers in participants' preventive health knowledge and literacy. With regards to each of the different NPHS preventive health focus topics, just over half of the sample (or in many cases even less than half) reported accessing their health information from a health care provider. This finding is particularly significant given the NPHS emphasises the important role of health care professionals within a wider multi-faceted approach to advance preventive health in the community [2], a position also supported in academic literature [54]. Our study findings suggest more effort is needed to establish and further expand or advance this role. Insights from our findings may provide some initial clues as to how and where future focus may be best placed. More specifically, our study shows health care professionals' verbal communication is by far the most prevalent resource type reported by those participants accessing a health care professional. Verbal information was also identified by previous Australian research with regards to health professionals' knowledge and information-sharing, however this did vary somewhat across different primary care professions [55]. While it may not always be necessary to visit a health care professional for basic preventive health information, every practitioner consultation should be optimised for improving patient knowledge; an approach formalised through the UK health promotion initiative 'Make Every Contact Count' which aimed to embed health behaviour change conversations in primary care settings, but not only by doctors [56]. This type of approach is particularly important in the contemporary health promotion landscape given the risk of unclear or conflicting information from external sources and our finding that the only significant relationship between providing correct answers to topic areas and accessing information from a health care professional was an inverse association (e.g., tobacco and alcohol information from a GP, immunisation and alcohol information from a CM practitioner). It is also a pertinent consideration given the notable absence in our findings of any correlation between knowledge and consultations with allied health professionals. All health care professionals can play a critical role in helping to discern safe and reliable information for their patients and the wider community [54]. Yet it is possible that some health care professionals may not possess the necessary skills, knowledge, beliefs or perception of scope to engage in effective conversations with patients about these topics [57] while others – such as allied health – may be underutilised in our current preventive health strategies in Australia. Information given by primary care professionals is trusted by individuals more than that given by other sources [58] and this appears to highlight the professional-patient consultation as an influential site of preventive health information exchange worthy of further attention by researchers and policymakers. Other information sources accessed via the direction of health care professionals such as TV, radio and online sources may also be areas for potentially improving preventive health knowledge and literacy. However, our study provides no details as to either the basis upon which health care professionals discerned the media to recommend nor how the participants experienced or rated those recommended sources, which warrants future investigation given the issues with commercial determinants and unreliable information sources raised earlier.

Limitations

This study relies on cross-sectional self-reported survey data recruited through a professional survey panel company. As such, the findings may be limited by responder and sampling bias. For example, the fact that participants were recruited through an online survey panel infers a certain level of digital literacy, and this may have resulted in an inflated health literacy score. However, without comparable data from the general population sample through other methods we are unable to verify the degree to which our sampling methods has influenced the results. Similarly, while the sample is representative of the Australian general population by gender, age and state of residence there may be differences in other characteristics which are known to impact on health literacy such as cultural background, level of education, and financial security [59]. Without statistically testing the difference between our sample and the target population, the influence of these factors on the study results cannot be known. The survey items used to assess preventive health knowledge were limited to a maximum of two items per focus area and while these statements were based on key facts outlined in the NPHS – which underwent extensive community consultation and peer review prior to publication – it is not a comprehensive assessment of each topic area. It is also worth noting that our study design collected separate data relating to each of the topics of 'alcohol', 'cannabis' and 'other drugs', all of which constituted one grouping in the NPHS [2]. As such, our findings relating to alcohol consumption provide a more nuanced appreciation of this important area of health prevention. However, unlike alcohol and cannabis use, the survey items did not distinguish between different methods of nicotine consumption (e.g. e-cigarettes vs. traditional cigarettes) and consequently some nuances around such behaviours and related motivations may have been missed in our analysis as a result. There was also only one item related to 'cannabis' and 'other drugs, respectively, which may have affected the comparison between these categories and other topics with two survey items. Despite these limitations, this study presents a critical insight into topics that have primary importance in Australian health policy.

Conclusions

The extent to which the Australian community report preventive health knowledge and literacy in support of NPHS priority areas is varied and while there is a general trend toward accurate preventive health knowledge there are also important gaps that require urgent attention as the NPHS is implemented. Health professionals may be a key resource in implementing the NPHS and improving preventive health behaviours in Australia however there appears to be inconsistencies in the outcomes of preventive health conversations with some professions, and underutilisation of others. Overall, this research supports the general intent of the NPHS to undertake multisectoral action on preventive health, but it also highlights a need for future research to investigate and understand some key issues challenging efforts to optimise effective preventive health initiatives with a view to informing better community health and wellbeing outcomes.

Abbreviations

GP	General practitioner
NPHS	National Preventive Health Strategy
CM	Complementary medicine

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Author contributions

AS designed the study. AS, HF and JA developed the study instrument. AS conceived the research question and analysis plan. HF undertook the analysis and drafted the methods and results. All authors contributed to drafting all other manuscript sections and reviewed and approved the final draft.

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Data availability

The dataset analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Informed consent was obtained from all subjects prior to consenting to participate. The study was reviewed and approved by the University of Technology Sydney Medical Research Ethics Committee (#ETH23-8633).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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