

BMJ Open Use of complementary medicine products: a nationally representative cross-sectional survey of 2019 Australian adults

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ABSTRACT

Objectives To provide a contemporary description of complementary medicine (CM) product use in Australia.

Design Cross-sectional survey.

Setting Online.

Participants A nationally representative sample (n=2019) of the Australian adult population.

Primary and secondary outcome measures Primary outcomes measures included the use and type of CM products used, and source of recommendation. Secondary measures included disclosure of CM product use to health practitioners, concomitant use of pharmaceuticals and predictors of use.

Results Prevalence of CM product use was 50.3%, with the most frequently used being vitamin and mineral supplements (VMSs; 47.8%) and homoeopathic medicines the least used (6.8%). A majority of respondents using CM products were also using pharmaceutical products, and small but significant associations were found between the use of CM products and pharmaceuticals ($p<0.05$). Small statistically significant associations were found between use of vitamin products and disclosure of use to general practitioners (GPs; Cramer's $V=0.13$, $p=0.004$) and hospital doctors (Cramer's $V=0.11$, $p=0.04$), and between use of herbal medicines and disclosure to both GPs (Cramer's $V=0.11$, $p=0.02$) and hospital doctors (Cramer's $V=0.12$, $p=0.03$). Women, those with higher education and those with no private health insurance were more likely to use CM products ($p<0.05$), while those without chronic conditions were less likely to use CM products ($p<0.05$) ($\chi^2(29)=174.70$, $p<0.001$).

Conclusions The number of Australians using CM products has remained relatively stable and substantial for nearly two decades. The majority of CM use relates to VMSs. Given the number of Australians using both CM products and pharmaceutical medicines, it is important to evaluate the potential clinical implications of such practices to ensure safe, effective and coordinated health policy and patient care.

INTRODUCTION

The use of natural products—a range of products not traditionally associated with the medical profession or medical

Strengths and limitations of this study

- This study involves a large sample of adults who were representative of the Australian population for age, gender and demographic location.
- The questionnaire includes validated instruments that are widely used to measure health status.
- The prevalence of complementary medicine (CM) recommendations by Australian healthcare professionals are captured.
- Due to the cross-sectional design, we could not determine causal relationships with CM use.
- The data are at risk of recall bias based on participant self-report of items related to the previous 12 months.

curriculum—is substantial across most countries.^{1 2} The titles employed to refer to such products vary between countries depending on the respective regulatory frameworks for medicines and food. The title ‘food supplements’ is used in the UK, ‘traditional herbal medicine’ and ‘health supplements’ in China and parts of South and South East Asia, and the title ‘complementary medicines’ (CMs) is used in Australia. The Australian Department of Health is responsible for the regulation of CMs in Australia which includes vitamin and mineral supplements (VMSs), herbal and botanical medicines, homoeopathic preparations and aromatherapy oils. We have included all these elements in our definition of CMs to reflect this wider Australian context.³

It is important to note that the practices and products that constitute CM may differ within different regions. These differences are considered within the WHO's definition that states ‘The terms “complementary medicine” or “alternative medicine” refer to a broad set of healthcare practices that are not part of that country's own tradition

or conventional medicine and are not fully integrated into the dominant healthcare system'.⁴ This definition has been adopted in this study and accommodates a plethora of CM prescribing scenarios and contexts involving different health professionals including doctors and pharmacists.⁴⁻⁶ Furthermore, the prescription and recommendation of CMs including vitamins by doctors and pharmacists in the Australian context is not systematic or formally directed^{7,8} nor is it included in any substantial way in the medical curriculum of any Australian medical school.⁷ In line with this definitional approach, cultural context and previous Australian studies,⁹⁻¹² we have appropriately included vitamins in our CM definition. Importantly, our inclusion of vitamins in our CM definition is in keeping with the Australian health regulatory framework for CM.³

According to a Roy Morgan report, Australian consumers spent over \$AU550 per capita on CMs in 2016, which was an increase from \$AU472 from the previous 5 years.¹³ A 2009 study identified 43.6% of 4500 Australians over the age of 50 years as consuming at least one CM product in the previous 24-hour period, and of these, 86% were currently being treated with pharmaceutical medicines.¹⁰ More recent data show Australians spend more out of pocket contribution to CM products than to pharmaceutical medicines.¹⁴ Although very dated, the 'latest' peer-reviewed published data obtained from a nationally representative sample of Australians estimated that the annual CM product expenditure was A\$1.86 billion (US\$1.41 billion) on CMs (excluding practitioner visits).⁹

People use CM products as part of their self-care and make informed decisions about their use.^{2,15} However, reports suggest that a potentially substantial portion of people living with serious health conditions do not tell their medical doctors about their CM use.¹⁶⁻¹⁸ Reasons provided for not disclosing CM use are as follows: they did not think it is relevant, that CM practices and products are safe, the doctor would not know about CM and/or that they would be negatively judged for choosing to use CM.¹⁶⁻¹⁸

Representative surveys of Australian adults use of CMs are over a decade old rendering the frequently cited prevalence, sociodemographic and economic data as possibly no longer accurate and in some cases obtained from narrow sample populations.^{9,19} In addition, there is limited current data about the health of Australians who are taking CM products and their decisions to disclose their CM product use to healthcare practitioners.²

In response, the study reported in this paper aimed to provide a contemporary analysis of CMs use (including VMSs) drawn from a representative sample of the Australian adult population. The primary objective of this study was to evaluate the prevalence and types of CM products used and the predictors of use.

METHODS

Study design

A cross-sectional online survey was administered to 2025 Australian adults representative of the Australian population. Representativeness was defined as matching the study sample population for distribution by age, gender and state of residence against the Australian Bureau of Statistics population demographic data.

Recruitment

Purposive convenience sampling was used to recruit participants from an existing database of Australian adults who had expressed interest in participating in research (Qualtrics). An email invitation to participate in the study was sent to members of the database. The survey took approximately 15 min to complete, and participants received a small financial remuneration based on time to complete. Ethics approval was provided by the Human Research Ethics Committee at Endeavour College of Natural Therapies (20170242) in accordance with the Declaration of Helsinki.

Patient and public involvement

This research was done without substantial patient involvement. Individuals without a research or healthcare background who were known to the research team were invited to comment on the survey instrument but not the study design and they were not consulted to develop patient-relevant outcomes or interpret the results. Patients were not invited to contribute to the writing or editing of this document for readability or accuracy. Patients will be enlisted for their help in the dissemination of the outcomes of this study.

Measurement

Demographic questions included gender, age, marital status, postcode of residence, highest level of educational qualification, employment status and level of financial difficulty currently experienced. Participants were also asked if they currently had a centre link (social security) healthcare card, and if they had private health insurance for a range of health services.

Health status

Participants were asked to indicate if they had been diagnosed or treated for a chronic illness in the previous 3 years from a list of 30 chronic conditions, with the option to indicate an 'other health condition' and specify the condition, or 'none of the above' indicating they had not been diagnosed or treated for a chronic illness. One item from the Medical Outcomes Study Short Form-20 (SF-20) was used to assess perceived general health status that asked participants to rate their health status on a 5-point Likert scale ranging from *excellent* (1) to *poor* (5). The SF-20 is a widely used measure of health-related quality of life.²⁰

CM use

Questions related to CM use were adapted from the International Complementary and Alternative Medicine

Questionnaire (I-CAM-Q). The I-CAM-Q was developed as a measure of CM health service and treatment use that could be used consistently across different populations that has been validated in a range of population samples.^{21 22} The I-CAM-Q necessitates country-specific items be added that are relevant to the population studied²³; therefore, a number of changes were made to ensure validity of the I-CAM-Q in an Australian population. Items from the I-CAM-Q used in this study related to CM product use including products used in the previous 12 months, who prescribed them (eg, type of health practitioner), and estimated total cost of each medicine type.

Pharmaceutical medicine use

A single item asked participants 'Do you take prescription medicine daily?' requiring a dichotomous (*yes, no*) response. If answering yes to this question, participants were then asked: 'What condition is the medicine taken to treat?' requiring an open-ended response.

CM disclosure

Participants were questioned about their communication with healthcare professionals (HCPs) within the previous 12 months. Specifically, they were questioned regarding their disclosure of CM use to their general practitioner (GP), specialist doctor, hospital doctor and/or pharmacist. There were four response options: 'I told them about ALL complementary and alternative medicines I was using', 'I only told them about SOME of my complementary and alternative medicine use', 'I DID NOT tell them about my complementary and alternative medicine use' and 'I did not visit this type of health professional'.

Data analysis

The data were analysed using IBM SPSS Statistics Premium Edition V.22. The data were initially screened for disengaged and missing responses, which resulted in six respondents being removed as their responses were unreliable (ie, no variance or repeat patterns in the data), leaving 2019 participants in the final data set. Relevant variables were recoded to reflect a positive direction.

χ^2 tests were used to examine the associations between categorical variables of interest and CM product use. Sociodemographic variables with an association $p < 0.25$ ²⁴ or with theoretical importance were included in a logistic regression to identify significant predictors of CM product use.

Economic data were calculated based on the mean (and SD) of expenditure of CM products for all participants, and for CM product users only. The mean for all participants was then extrapolated to the Australian population based on the most recent census figures.²⁵

RESULTS

Participant characteristics

The sociodemographic characteristics of participants are included in [table 1](#). The majority of participants were

women (n=1034), with three people identifying as 'other' gender, which is comparable to the Australian general population.²⁵ The majority of participants (26.1%) were ≥ 60 years of age. New South Wales (29.7%) was the most common place of residence. The minority of participants were those aged between 50 and 59 years (15.2%) and those residing in the Australian Capital Territory (1.4%). The majority of participants were either employed full time (31.6%) or not in the paid workforce (34%). The most commonly reported highest level of education was a trade/apprenticeship/certificate/diploma (33.8%), with the least common being less than year 12 (16.2%). Most participants were married (42.8%), which compared with 1.4% in a same-sex and 10.9% in an opposite-sex de facto relationship.

Associations between sociodemographic variables and CM product use

χ^2 tests of association revealed that gender, employment status, marital status, chronic health condition and private health insurance were all statistically significantly associated with CM product use with (see [table 1](#) for summary statistics). People with private health insurance (PHI) were less likely to use CM products than those without. Cramer's V showed that the strength of all significant associations was negligible (0.01) to small (16).²⁶

Expenses for each type of medicine use

[Table 2](#) presents the summary of the expenditure of each type of medicine product reported in the previous 12 months. Survey respondents spent an average of AUD\$102.41 on prescription-only pharmaceuticals and \$39.52 on over-the-counter pharmaceuticals. Mean expenditure on CM products varied across categories with the highest spend on VMSs (AUD\$86.24 per CM product user) and the lowest spend on homeopathy (AUD\$7.05 per CM product user) and flower essences (AUD\$4.94 per CM product user). Extrapolation of this data to the Australian population indicates an annual spend of AUD\$480 on CM products.

Prevalence of CM and pharmaceutical medicine use and source of prescription

A total of 1016 participants used any type of CM product (50.3%), which compared with 74.4% of participants who used prescription pharmaceuticals, and 66.8% who used over-the-counter pharmaceuticals. VMSs were the most frequently used CM product (47.8%) by participants, and were the most frequently prescribed by all types of health practitioners, and the most frequently self-prescribed. In contrast, homeopathic products were the least frequently used (6.8%), and the least frequently prescribed CM product by GPs, pharmacists, store assistants and least frequently self-prescribed. See [table 3](#) for a summary of the frequency of each type of medicine use.

[Table 3](#) shows that statistically significant associations were found between all types of medicine use with all sources of medicine prescription. For self-prescription,

Table 1 Participant sociodemographic characteristics and associations between CM product use

Characteristic	Used CM products		Total	P value
	No (n=1003)	Yes (n=1016)	(N=2019)	
Gender				
Female	444 (44.4)	590 (58.1)	1034 (51.2)	<0.001
Male	557 (55.6)	425 (41.9)	982 (48.6)	
Other*	-	-	3 (0.1)	
Age (years)				
18–29	281 (28)	231 (22.7)	512 (25.4)	0.08
30–39	156 (15.6)	157 (15.5)	313 (15.5)	
40–49	170 (16.9)	192 (18.9)	362 (17.9)	
50–59	150 (15)	156 (15.4)	306 (15.2)	
60 and over	246 (24.5)	280 (27.6)	526 (26.1)	
State				
New South Wales	307 (30.6)	290 (28.5)	597 (29.6)	0.07
Victoria	262 (26.1)	226 (22.2)	488 (24.2)	
Queensland	202 (20.1)	262 (25.8)	464 (23)	
South Australia	95 (9.5)	93 (9.2)	188 (9.3)	
Northern Territory	4 (0.4)	1 (0.1)	5 (0.2)	
Western Australia	95 (9.5)	104 (10.2)	199 (9.9)	
Tasmania	24 (2.4)	25 (2.5)	49 (2.4)	
Australian Capital Territory	14 (1.4)	15 (1.5)	29 (1.4)	
Employment status				
Full-time work	327 (32.6)	312 (30.7)	639 (31.6)	0.01
Part-time work	167 (16.7)	203 (20)	370 (18.3)	
Casual/temp work	66 (6.6)	73 (7.2)	139 (6.9)	
Looking for work	112 (11.2)	73 (7.2)	185 (9.2)	
Not in the paid workforce	331 (33)	355 (34.9)	686 (34)	
Marital status				
Never married	320 (31.9)	264 (26)	584 (28.9)	0.001
Married	394 (39.3)	470 (46.3)	864 (42.8)	
De facto (opposite sex)	126 (12.6)	94 (9.3)	220 (10.9)	
De facto (same sex)	11 (1.1)	18 (1.8)	29 (1.4)	
Separated/divorced/widowed	152 (15.2)	170 (16.7)	322 (16)	
Highest qualification				
Less than year 12	185 (18.4)	142 (14)	327 (16.2)	<0.001
Year 12 or equivalent	251 (25)	170 (16.7)	421 (20.9)	
Trade/apprenticeship/certificate/diploma	320 (31.9)	362 (35.6)	682 (33.8)	
University degree	247 (24.6)	342 (33.7)	589 (29.1)	
General health status				
Poor	68 (6.8)	96 (9.4)	164 (8.4)	0.07
Fair	220 (21.9)	220 (50)	440 (21.8)	
Good	335 (30.7)	335 (33)	643 (31.8)	
Very good	287 (31)	287 (28.2)	598 (29.6)	
Excellent	78 (9.6)	78 (7.7)	174 (8.6)	
Chronic health condition				

Continued

Table 1 Continued

Characteristic	Used CM products		Total	P value
	No (n=1003)	Yes (n=1016)	(N=2019)	
Yes	576 (57.4)	738 (72.6)	1314 (65.1)	<0.001
No	427 (42.6)	278 (27.4)	705 (34.9)	
Financial management				
It is impossible/it is difficult all of the time	217 (21.6)	213 (21)	430 (21.3)	0.91
It is difficult some of the time	375 (37.4)	391 (38.5)	766 (37.9)	
It is not too bad	352 (35.1)	348 (34.3)	700 (34.7)	
It is easy	59 (5.9)	64 (6.3)	123 (6.1)	
Healthcare card				
Yes	406 (40.5)	433 (42.6)	839 (41.6)	0.34
No	597 (59.5)	583 (57.4)	1180 (58.4)	
Private health insurance				
Yes	558 (55.6)	470 (46.3)	1028 (50.9)	<0.001
No	445 (44.4)	546 (53.7)	991 (49.1)	

*Excluded due to cell size count <5.

the strongest associations were found with aromatherapy oils (Cramer's V=0.58, p<0.001) and vitamins and mineral use (Cramer's V=0.61, p<0.001). Unsurprisingly, the strongest association for prescription pharmaceutical use was with GPs (Cramer's V=0.72, p<0.001). The weakest association was found between use of over-the-counter pharmaceuticals and CM practitioner prescription (Cramer's V=0.06, p=0.009).

Associations between CM product use and pharmaceutical medicine use

The majority (>80%) of ingestible CM product (ie, herbal medicines, vitamin and nutritional supplements, homeopathy, flower essences) users reported use of pharmaceutical medicines. All types of ingestible CM products

were statistically significantly (p<0.05) associated with both over-the-counter and prescribed pharmaceutical medicine use, with the exception of the relation between flower essences and prescribed pharmaceuticals. The strength of associations ranged from negligible to small. See table 4 for χ^2 test results.

CM use disclosure

χ^2 tests of association were conducted between the use of each type of ingestible CM product and disclosure of use to health professionals to determine frequencies and percentages in people who used any type of CM product (n=1016). These analyses only found small statistically significant associations between the use of vitamin/nutritional products and disclosure to both GPs (Cramer's

Table 2 Expenditure for each type of medicine use in the previous 12 months

Type of medicine used	Total expenses (2016–2017)	Mean expense per CM product user (n=1016)	Mean expense per person (n=2019)	Estimated CM product expense for Australian population (n=24 702 900)
Pharmaceutical products				
Prescription-only pharmaceuticals	\$206 761.69	\$122.44	\$102.41	\$3 024 623 076
Over-the-counter pharmaceuticals	\$79 798.05	\$52.39	\$39.52	\$1 294 184 931
CM products				
Western or Chinese herbal medicines	\$11 534.00	\$11.24	\$5.71	\$277 660 596
Vitamin/mineral supplements	\$88 297.20	\$86.46	\$43.73	\$2 135 812 734
Aromatherapy oils	\$10 381.00	\$10.13	\$5.14	\$250 240 377
Homeopathy	\$7 239.00	\$7.05	\$3.59	\$174 155 445
Flower essences	\$5 107.00	\$4.94	\$2.54	\$122 032 326
Total CM products	\$122 558.20	\$119.82	\$60.71	\$2 959 901 478

CM, complementary medicine.

Table 3 Prevalence of type of CM use and pharmaceutical medicines use

Type of medicine used		Source of CM prescription in previous 12 months																Total used in previous 12 months n (%)*
		General practitioner		Specialist doctor		Pharmacist		Store assistant		CM practitioner		Self-prescribed						
		No	Yes	p	No	Yes	p	No	Yes	p	No	Yes	p	No	Yes	p		
Prescription-only pharmaceuticals	No	507 (98.1)	271 (18)	<0.001	514 (99.4)	1161 (77.3)	<0.001	-	-	-	-	-	-	-	-	-	517 (25.6)	
	Yes	10 (1.9)	1231 (82)		3 (0.6)	341 (22.7)		-	-	-	-	-	-	-	-	-	1502 (74)	
Over-the-counter pharmaceuticals	No	662 (98.8)	1018 (75.5)	<0.001	666 (99.4)	1267 (93.9)	<0.001	662 (98.8)	788 (58.4)	<0.001	667 (99.6)	1248 (92.5)	<0.001	667 (99.6)	1323 (98.1)	858 (63.6)	670 (33.2)	
	Yes	8 (1.2)	331 (24.5)		4 (0.6)	82 (6.1)		8 (1.2)	561 (41.6)		3 (0.4)	101 (7.5)		3 (0.4)	26 (1.9)	8 (1.2)	1349 (66.8)	
Western or Chinese herbal medicines	No	1821 (99.6)	167 (87.4)	<0.001	1825 (99.8)	145 (75.9)	<0.001	1821 (99.6)	159 (83.2)	<0.001	1822 (99.7)	155 (81.2)	<0.001	1823 (99.7)	146 (76.4)	152 (79.6)	1828 (90.5)	
	Yes	7 (0.4)	24 (12.6)		3 (0.2)	46 (24.1)		7 (0.4)	32 (16.8)		6 (0.3)	36 (18.8)		5 (0.3)	45 (23.6)	39 (20.4)	191 (9.5)	
Vitamin/mineral supplements	No	1046 (99.3)	769 (79.6)	<0.001	1053 (100)	896 (92.8)	<0.001	1048 (99.5)	786 (81.4)	<0.001	1049 (99.6)	846 (87.6)	<0.001	1050 (99.7)	910 (94.2)	1045 (49.5)	1053 (52.2)	
	Yes	7 (0.7)	197 (20.4)		0 (0)	70 (7.2)		5 (0.5)	180 (18.6)		4 (0.4)	120 (12.4)		3 (0.3)	56 (5.8)	8 (0.8)	966 (47.8)	
Aromatherapy oils	No	1790 (99.7)	201 (89.7)	<0.001	1791 (99.8)	201 (89.7)	<0.001	1790 (99.7)	184 (82.1)	<0.001	1792 (99.8)	191 (85.3)	<0.001	1791 (99.8)	196 (87.5)	128 (6.7)	1795 (88.9)	
	Yes	5 (0.3)	23 (10.3)		4 (0.2)	23 (10.3)		5 (0.3)	40 (17.9)		3 (0.2)	33 (14.7)		4 (0.2)	28 (12.5)	96 (42.9)	224 (11.1)	
Homeopathy	No	1879 (99.9)	112 (81.2)	<0.001	1880 (99.9)	111 (80.4)	<0.001	1877 (99.8)	111 (80.4)	<0.001	1877 (99.8)	115 (83.3)	>	1878 (99.8)	102 (73.9)	114 (82.6)	1881 (93.2)	
	Yes	2 (0.1)	26 (18.8)		1 (0.1)	27 (19.6)		4 (0.2)	27 (19.6)		4 (0.2)	23 (16.7)		3 (0.2)	36 (26.1)	5 (0.3)	138 (6.8)	
Flower essences	No	1866 (99.9)	125 (82.8)	<0.001	1865 (99.8)	132 (87.4)	<0.001	1864 (99.8)	115 (76.2)	<0.001	1864 (99.8)	125 (82.8)	<0.001	1865 (99.8)	125 (82.8)	114 (75.5)	1868 (92.5)	
	Yes	2 (0.1)	26 (17.2)		3 (0.2)	19 (12.6)		4 (0.2)	36 (23.8)		4 (0.2)	26 (17.2)		3 (0.2)	26 (17.2)	7 (0.4)	151 (7.5)	

*Per cent of total number of each type of medicine use.
 †Per cent of total n=2019.
 CM, complementary medicine.

Table 4 Associations between type of ingestible CM product used and pharmaceutical product use

Type of CM product used		Used any CM product (n=1016)									
		Used prescribed pharmaceutical n (%)					Used over-the-counter pharmaceutical n (%)				
		No	Yes	Total*	p	Cramer's V	No	Yes	Total*	p	Cramer's V
Western or Chinese herbal medicines	No	151 (87.8)	674 (79.9)	825 (81.2)	0.02	0.08	181 (21.9)	644 (78.1)	825 (81.2)	0.002	0.10
	Yes	21 (12.2)	170 (89)	191 (18.8)			23 (12)	168 (88)	191 (18.8)		
Vitamin/mineral supplements	No	15 (30)	35 (70)	50 (4.9)	0.01	0.08	19 (38)	31 (62)	50 (4.9)	0.001	0.10
	Yes	157 (16.3)	809 (83.7)	966 (95.1)			185 (19.2)	781 (80.8)	966 (95.1)		
Homeopathy	No	160 (18.2)	718 (81.8)	878 (86.4)	0.006	0.09	199 (22.7)	679 (77.3)	878 (86.4)	<0.001	0.16
	Yes	12 (8.7)	126 (91.3)	138 (13.6)			5 (3.6)	133 (96.4)	138 (13.6)		
Flower essences	No	153 (17.7)	712 (82.3)	865 (85.1)	0.12	0.05	195 (22.5)	670 (77.5)	865 (85.1)	<0.001	0.15
	Yes	19 (12.6)	132 (87.4)	151 (14.9)			9 (6)	142 (94)	151 (14.9)		

*Percentage of total number of participants using any CM product. CM, complementary medicine.

V=0.13, p=0.004) and hospital doctors (Cramer's V=0.11, p=0.04), and between use of herbal medicines and disclosure to both GPs (Cramer's V=0.11, p=0.02) and hospital doctors (Cramer's V=0.12, p=0.03). No association was found between any other type of product use and disclosure to health practitioners. See [table 5](#) for summary statistics.

Predictors of CM product use

The independent variables of gender, age, marital status, qualification, general health status, chronic health condition and private health insurance were included in a binomial logistic regression predicting CM product use. The model was statistically significant, $\chi^2(29)=174.70$, $p<0.001$, and correctly classified 61% of cases. Gender, qualification, chronic disease diagnosis and private health insurance were statistically significant ($p<0.05$) predictors of CM product use (see [table 6](#)). Women had an increased odds of using CM product compared with men. Higher education levels were associated with an increased likelihood of CM product use compared with those with less than year 12 level education, with the exception of university degree level. People with a chronic health condition were *more likely* to use CM products compared with those without a chronic health condition. Those without private health insurance were *more likely* to use CM products compared with those with PHI.

DISCUSSION

This is the first study in over a decade to report the prevalence, characteristics and predictors of CM product use in a nationally representative population of Australians. We identified that 50.3% of Australians used some form of CM product in the previous 12 months. CM use in the general population has previously reported in 2006 at 68.9% including both products and services.⁹ Unfortunately, a direct comparison between our data and this previous study cannot be made as a number of CM in the

older study could not be clearly categorised into either products or services. The consistency of these figures suggests that the use of CM products is an established feature of Australians' healthcare choices.

The estimated annual expenditure on CM products by the adult Australian population in 2006 was A\$1.86 billion,⁹ which is higher than the estimated expenditure of AUD\$480 million identified from our data. It is important to note, however, that the difference in expenditure is likely related to the difference in defining a CM product rather than a substantive difference in CM spending by the Australian population. As the previously published data did not specify which products were included in the final amount of expenditure, the variability between both studies is difficult to meaningfully quantify. Industry data from the Complementary Medicine Association for CM reports much higher sales revenue for CM products (AUD\$4.7 billion); however, this includes domestic sales and international exports as well as other health products not included in our study, such as sports nutrition, meal replacements and weight loss products.²⁷

VMSs were the most common CM product used by Australians (47%), which is comparable to 45% of Australians who reported using supplements in 2006.⁹ Other reports obtained from narrower samples of Australians within the last 20 years provide similar rates, reporting VMS use ranging from 47% to 53%.^{10 19 28 29} Both Xue *et al*⁹ and Morgan *et al*¹⁰ instructed participants to exclude medically prescribed nutrients such as iron and calcium when reporting their VMS use. This present study did not instruct participants to exclude medically prescribed nutrients. Nevertheless, VMS were the most common CM products prescribed by any type of healthcare professional in our study, which may be associated with the treatment of common medical conditions such as iron deficiency,³⁰ the use of calcium and vitamin D in the clinical management of osteoporosis, vitamin D deficiency³¹ and specific VMS formulations for macular degeneration.^{32 33}

Table 5 Association between type of CM product used with disclosure to type of health practitioners

Type of ingestible CM product used	Disclosure to general practitioner (n=494) n (%)			Disclosure to specialist doctor (n=395) n (%)			Disclosure to hospital doctor (n=339) n (%)			Disclosure to pharmacist (n=472) n (%)		
	No	Yes	Total* p	No	Yes	Total* p	No	Yes	Total* p	No	Yes	Total* p
Western or Chinese herbal medicines	No	34 (9.6)	320 (90.4)	20 (7.7)	240 (92.3)	260 (65.8)	25 (11.6)	190 (88.4)	215 (63.4)	93 (27.9)	238 (72.1)	330 (69.9)
	Yes	24 (17.1)	116 (82.9)	18 (13.3)	117 (86.7)	135 (34.2)	25 (20.2)	99 (79.8)	124 (36.6)	39 (27.5)	103 (72.5)	142 (30.1)
Vitamin/mineral supplements	No	8 (28.6)	20 (71)	4 (21.1)	15 (78.9)	19 (4.8)	4 (36.4)	7 (63.6)	11 (3.2)	8 (33)	16 (66.7)	24 (5.1)
	Yes	50 (10.7)	416 (89.3)	34 (9)	342 (91)	376 (95.2)	46 (14)	282 (86)	328 (96.8)	123 (27.5)	325 (72.5)	448 (94.9)
Homeopathy	No	44 (11.2)	348 (88.8)	26 (8.9)	265 (91.1)	291 (73.7)	34 (14)	208 (86)	242 (71.4)	101 (27.5)	266 (72.5)	367 (77.8)
	Yes	14 (13.7)	88 (86.3)	12 (11.5)	92 (88.5)	104 (26.3)	16 (16.5)	81 (83.5)	97 (28.6)	30 (28.6)	75 (71.4)	105 (22.2)
Flower essences	No	42 (10.9)	345 (89.1)	26 (9)	263 (91)	289 (73.2)	32 (13.4)	206 (86.6)	238 (70.2)	100 (27.5)	263 (72.5)	363 (76.9)
	Yes	16 (15)	91 (85)	12 (11.3)	94 (88.7)	106 (26.8)	18 (17.8)	83 (82.2)	101 (29.8)	31 (28.4)	78 (71.6)	109 (23.1)

*Percentage of total number of participants disclosing any CM product use to each type of practitioner. CM, complementary medicine.

Table 6 Predictors of complementary medicine product use

Variable	OR (95% CI)	P value
Gender		
Female	1.78 (1.46 to 2.18)	<0.001
Male	–	–
Age (years)		
18–29	–	0.55
30–39	0.83 (0.59 to 1.17)	0.29
40–49	0.80 (0.57 to 1.13)	0.21
50–59	0.87 (0.63 to 1.19)	0.38
60 and over	0.76 (0.56 to 1.06)	0.10
State		
New South Wales	–	0.21
Victoria	0.87 (0.40 to 1.92)	0.73
Queensland	0.77 (0.35 to 1.71)	0.52
South Australia	1.12 (0.50 to 2.48)	0.79
Northern Territory	0.92 (0.40 to 2.12)	0.85
Western Australia	0.23 (0.02 to 2.54)	0.23
Tasmania	1.02 (0.45 to 2.33)	0.96
Australian Capital Territory	0.93 (0.35 to 2.48)	0.89
Employment status		
Full-time work	–	0.13
Part-time work	1.08 (0.81 to 1.43)	0.61
Casual/temp work	1.25 (0.93 to 1.68)	0.14
Looking for work	1.18 (0.79 to 1.78)	0.42
Not in the paid workforce	0.76 (0.52 to 1.10)	0.15
Marital status		
Never married	–	0.18
Married	0.95 (0.68 to 1.33)	0.77
De facto (opposite sex)	1.07 (0.81 to 1.42)	0.61
De facto (same sex)	0.73 (0.50 to 1.07)	0.11
Separated/divorced/widowed	1.43 (0.62 to 3.32)	0.40
Highest qualification		
Less than year 12	–	<0.001
Year 12 or equivalent	0.53 (0.39 to 0.73)	<0.001
Trade/apprenticeship/certificate/diploma	0.51 (0.39 to 0.68)	<0.001
University degree	0.81 (0.63 to 1.05)	0.09
General health status		
Poor	–	0.31
Fair	1.40 (0.86 to 2.26)	0.18
Good	0.96 (0.65 to 1.41)	0.84
Very good	1.12 (0.78 to 1.61)	0.53
Excellent	0.99 (0.69 to 1.42)	0.95
Chronic health condition		
No	0.52 (0.42 to 0.64)	<0.001
Yes	–	–
Do you have PHI?		

Continued

Table 6 Continued

Variable	OR (95% CI)	P value
No	1.33 (1.09 to 1.62)	0.01
Yes	–	–
Constant	1.30	0.57

As reported by the participants in this study, VMS were the most commonly prescribed CM products by all healthcare providers, half of the VMS used were self-prescribed. It is generally accepted and promoted by health authorities and health professionals, that eating a well-balanced diet will provide adequate vitamin and minerals to prevent deficiencies.³⁴ VMSs sold in Australia are required to carry a ‘warning’ on their labels that reads ‘vitamin/mineral supplements should not replace a balanced diet’.³ Although the reasons why so many Australians use VMSs was not the focus of this study, it is important that additional research is conducted to identify drivers of VMS use. Possible reasons for such high use may be associated with the substantial number of Australians not meeting the recommended intake of foods high in vitamins and minerals and their high intake of ‘discretionary’ foods.³⁵ The Australian Bureau of Statistics 2015 National Health Survey reported that just less than half (49.8%) of Australian adults meet the Australian Dietary Guidelines for recommended daily serves of fruit, only 7% meet the guidelines for serves of vegetables, and 5.1% meet both guidelines.³⁵ Other research has reported inadequate dietary intakes and/or deficiencies of specific nutrients among children, pregnant women and adolescences for iron,³⁰ zinc,³⁶ calcium, magnesium, vitamin D and folic acid.³⁷ Whether the high use of VMS among Australians is associated with an attempt to compensate for poor food choices is an area that requires public health attention. Of equal importance, is the need to understand if and why well-nourished Australians supplement their diet with VMSs. While there is some evidence to suggest that the long-term use of multi-VMSs for up to 10 years in healthy populations is likely to be safe, formulations vary and there are safety concerns for specific populations taking specific nutrients; for example, smokers and beta carotene use has been associated with increasing the risk of lung cancer.³⁸ Other research is currently being conducted to evaluate the efficacy and safety of more clearly defined VMS formulations in specific populations.³⁹

CM product use being greater among women, those in full-time employment, and those with a higher level of education in our study is consistent with previous findings.^{2 9 29} However, our finding that those with private health insurance were *less likely* to use CM products compared with those with private health insurance differs from these previous studies.^{9 29 40} While highly speculative, there may be an association with the rising costs of private health insurance premiums in Australia⁴¹ and consumers allocating more of their income on health maintenance and preventative strategies as a ‘surrogate’ to private

health insurance. The efficacy of VMS in disease prevention and health maintenance is unclear and controversial resulting in large-scale research currently being undertaken.³⁹

Having a diagnosis of one or more chronic illnesses also increased the likelihood of CM product use and CM product users were likely (>80%) users of both over-the-counter and prescription pharmaceuticals. Given that self-prescribing of CM products is the most common method leading to use, it is important that healthcare professionals caring for individuals with chronic disease inquire about CM product use and monitor for any potential disease–CM interactions and drug–CM product interactions, especially with regards to herbal medicines. The likelihood of having a chronic illness increases with age and so does pharmaceutical medicine use.¹⁰ While evidence-based resources aimed at practitioners are available to guide appropriate and safe use of CMs,⁴² well-established evidence based on human studies is limited. Available evidence is largely based on theory obtained from animal studies with individual case reports currently used to calculate likely risks.⁴³ This being said, it is well established that short-acting pharmaceutical medicines used for serious diseases, such as the use of digoxin for heart disease and chemotherapeutic agents for cancer, may result in serious interactions when used concurrently with some CMs, resulting in possible therapeutic failure or drug-related toxicity.⁴⁴

The finding that both users of VMS and herbal medicines were more likely to disclose their use to their GPs and hospital doctors than to pharmacists and specialists is encouraging. However, overall the number of those that never disclose their herbal medicine use (18%) is similar to that reported in 2006 where 17.9% participants never informed their doctors about any CM use.⁹ However, data obtained in 2012 reporting Australians’ disclosure to HCPs about CM use reported that only 47% to 60% informed their health professionals.⁴⁵

Given the majority of CM products and over-the-counter pharmaceutical and prescription medicines are accessed through pharmacy outlets, further developments within the profession are required to help encourage CM product users to discuss such use with their pharmacist.⁸ The reasons for a lower disclosure rate about CM use to medical specialists and pharmacists compared with other healthcare professionals in this study is unclear. Speculatively, there may be an association with earlier reports that suggest such healthcare providers feel they do not have adequate training or education to be able to engage in discussions about CMs.^{7 16 46 47}

This study presents the first nationally representative data in over 10 years regarding the use of CM products in the Australian population. Interpretation of the findings, however, must be contextualised to the study's limitations. The study may be vulnerable to random error due to sampling bias; however, as the participants have been verified as nationally consistent based on a range of sociodemographic variables, this is likely to have minimal impact on the outcome of our analysis. The data are also at risk of recall bias based on participant self-report of items related to the previous 12 months. This is particularly the case for the economic data, which should only be considered estimates of true values. However, the instrument used in this study is informed by increased rigour in health services research methodology and advances in knowledge regarding CM use globally over the last decade, and as such offers the most robust and contemporary view of the topic than has been available in recent years.

CONCLUSIONS

Overall CM product use in Australia has remained stable over the last 10 years and can be confirmed as an established component of many Australians healthcare choices. This highlights the need for all health professionals providing care to the Australian population to engage more meaningfully in the role, value and implications of this use. Pharmacists and medical doctors, in particular, need to ensure their knowledge of ingestible CM products is up-to-date and evidence-based so they can provide accurate and relevant information to the Australian community seeking their care. Future research is encouraged to focus on the reasons a substantial number of Australian are using VMS, the efficacy in 'supplementing' inadequate dietary nutrient intakes and the safety of long-term and concurrent use with pharmaceutical medicines.

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Competing interests None declared.

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Correction: *Use of complementary medicine products: a nationally representative cross-sectional survey of 2019 Australian adults*

Harnett JE, McIntyre E, Steel A, *et al.* Use of complementary medicine products: a nationally representative cross-sectional survey of 2019 Australian adults. *BMJ Open* 2019;9:e024198. doi: 10.1136/bmjopen-2018-024198

This article was previously published with errors in data.

The error relates to a discrepancy between the reporting of a dollar amount in Table 2 and the text of the section ‘expense of each type of medicine use’.

Incorrect statement: ‘Extrapolation of this data to the Australian population indicates an annual spend of AUD\$480 on CM products.’

Corrected statement: ‘Extrapolation of this data to the Australian population indicates an annual spend of AUD\$2 959 901 478 on CM products.’

Table 2 does not require any revision. The incorrect \$ amount is cited again in the discussion section:

‘The estimated annual expenditure on CM products by the adult Australian population in 2006 was A\$1.86 billion,⁹ which is higher than the estimated expenditure of AUD\$480 million identified from our data.’

The sentence below has been revised to contain the correct information for inclusion in the discussion:

‘The estimated annual expenditure on CM products by the adult Australian population in 2006 was A\$1.86 billion,⁹ which is lower than the estimated expenditure of AUD\$2.9 billion identified from our data.’

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