Associations between complementary medicine utilization and influenza/pneumococcal vaccination: Results of a national cross-sectional survey of 9151 Australian women

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Title

Associations between complementary medicine utilization and influenza/pneumococcal vaccination: Results of a national cross-sectional survey of 9,151 Australian Women

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ABSTRACT

Influenza and pneumococcal vaccination is recommended for all adults, with older adults considered a high-risk group for targeted intervention. As such it is important for factors affecting vaccine uptake in this group to be examined. Complementary medicine (CM) use has been suggested as a possible factor associated with lower vaccination uptake. To determine if associations exist between influenza and pneumococcal vaccine uptake in older Australian women and the use of CM, data from women aged 62-67 years surveyed as part of the Australian Longitudinal Study on Women's Health (ALSWH) were analyzed in 2013 regarding their health and health care utilization. Associations between the uptake of influenza and pneumococcal vaccinations and the use of CM were analyzed in 2016 using chi-squared tests and multiple logistic regression modelling. Of the 9,151 women, 65.6% and 17.7% reported that they had had influenza and pneumococcal vaccination within the past 3 years respectively. Regression analyses show that women who consulted naturopaths/herbalists (OR=0.64) and other CM practitioners (OR=0.64) were less likely to have vaccination (influenza only), as were women who used yoga (OR=0.77-0.80) and herbal medicines (OR=0.78-0.83) (influenza and pneumococcal). Conversely, women using vitamin supplements were more likely to receive either vaccination (OR=1.17-1.24) than those not using vitamin supplements. The interface between CM use and influenza and pneumococcal vaccination uptake in older women appears complex, multi-factorial and often highly individualized and there is a need for further research to provide a rich examination of the decision-making and motivations of stakeholders around this important public health topic.

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INTRODUCTION

Whilst influenza and pneumococcal vaccination is recommended for all adults in Australia, adults aged over 65 in the general Australian population are considered to be at higher risk of contracting these conditions (or at higher risk from complications from potential infection) and as such are entitled to free influenza and pneumococcal vaccinations under the National Immunisation Program. Immunization in this group is undoubtedly effective – the preventative vaccination rate for Australian adults aged 65 and over is 74.6% for influenza and 54.4% for pneumococcal vaccination (18) – yet little is known about associations between certain health seeking practices and vaccine uptake. The use of complementary medicine (CM) – a diverse group of health care practices (such as naturopathy, chiropractic or massage) and products (such as herbal medicines, dietary supplements and homeopathy) not generally considered part of the conventional medical curriculum [1] – has undergone significant expansion in recent decades. The increasing popularity of CM has led to concern around possible direct and indirect risks [2], with some commentators suggesting that CM practitioners may discourage or actively oppose vaccination [3-6], or that users of alternative models of health care may not support conventional preventive medical measures such as vaccination [7].

In Australia, the role CM plays in the contemporary health sector is of particular and increasing significance, with the estimated numbers of consultations with CM providers being similar to those of conventional medical providers (69.2 million v. 69.3 million), reported out-of-pocket expenditure on CM products representing over $4.1 billion annually

(US$3.8 billion; £2.3 billion) [8] and CM practitioners outnumbering conventional primary care providers in some areas [9]. Underlying concerns about the impact of CM on preventive adult vaccination may have some merit: a survey of older people in the US, for example, found that those who did not use the influenza or pneumococcal vaccinations were more likely to believe that they could prevent those diseases with alternative therapies [10], and a preference for CM over conventional treatments and utilization of most CMs in the previous 12 months was found to be a predictor for vaccine rejection [11]. Moreover, some CM practices have been associated with high-profile anti-vaccination activity [12].

Despite such concerns, the relationship between CM and preventive adult vaccinations such as influenza and pneumococcal vaccination remains unclear, with little critical or rigorous examination of this relationship undertaken to date. Studies of the interface between CM and other vaccinations – for example childhood vaccination – do suggest that the relationship between CM and vaccination is complex, multi-factorial and often highly individualized [13]. For example, not all CM use may have the same impact on vaccination uptake. Analyses of National Health Interview Survey (NHIS) data suggest that users of non-chiropractic forms of CM are in fact more likely to receive the influenza vaccination [14] and CM users generally are more likely to receive the influenza and pneumococcal vaccines [15]. The broad definition of CM may also add to the complexity of the relationship between CM and vaccination as not all CM practices appear to influence adult vaccination equally. French general practitioners practicing acupuncture or homeopathy were less likely to receive the occupational influenza vaccine than those who did not practice CM modalities, but were not less likely to vaccinate for other diseases, [16]. A study of US health fair attendees found that CM use was not associated with reduced uptake of the influenza vaccine, but this association was identified amongst attendees using provider-based CM services [17].

Chiropractic practice has been the most extensively studied CM modality in relation to associations with preventive adult vaccination uptake [13]. However, even within this specific discipline there is significant heterogeneity of results. For example, analyses from NHIS data in the US has drawn contrasting results of the correlation between chiropractic use and the uptake of the influenza vaccine, showing chiropractic use as being correlated with both higher influenza vaccine use [15] *and* lower vaccine use [18] in different studies. Re-analysis of this data by different authors has suggested these differences are dependent on the definition of chiropractic use is employed (i.e. 'ever used' versus 'have used in past 12 months') and how 'high-priority' conditions for vaccination were built into the multiple regression model [19]. Additional re-analysis of this dataset also determined that for high-priority patients there were no significant differences in vaccination uptake between those patients who used chiropractic and those who did not use chiropractic [14]. A review of childhood immunization has found that participants in younger cohort of CAM users (excluding chiropractic users) were more likely to have received the influenza vaccination when compared to non-CAM users[14].

Given the importance of public health vaccination in improving population health outcomes it is essential that we address the lack of information regarding the association of vaccination with other health behaviors. In direct response to these circumstances, the analyses reported in this paper examines whether consulting with CM practitioners or using a variety of CM interventions is associated with uptake of influenza and pneumococcal vaccine uptake in Australian women aged 62 to 67 years.

METHODS

The study reported here was conducted using data from the Australian Longitudinal Study on Women's Health (ALSWH) – a study designed to assess a range of factors associated with

health and wellbeing in Australian women. Study participants consist of women randomly selected from the national Medicare database in 1996 in three different age groups (18-23, 45-50, 70-75 years) [20]. The women participating in the ALSWH are broadly representative of the national population of women in their respective age cohorts [21]. For the study reported here, analyses focused on 9,151 women from the ALSWH 1946-1951 cohort, who were aged between 62 and 67 years at the time of the 2013 survey. Ethical approval for the ALSWH was gained from the Human Ethics Committees at the University of Queensland and University of Newcastle. The study participants provided written consent.

Vaccination

The primary outcome was uptake of pneumococcal vaccine. Women were asked whether they had been vaccinated for influenza and whether they had had a pneumococcal vaccine (also called PPV, for pneumonia) in the past 3 years. These questions were answered on a yes/no basis.

CM utilization

All participants were asked if they had consulted with any of the following CM practitioners in the last 12 months: a massage therapist, a naturopath/herbalist, a chiropractor, an acupuncturist or a 'other' alternative health practitioners (e.g. an aromatherapist, a homeopath, a reflexologist and a iridologist). These questions were answered on a yes/no basis. Participants were further asked how often they had used the following CM therapies for their own health in the past 12 months: vitamins/minerals, yoga/meditation, herbal medicines, Chinese medicines, and other alternative therapies. For this question participants were able to select the following categories: never, rarely, sometimes or often, with responses

being categorised as: not used (including never and rarely), used sometimes (including sometimes) and used frequently (including often).

Statistical Analyses

Chi-squared tests were used to compare uptake of vaccinations between those who had or had not consulted particular CM practitioners or used particular CM therapies. Results of these analyses were used to inform the subsequent logistic regression model, including variables with significant bivariate associations of $p<0.1$ only. Multiple logistic regression analyses were conducted to determine whether consulting a particular CM practitioner or using a particular CM therapy (independent variables, categorical format), was associated with having been vaccinated for influenza or pneumonia (dependent variables). Adjusted odds ratios with 95% confidence intervals were computed for all predictor variables. Analyses were adjusted for known confounders relating to socio-demographic and other factors associated with CM use in the Australian population [22], as well as known confounding factors from previous analyses of pneumococcal vaccination uptakes [14, 15] These factors included: marital status, education, income, area of residence, consultations with family doctors/GPs, hospital doctors or specialists, being diagnosed with chronic diseases, mental health conditions; and/or cancer. The primary outcome was the outcome as per logistic regression analysis, and the statistical significance was set at $p < 0.05$. Statistical significance was set at $p < 0.05$. All statistical analyses were performed in 2016 using IBM SPSS ® software (IBM SPSS Statistics for Windows, release 22.0. Armonk, NY: IBM Corp.).

RESULTS

Of the 9,151 women who completed the questionnaire, 66 did not provide data on vaccination. Of the remaining 9,085 women, 65.6% and 17.7% had received the influenza and pneumococcal vaccination within the past 3 years respectively.

Table 1 shows participant characteristics. The bivariate associations between consulting a CAM practitioner and uptake of vaccinations are shown in Table 2. Associations significant at $p<0.1$ were found for the following practitioner groups, and included as potential predictors in the subsequent logistic regression analysis: Women who consulted with naturopaths, massage therapists, chiropractors (pneumococcal vaccination only), and other alternative therapies (influenza vaccination only) in the past 12 months, reported a lower uptake of influenza and pneumococcal vaccinations.

Table 3 shows the bivariate associations between the use of CAM therapies and uptake of vaccination. Associations significant at $p<0.1$ were found for the following complementary medicines, and included as potential predictors in the subsequent logistic regression analysis: Women who used vitamins/minerals reported higher uptake of both vaccine types, while women using yoga/meditation, herbal medicine, Chinese medicine or other alternative therapies (pneumococcal vaccination only) reported lower uptake of influenza and pneumococcal vaccinations.

The outputs from the adjusted logistic regression models are presented in Table 4. Women who consulted a naturopath/herbalist (OR=0.64; 95% CI: 0.52, 0.78) or other alternative health practitioners (OR=0.65; 95% CI: 0.50, 0.82) were less likely to have received an influenza vaccination. No influence of practitioner consultations was shown for prevalence of pneumococcal vaccination. Furthermore, women using vitamins/minerals at least sometimes (OR=1.17; 95% CI: 1.00, 1.36) or often (1.22; 95% CI: 1.08, 1.38) were more likely to have received the influenza vaccination, whilst those using vitamins often (OR=1.24; 95% CI:

1.06, 1.44) were more likely to have received a pneumococcal vaccination. Having practiced yoga often was predictive of a decreased likelihood of receiving both influenza (OR=0.79; 95% CI: 0.66, 0.95) and pneumococcal (OR=0.78; 95% CI: 0.60, 1.02) vaccinations. Similarly, women who reported *sometimes* using herbal medicines had a decreased likelihood of receiving both vaccine types (influenza: OR=0.83; 95% CI: 0.71, 0.97; pneumococcal: OR=0.80; 95% CI: 0.65, 0.97), whereas women who *often* used herbal medicines were less likely to report being vaccinated for influenza (OR=0.78; 95% CI: 0.65, 0.93) but had no difference in likelihood of receiving pneumococcal vaccination.

DISCUSSION

This paper reports findings from the first study examining the association between particular types of CM use and the uptake of recommended adult preventive vaccinations from a national representative sample outside the US.

Visits to naturopaths/herbalists and 'other CM practitioners were found to be associated with lower uptake of influenza vaccine in our study population. The only other study examining connections between individual CM practice modalities and adult uptake of the influenza vaccine found no significant association for naturopathy[18] and further large scale studies are required to fully understand the relationship between consulting with naturopaths (or any other CM practitioner types) and vaccination uptake. The majority of research that has evaluated associations between adult vaccine uptake and CM use has examined all CM practice modalities together and further exploration of individual practitioner modalities is warranted as findings are likely to be more nuanced, and possibly highly individualized. It is also possible that additional geographical, cultural and societal distinctions exist in different populations.

Associations between adult vaccine uptake and the use of CM products and self-care practices were also found in our study. Participants who used herbal medicine products or practiced yoga/meditation were less likely to have received influenza and/or pneumococcal vaccinations. This finding somewhat conflicts to analysis of a large nationally representative US study that found no such association with the use of herbal medicine products, yoga and/or meditation [18]. Again, further research is warranted to ascertain what influence these practices may have on vaccination uptake. Participants who used vitamin/mineral supplements were the exception to this trend of declining vaccination uptake with CM use, as they were more likely to be vaccinated against influenza and pneumococcal disease. Whilst the reasons for the positive association between vitamin/mineral use and vaccination uptake are unknown, the use of vitamin and mineral supplements are a common preventative health measure in Australia[22] and it is possible that women who use these supplements may also utilize other preventative health measures such as vaccines.

The trend towards lower adult preventive vaccinations among CM users may not necessarily indicate a causative role for CM (and in particular CM practitioners). Anti-vaccination sentiments are often a proxy for deeper concerns in a much wider discourse about medicine, the state and the body [23]. Such sentiments are also part of what seems to be a growing distrust of health professionals, pharmaceutical manufacturers and government [24]. These same factors have been posited as fuelling the growth of CM use [1] and it is therefore perhaps unsurprising that the two issues have become linked. Additionally, research has found adults with a pre-existing preference for CM are more likely to reject vaccination [11] and therefore it is possible the patient's personal belief may predispose them to both CM use and anti-vaccination sentiment, rather than a causal link existing between the two. Such beliefs may drive self-care practices which are perceived as safer and more effective at preventing disease than vaccination[10]. As such, there may be utility in further examination of specific factors that

influence decision-making around uptake practices associated with lower vaccination uptake. This may help to ascertain both what drives patients both toward unconventional preventive practices, but also away from evidence-based conventional healthcare practices, and may lead to development of more effectively tailored vaccine promotion towards those who are vaccine hesitant.

Pre-existing patient beliefs that partly drive CM use may also help to explain why women who consult with naturopaths and herbalists report significantly lower levels of influenza vaccination in our study. It has been suggested that the broad scope and eclectic and philosophically-defined nature of naturopathic practice may differ from other CM practitioners, who may have a more clearly delineated scope of practice (for example, acupuncturists may be defined by their tool of trade, chiropractors and osteopaths by their focus on musculoskeletal treatment), and as such may be more attractive to those seeking an 'alternative' form of care in place of conventional medicine[25]. In Australia, approximately one-third of naturopathic practitioners are consulted by patients who use them as their primary provider [26, 27]. Naturopaths are Australia's largest CM profession with a primary point of care role [28] and as such, naturopaths may be able to attract a larger pool of patients who are resistant to conventional approaches to care for a broad range of conditions, or attracted to a 'natural' healthcare approach, rather than those seeking specific treatments. This hypothesis may also partly explain why the eclectic and diverse 'other provider' category of CM practitioners was the only other CM which independently predicted lower influenza vaccination in our analyses. However, as the specific professions included in this category are not defined this interpretation remains purely speculative. However, the results of our study do suggest that there is a significant level of heterogeneity between the effects of individual CM practices on influenza and pneumococcal vaccine uptake among the elderly. This finding mirrors the results of a review of the impact of CM and childhood vaccination,

which found that the interface between CM and vaccination was complex, multi-factorial and highly individualized[13].

The potential influence of CM practitioner views on vaccination should not be discounted. There is a clear decrease in vaccination uptake associated with consulting CM practitioners in general in our study, which was found to be most pronounced with naturopaths/herbalists and the broad 'other' category of alternative health providers. Studies in the US and Canada have suggested significant heterogenity of opinion on vaccination within the naturopathic profession in those countries [29, 30], which is mirrored in many other CM professions [13]. Attitudes within the naturopathic profession in Australia are likely to display even more heterogeneity, as it is unique among the larger CM professions in that is remains unregulated [31]. However, despite the prominent role of CM practitioners in Australia, little is known about CM practitioner perceptions, attitudes and practices towards vaccination. Further examination of the actual impact of CM practitioners on public health initiatives such as vaccination is essential in order to fully elucidate the drivers and influencers of patient preventive care. Given that international studies have uncovered that significant levels of support for vaccination occur even in CM practitioner groups traditionally considered "anti-vaccine"[13], it may even be possible for such practititioners to have a role in improving vaccine uptake, given that they may attract a patient base that may be more vaccine-hesitant than patients who do not use CM providers. Similarly, a clearer understanding of the views of patients, who visit naturopaths, with regards to vaccination is needed to identify the degree to which patient perceptions are driven by the consultation, or whether personal beliefs underpinning the decision not to vaccinate also motivate individuals to seek naturopathic care for their health.

Difficulties assessing the influence of CM use on vaccine uptake may be due in part to demographic characteristics among the vaccine hesitant that are also known to occur among CM users (higher income levels, higher education levels) [7, 32, 33], and therefore one of the strengths of our analysis is that we controlled for such obvious confounders. However, the presence of other confounders – such as the social or cultural drivers that may influence decision-making around both vaccination and CM use – should not be excluded.

The ALSWH is a well-respected source of epidemiological data on women's health and the large number of participants as well as the inclusion of the most important confounders within the regression models provides strength to the analyses reported here. Nevertheless, there are some limitations: the data are based on self-reports and women may not have recollected all data correctly; and a social desirability bias cannot be ruled out (this may occur in either direction: participants may wish to show involvement in public health initiatives such as vaccination even if they had not complete these endeavors, or CM users may not report vaccinations due to perceptions that they do not align with 'natural health' approaches). As our analysis focused heavily on correlation rather than causation, our results should be viewed as drivers for further examination of the potential influence of CM on vaccination attitudes and practices, rather than supporting the hypothesis that factors are independently related.

CONCLUSION

There appears to be a trend towards lower uptake of influenza and pneumococcal vaccination by users of all types of CM except high users of vitamin supplements. However, most associations between CM utilisation and vaccination uptake were not confirmed as independent predictors. The interface between CM use and vaccination is complex, multi-

factorial and often highly individualised, and points to a need for deeper understanding of the interface between CM use and vaccination informed by empirical research.

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TABLES:

Table 1: Participant characteristics

Age, in years, mean±SD (range)	64.8±1.5 (62-67)
Marital status, in %	
Married or de facto	74.8
Divorced, separated or widowed	22.5
Never married	2.7
Qualifications, in %	
No formal school education	13.0
School only	43.9
Trade/Apprentice/Diploma	21.7
University/Higher Degree	21.3
Area, in %	
Urban	39.1
Rural	57.6
Remote	3.4
Body mass index, in %	
<18.5	1.2
18.5-24.9	34.7
25.0-29.9	34.0
>30.0	30.1
Retirement status, in %	
No retired	22.2
Partially retired	16.5
Retired	52.8
Other	8.4

Table 2: The bivariate association between consulting complementary medicine (CM) practitioners and influenza or pneumococcal vaccination uptake, in 9151 Australian women aged 62-67 years, in % of respondents

CM practitioner	Consultation	Received influenza vaccination	p-value	Received pneumococcal vaccination	p-value
Naturopath/herbalist	not consulted, %	66.8	<0.001	18.1	0.001
	consulted, %	49.3		13.2	
Massage therapist	not consulted, %	66.1	0.045	18.3	0.018
	consulted, %	63.8		16.1	
Chiropractor	not consulted, %	65.7	0.341	18.1	0.038
	consulted, %	64.3		15.7	
Osteopath	not consulted, %	65.7	0.145	17.7	0.279
	consulted, %	62.2		19.8	
Acupuncturist	not consulted, %	65.6	0.506	17.8	0.383
	consulted, %	64.2		16.4	
Other alternative health practitioner	not consulted, %	66.4	<0.001	17.9	0.171
	consulted, %	49.2		15.4	

Table 3: The bivariate association between the use of complementary medicine (CM) and influenza or pneumococcal vaccination uptake, in 9151 Australian women aged 62-67 years, in % of respondents

CM intervention	Frequency of use	Received influenza vaccination	p-value	Received pneumococcal vaccination	p-value
Vitamins/minerals	not used, %	62.9	0.002	16.3	0.013
	used sometimes, %	65.2		16.8	
	used often, %	67.0		18.8	
Yoga/meditation	not used, %	66.7	<0.001	18.4	0.002
	used sometimes, %	63.0		15.8	
	used often, %	57.0		13.8	
Herbal medicine	not used, %	67.2	<0.001	18.4	0.012
	used sometimes, %	61.7		15.0	
	used often, %	59.0		16.8	
Chinese medicine	not used, %	66.0	<0.001	18.0	0.014
	used sometimes, %	56.1		10.9	
	used often, %	53.6		15.2	
Other alternative therapies	not used, %	66.6	<0.001	17.9	0.144
	used sometimes, %	59.1		16.8	
	used often, %	49.4		13.8	

Table 4: Output from the logistic regression models showing the association between consulting health care practitioners/using complementary medicine and the use of influenza or pneumococcal vaccination, in 9151 Australian women aged 62-67 years. OR: Odds Ratio, CI: Confidence interval

Independent Variable		**OR (95% CI)**
Health care practitioner consulted		**Influenza vaccination**
Naturopath/herbalist		0.64 (0.52; 0.79)
Massage therapist		0.98 (0.86; 1.10)
Chiropractor		0.95 (0.82; 1.10)
Osteopath		0.79 (0.62; 1.02)
Acupuncturist		1.12 (0.89; 1.42)
Other alternative health practitioner		0.65 (0.50; 0.83)
Health care practitioner consulted		**Pneumococcal vaccination**
Naturopath/herbalist		0.80 (0.60; 1.07)
Massage therapist		0.92 (0.79; 1.08)
Chiropractor		0.83 (0.69; 1.01)
Osteopath		1.25 (0.94; 1.67)
Acupuncturist		0.99 (0.75; 1.31)
Other alternative health practitioner		1.08 (0.78; 1.49)
CM intervention used		**Influenza vaccination**
Vitamins/minerals	never/rarely	1.00
	sometimes	1.17 (1.01; 1.36)
	often	1.23 (1.09; 1.39)
Yoga/meditation	never/rarely	1.00
	sometimes	0.99 (0.84; 1.18)
	often	0.80 (0.66; 0.96)
Herbal medicine	never/rarely	1.00
	sometimes	0.83 (0.71; 0.97)
	often	0.78 (0.65; 0.94)
Chinese medicine	never/rarely	1.00
	sometimes	0.82 (0.59; 1.14)
	often	0.96 (0.59; 1.55)
Other alternative therapies	never/rarely	1.00
	sometimes	0.86 (0.69; 1.08)
	often	0.76 (0.56; 1.03)

CM intervention used		**Pneumococcal vaccination**
		OR (95% CI)
Vitamins/minerals	never/rarely	1.00
	sometimes	1.08 (0.89; 1.31)
	often	1.24 (1.06; 1.44)
Yoga/meditation	never/rarely	1.00
	sometimes	0.96 (0.77; 1.19)
	often	0.77 (0.59; 1.00)
Herbal medicine	never/rarely	1.00
	sometimes	0.79 (0.65; 0.96)
	often	0.91 (0.72; 1.14)
Chinese medicine	never/rarely	1.00
	sometimes	0.69 (0.43; 1.10)
	often	1.03 (0.54; 1.97)
Other alternative therapies	never/rarely	1.00
	sometimes	1.10 (0.83; 1.45)
	often	0.93 (0.61; 1.40)

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Highlights:

- Women using naturopaths or herbalists less likely to receive influenza vaccination
- Women using yoga or herbal medicines less likely to receive influenza and pneumococcal vaccination
- Women using vitamin supplements more likely to receive influenza and pneumococcal vaccination
- Interface between CM use and adult vaccination is highly nuanced, multi-factorial and complex
- Individual factors more likely to influence vaccination status than CM use