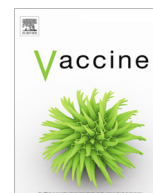




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Anti-vaccination and pro-CAM attitudes both reflect magical beliefs about health ☆

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ABSTRACT

We examined the relationship between complementary and alternative medicine (CAM) use and vaccination scepticism; and specifically whether a person's more general health-related worldview might explain this relationship. A cross-sectional online survey of adult Australians ($N = 2697$) included demographic, CAM, and vaccination measures, as well as the holistic and magical health belief scales (HHB, MHB). HHB emphasises links between mind and body health, and the impact of general 'wellness' on specific ailments or resistance to disease, whilst MHB specifically taps ontological confusions and cognitive errors about health. CAM and anti-vaccination were found to be linked primarily at the attitudinal level ($r = -0.437$). We did not find evidence that this was due to CAM practitioners influencing their clients. Applying a path-analytic approach, we found that individuals' health worldview (HHB and MHB) accounted for a significant proportion (43.1%) of the covariance between CAM and vaccination attitudes. MHB was by far the strongest predictor of both CAM and vaccination attitudes in regressions including demographic predictors. We conclude that vaccination scepticism reflects part of a broader health worldview that discounts scientific knowledge in favour of magical or superstitious thinking. Therefore, persuasive messages reflecting this worldview may be more effective than fact-based campaigns in influencing vaccine sceptics.

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1. Introduction

The uptake of vaccinations in developed countries is generally high, however, there is a potentially growing minority of individuals, often concentrated in specific locations, who are sceptical about the importance and safety of vaccines, and who refuse or delay vaccination, or who selectively vaccinate [4,31]. Childhood vaccination rates in some pockets of Australia have fallen below herd immunity levels and there have been a number of measles outbreaks around the country, including a measles outbreak in New South Wales in 2012 where the majority of infections were in unvaccinated individuals, with a significant proportion identifying as anti-vaccine [10]. Recently there has been resurgence of pertussis in the USA due mainly to parental vaccine refusal [3]. There are a range of psychological, social and cultural factors that can affect an individual's attitudes towards vaccination, and any attempt to influence public opinion must recognise these complexities [10,17,18].

The use of complementary and alternative medicines (CAM) has been identified as one possible factor in the development of vaccine scepticism and vaccine refusal. Historically many CAM service providers have adopted an anti-vaccination stance [11,32]. They have questioned the efficacy and effectiveness of vaccinations [15], and some have offered ineffective alternatives such as homeopathic 'vaccinations' [28]. The first critical review in the field was undertaken by Wardle et al. [35] to summarise the limited research available on the relationship between CAM and childhood vaccinations. The authors identified 23 studies which met their criteria, and concluded that the relationship was complex and multifactorial. Their conclusions were somewhat mixed, noting a heterogeneity of effect on childhood vaccination across CAM disciplines, users and regions. However, significant anti-vaccination attitudes were found among CAM providers, and there was a positive correlation between use of CAM products and lower vaccination uptake.

In summary, the available evidence suggests that there is an association between CAM and anti-vaccine attitudes. However, it is not currently clear whether CAM providers are directly influencing vaccine scepticism by communicating vaccination concerns with clients, or whether individuals with negative attitudes to vaccination are also attracted to CAM – due to, for example, other

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cultural, or psychological factors. To the extent that there is an attitudinal correspondence, it is an open question as to whether it is a direct relationship from social influence, or whether it may be explained by more general alternative health beliefs underlying both positions. On one hand, a direct influence may be observed due, for instance, chiropractors directly counselling their clients to avoid vaccination [30] or CAM material being promoted on anti-vaccination websites [15]. On the other hand, specific CAM and vaccination attitudes may reflect broader concerns or misunderstandings regarding science-based medicine [9]. This latter explanation is consistent with the idea that negative vaccination attitudes are due to a worldview that rejects orthodox approaches in favour of alternative wisdom that values naturalness, spirituality, and intuitive understandings of disease and health [6,34,2]. There is some evidence for the 'shared worldview' explanation of the link between CAM and vaccination scepticism. Browne et al. [6] found that vaccine sceptics tended not only to prefer CAM to conventional medicine, but also valued spirituality as a source of knowledge, tended to be more open to new ideas, and to prefer intuitive over analytic reasoning. Other general explanatory factors of vaccine scepticism include a belief in natural immunity, conspiracy ideation, an anti-authoritarian worldview, and general distrust of the medical community and expertise [5,16,19,24,27,36].

There is little empirical evidence to support a relationship between more general alternative beliefs about health, such as a belief in magical concepts regarding health, or holistic health beliefs, and an anti-vaccination stance. However, there are reasonable grounds to assume that these types of alternative health beliefs may be instrumental in pre-disposing individuals towards vaccination scepticism. Magical health beliefs (MHB) as defined by Lindeman and colleagues [22] have no empirical, logical or scientific basis, but are thought to have intuitive appeal due to suppositions regarding contagion, naturalness, as well as certain core knowledge or ontological confusions, cognitive errors and biases [22]. One example of a modern MHB is that consuming red drinks will raise your haemoglobin level. In contrast, holistic health beliefs (HHB) relate to the philosophy that in order to maintain health the whole person must be considered as the mind, body and spirit are integrated [12]. Unlike MHB, HHB are not necessarily demonstrably false, or reflect biases or errors of cognition. For example, the HHB that it is important to find a balance between work and relaxation in order to stay healthy is a reasonable supposition [25]. To our knowledge, neither MHB nor HHB have been previously employed to explain vaccination scepticism. Therefore, we believe that inclusion of these factors is important if we are to develop a greater understanding of the relationship between CAM use and attitudes and vaccination scepticism.

The present study aimed to investigate explanatory factors for the relationship between CAM use and vaccination scepticism. Specifically, the study aimed to (a) investigate whether CAM use directly promotes vaccination scepticism, or (b) whether the relationship between CAM use and vaccination scepticism is best understood to occur at the attitudinal level, including pro-CAM attitudes, and more general alternative health attitudes or beliefs – magical health beliefs and holistic health beliefs – as well as socio-demographic differences.

2. Methods

2.1. Design and sample

A cross-sectional survey was conducted in Australia with the first stage of sampling involving the invitation of participants from an institutional health survey panel to complete a standalone web-based survey. This online panel group is re-populated on an annual

basis via computer assisted telephone interviewing (CATI) from random number landline and mobile telephone contacts, which results in an online panel with sampling properties similar to the contributing CATI surveys. At the time of the survey launch, the panel comprised 3864 members. Each participant was sent a personalised e-mail that contained instructions on how to complete the survey, along with a link and password directing them to the Survey Sampling International (SSI) host software. A total of 1744 complete responses were obtained from the panel with 45% completion rate. This dataset was supplemented by utilising a commercial panel provider with instructions to recruit 1000 additional general-population Australian participants with an approximate balance across gender and major age categories. Members of the commercial panel were provided with cash and in-kind incentives to complete online surveys. A further 953 complete responses were obtained by this method.

2.2. Measures

2.2.1. Socio-demographics

Information was collected on age, gender, education level, total household income, and location (urban, regional town or city, and rural).

2.2.2. CAM use

The International Questionnaire to Measure Use of Complementary and Alternative Medicine (I-CAM-Q) [26], is a comprehensive measure of the use of CAM which asks about visiting CAM providers, using CAM products, and self-help CAM practices. The original instrument includes four sections: (1) visiting health care providers, (2) complementary treatments received from physicians, (3) use of herbal and dietary supplements, and (4) self-help practices. It was adapted for the purpose of quantitative assessment [7], and is organised into three sub-scales: provision of CAM services, use of CAM products, and self-help practices. The I-CAM-Q, modified for an online quantitative survey format [7], is included in [Appendix A](#).

2.2.3. Vaccination scepticism questions

Questions on vaccination were selected by the authors of this current study from a review of the scientific literature containing questions on attitudes, beliefs, and behaviours regarding vaccination of children. The format was designed to be applicable to those with or without children. If the respondent does not have a child, they are asked to imagine having the responsibility of making a decision to vaccinate a child in their care. The resultant questionnaire is a continuous measure of vaccination scepticism with a range from 1 to 4 (averaged over 9 questions), with greater scores reflecting a high degree of scepticism toward vaccination. Descriptive statistics using the sample from this current study ($N = 2754$) showed skewness = 1.14 ($SE = 0.047$) and kurtosis = 1.57 ($SE = 0.093$). The distribution is positively skewed but within acceptable levels for analysis. The majority (75%) of respondents scored 2 or less on this vaccination scale. Given the large sample size in this study, there was a large enough sample of individuals scoring at the 'vaccine sceptics' end of this scalar measurement for all analyses to be considered methodologically robust. The scale also has good internal consistency (Cronbach's $\alpha = 0.85$). See [Appendix A](#) for vaccination questions.

2.2.4. Magical health beliefs (MHB)

The General Magical Beliefs subscale of *The Magical Beliefs about Food and Health Scale* developed by Lindeman and her colleagues [22], (referred to here as MHB) was included in the survey. An example includes, "An imbalance between energy currents lies behind many illnesses". A factor analysis conducted by Lindeman

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