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CHILDHOOD VACCINE PERCEPTIONS AND PRACTICES AMONG NATUROPATHIC PHYSICIANS

A Thesis Presented

by

Katherine B. Whitman

to

The Faculty of the Graduate College

of

The University of Vermont

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For the Degree of Master of Science
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ABSTRACT

Purpose: Parental decisions to vaccinate their children may be impacted by the advice of health care providers practicing complementary and alternative medicine (CAM). Available literature suggests an association between vaccine delay or refusal and CAM use, decreased vaccination status of naturopathic patients, and increased vaccine hesitancy among naturopathic students. Some naturopathic physicians state that their approach towards discussions about childhood vaccinations may support families in choosing partial vaccination over complete refusal, ultimately contributing to an overall increase in vaccinations.

Methods: Using a modified Health Belief Model as a theoretical framework, this online survey of naturopathic physicians assessed childhood vaccine-related perceptions and practices. The survey instrument was developed through an iterative process using surveys from previous research, adapted by expert opinion and input from focus group participants.

Results: Surveys were completed between October and November 2014 by 145 naturopathic physicians (response rate 28.7%) licensed and practicing in Vermont or Oregon State. The vast majority of respondents (93%) discuss childhood vaccines with their patients, and discussions may include numerous topics focused on assessing individualized risk factors and providing information to parents. Most (70%) assist parents in creating a customized vaccine schedule for their children, which may delay the start of vaccination until a later age, give select vaccines only, and/or spread out the vaccine schedule (as compared to the CDC-ACIP recommended schedule). Vaccine-specific safety concerns are highly prevalent (67%), vary by vaccine, and include concerns regarding vaccine schedule, necessity, risk for potential adverse effects, and safety of vaccine ingredients. The majority of respondents use a variety of approaches intended to reduce adverse effects of vaccination (91%) and to make childhood vaccination safer and more effective (93%). Finally, most respondents are in agreement with each other on key vaccination beliefs underscoring both concerns and the importance of childhood vaccinations.

Conclusions: Results highlight an individualized approach towards childhood vaccinations by naturopathic physicians, often including a customized schedule and in-depth conversations with parents. The impact of this approach on parental vaccine choice and public health remains unknown. Results may promote further understanding of the various therapeutic recommendations and safety concerns regarding childhood vaccinations held by naturopathic physicians and can potentially foster more effective communication among all healthcare providers on this important public health issue.

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CHAPTER 1: INTRODUCTION

Childhood vaccination programs are a cost-effective strategy to prevent morbidity and mortality worldwide. Between 2000-2010, the use of measles, polio, and diphtheria-tetanus-pertussis vaccines prevented an estimated 2.5 million deaths worldwide in children under five years (Centers for Disease Control and Prevention [CDC], 2011a). In the United States (US), each birth cohort that receives the CDC recommended infant vaccination series contributes to the estimated prevention of 42,000 premature deaths, 20 million fewer illnesses, and $69 billion in savings to society (CDC, 2011b). As prevalence of vaccine-preventable diseases declines, perceptions of disease severity and susceptibility may also decline, leading some to perceive vaccine-related risks as greater than their well-documented benefit (Salmon et al., 2008).

Vaccination rates remain high in the US (CDC, 2013), however parental acceptance of childhood vaccination appears to be decreasing (Wightman, Opel, Marcuse, & Taylor, 2011). A recent retrospective multi-site cohort study reported 13% of under-vaccinated children were due to parental choice (Glanz, Wagner, et al., 2013). A nationally representative survey of parents of young children revealed that 13% use an alternative childhood vaccination schedule (Dempsey et al., 2011). Additionally, non-medical exemptions to vaccinations may be geographically clustered and associated with outbreaks of vaccine-preventable diseases, such as measles and pertussis (Atwell et al., 2013, Blank, Caplan, & Constable, 2013; Glanz, Narwaney, et al., 2013; Omer et al., 2008). According to the CDC, of the 288 measles cases reported in the US between January 1, 2014 and May 23, 2014, most (n = 200, 69%) were in those who were unvaccinated, of which 85% declined vaccination due to personal, philosophical, or

religious objections (Gastanaduy et al., 2014). These reported cases, which include an outbreak of 138 cases within an unvaccinated Amish community in Ohio, represent the highest number of reported measles cases between January and May since 1994, and highlight the risks of geographically clustered pockets of unvaccinated individuals (Gastanaduy et al., 2014). Later in 2014, an outbreak of measles linked to Disney theme parks in California resulted in at least 125 confirmed cases across eight states (Zipprich et al., 2015). Of the 110 cases in California, 13 (12%) had at least one dose of measles vaccine, 12 (11%) were too young to be vaccinated, 37 (34%) were unvaccinated and vaccine-eligible (based on age), and 47 (43%) had an unknown vaccination status. Of those were eligible but not vaccinated, 28 (76%) were not vaccinated intentionally due to personal beliefs, and one additional case was using an alternative vaccination schedule (Zipprich et al., 2015).

Role of Health Care Providers in Childhood Vaccination Programs

Several studies have examined parental reasons for vaccine hesitancy, their knowledge, attitudes and beliefs about vaccination, and communications with a health care provider regarding vaccinations (Chatterjee, 2013; Gaudino & Robison, 2012; Gust, Darling, Kennedy, & Schwartz, 2008; Jones et al., 2012; Kempe et al., 2011; Kennedy, Basket, & Sheedy, 2011; McCauley, Kennedy, Basket, & Sheedy, 2012; Richards et al., 2013; Salmon et al., 2005). Health care providers have an important role in educating and advising their patients and families about childhood vaccinations, and studies have noted a strong association between parental and provider vaccine-related attitudes and beliefs (Mergler et al., 2013). The knowledge, attitudes and practices of primary health care providers may affect parental decisions to vaccinate (Salmon et al., 2008).

According to Gust et al. (2008), a primary reason that parents changed their decision about either delaying or refusing an immunization was information or assurances from a health care provider.

A variety of health care providers interact with parents in the care of children and thus have an opportunity to discuss vaccinations. Some are trained in mainstream conventional medicine (e.g., pediatricians, family physicians, general practitioners, nurse practitioners, and nurses) whereas others are trained in complementary and alternative medicine (CAM), including chiropractors, homeopathic practitioners, herbalists, and naturopathic physicians.

Naturopathic Physicians as Pediatric Primary Care Providers

There is an increase in CAM use nationwide, and pediatric use of naturopathy and chiropractic care may be higher than other CAM therapies (Downey, Tyree, Huebner, & Lafferty, 2010). The 2007 National Health Interview Survey reports approximately 237,000 children received care from a naturopathic physician in the previous year, and approximately 10% of all visits to naturopathic physicians are for children and adolescents, as compared to approximately 1-4% for other CAM providers (Busse, Walji, & Wilson, 2011). In a cross-sectional survey of families whose children use naturopathic services, the majority of families also have a family physician (92.9%) but only 20% consider their physician to be the primary care provider (PCP) for the child (Leung & Verhoef, 2008). Within that survey, approximately 35% consider a naturopathic physician as the child's' main healthcare provider, while another 35% report both an allopathic physician and naturopathic physician as equally important in the health care of their child (Leung & Verhoef, 2008). Of a small group of practicing naturopathic

physicians surveyed in Massachusetts, 33% reported training in pediatrics while 100% reported seeing pediatric patients; pediatric visits comprised about 19% of patient visits/week (Lee & Kemper, 2000).

Naturopathic physicians are trained as PCPs in four-year, doctoral programs accredited by the Council on Naturopathic Medical Education (CNME), of which there are seven in North America (Academic Consortium for Complementary and Alternative Health Care, 2013; Fleming & Gutknecht, 2010). There were approximately 1900 practicing naturopathic physicians in the US in 1997, but this estimate was expected to increase dramatically due to increasing graduating class sizes (Fleming & Gutknecht, 2010; Lee & Kemper, 2000). A recent estimate of combined enrollment in the seven naturopathic medical schools accredited by the CNME was approximately 2,250 students (Academic Consortium for Complementary and Alternative Health Care, 2013). An informal survey in 2012 estimated 3,400 licensed or registered naturopathic physicians in the US and 1,900 in Canada (Academic Consortium for Complementary and Alternative Health Care, 2013).

Formal coursework in naturopathic education includes basic and diagnostic sciences, including immunology. Licensing procedures and laws regulating the scope of practice for naturopathic physicians vary by state. Currently, licensing laws exist in sixteen states, two US territories, and several provinces in Canada, Australia and New Zealand (Academic Consortium for Complementary and Alternative Health Care, 2013; Fleming & Gutknecht, 2010). In states where naturopathic providers are not licensed, there exists no regulatory agency to ensure educational background or to regulate their practice. In some states, reimbursement by public and private insurers is available for

medically necessary services provided by naturopathic physician. In the state of Vermont, for example, this reimbursement is required by law and includes Medicaid coverage (8 V.S.A. §4088d, 2011). In Oregon, naturopathic physicians are included in some coordinated care organizations and are recognized as PCPs within the Patient-Centered Primary Care Home Program (Academic Consortium for Complementary and Alternative Health Care, 2013; W. Shaffer, personal communication, July 11, 2014). However, other states do not regulate insurance coverage for services, and a recent survey revealed only 19% of patient visits provided by naturopathic physicians in North America were covered by insurance (Academic Consortium for Complementary and Alternative Health Care, 2013).

It is within the scope of practice for naturopathic physicians to counsel on childhood vaccinations. In some states, however, naturopathic physicians are not licensed to administer vaccines and thus some children who only receive care from naturopathic physicians may not have adequate access to vaccinations (Weber, Taylor, McCarty, & Johnson-Grass, 2007). In a survey of naturopathic physician visits in Washington state, vaccinations were provided at 18.6% of health supervision visits of children under two years old and 27.3% of health supervision visits of children between two and five years (Weber et al., 2007). For comparison, based on the current vaccine schedule recommended by the CDC, it is likely that vaccinations are provided at more than 50% of health supervision visits for children under two years old seen by pediatricians (Weber et al., 2007). Despite a relatively lower percentage of vaccine administration at pediatric visits with a naturopathic physicians, conversations about vaccinations often occur during these visits, and some parents feel these discussions are

more balanced and less biased than conversations they may have with their allopathic provider (Busse et al., 2011).

Purpose

The aim of this study is to further understand the childhood vaccine-related perceptions and practices of naturopathic physicians. Together with a variety of healthcare providers, naturopathic physicians provide primary care for families, and interprofessional collaboration among healthcare providers contributes to improved care. A greater understanding of the naturopathic approach towards childhood vaccinations may contribute to interprofessional collaboration in the provision of primary care services, including childhood vaccinations.

Theoretical Framework

The health belief model (HBM) was developed in the middle of the twentieth century in an attempt to understand hesitation to polio vaccinations. Several major concepts are proposed to affect the likelihood of a person taking a recommended health preventive action. The HBM proposes that the likelihood of receiving a vaccination, in this case, increases when the individual perceives: (1) a high level of susceptibility to the disease, (2) the disease is potentially severe, (3) the vaccination is perceived as beneficial and efficacious, (4) the barriers (including risks and safety concerns) are minimal, and (5) cues to act (from prior education, media, social norms) are strong (Chen et al., 2011; Smith et al., 2011).

Some studies of parental beliefs suggest that the decision to vaccinate is only partially explained by the HBM (Bond, Nolan, Pattison, & Carlin, 1998; Chen et al., 2011; Larson, Jarrett, Eckersberger, Smith, & Paterson, 2014) whereas others find that

the domains of the HBM are predictive of vaccination coverage after adjusting for potentially confounding factors (Smith et al., 2011). Several studies have examined the relationship between health care providers' vaccine-related knowledge, beliefs, attitudes and their intention to provide vaccinations (Bean & Catania, 2013; Herzog et al., 2013; Salmon et al., 2008). While not all explicitly used the HBM as a framework, perceptions of disease severity, susceptibility, vaccine efficacy and safety consistently arose as themes contributing to the decision to recommend vaccination. Additionally, a qualitative study of six traditional and nine CAM providers (chiropractors and midwives) in Oregon proposed additional themes to the HBM in understanding vaccine hesitancy (Bean & Catania, 2013). These include beliefs about immunology, professional reference-group norms, perceptions of industry and government, and personal salience (Bean & Catania, 2013).

The concept of vaccine hesitancy has been increasingly explored in the scientific literature in recent years. Larson et al. (2014) published a systematic review of the literature between 2007 and 2012, analyzed 1164 articles about vaccine hesitancy from all regions of the world, and report that research on this topic has doubled within the European and American regions during this time frame. Authors discuss factors contributing to vaccine hesitancy, however note the absence of an "established metric to assess the presence or impact of vaccine hesitancy" as well as a dearth of literature that explore the interrelationship among contributing factors (Larson et al., 2014, p. 6). A model of the determinants of vaccine hesitancy, developed by the World Health Organization Strategic Advisory Group of Experts Working Group (SAGE WG) on vaccine hesitancy, include barriers and promoters of childhood vaccination within three

broad categories: (1) contextual influences, (2) vaccine and vaccination-specific issues, and (3) individual/social group influences (Larson et al., 2014).

The HBM with additional themes as presented by Bean and Catania (2013), henceforth referred to as “modified-HBM”, together with an evolving understanding of the concept of vaccine hesitancy, offer a broader framework to understand a healthcare providers' decision to recommend childhood vaccinations.

Significance to Advanced Practice Nursing

Given the context of increasing CAM use and the expansion of naturopathic physicians as PCPs, Advanced Practice Registered Nurses (APRNs) may work on integrative teams with naturopathic physicians. APRNs working as PCPs will encounter patients and families who are using naturopathy, and may have an opportunity to work together with naturopathic physicians in providing healthcare to children in the community. A greater understanding of the approach towards childhood vaccination recommendations and related attitudes held by naturopathic physicians may foster effective collaboration on this important public health issue. APRNs and naturopathic physicians may have different approaches to assist those families who are hesitant about vaccines, and may discover ways to work together towards the combined goal of protecting an individual from illness and protecting a community from vaccine-preventable diseases.

Promoting knowledge of other healthcare systems and practitioners is recently highlighted as an essential step towards effective interprofessional collaboration. In early 2011 the Interprofessional Education Collaborative, representing six disciplines of medicine, nursing, pharmacy, osteopathy, dentistry and public health, published a

document focused on team-based care and outlining the core competencies for interprofessional collaborative practice (Interprofessional Education Collaborative Expert Panel, 2011). Just a few months prior in late 2010, the Academic Consortium for Complementary and Alternative Health Care, representing five disciplines of chiropractic, naturopathic medicine, massage therapy, acupuncture/Oriental medicine, and direct-entry midwifery, published a document outlining competencies for optimal practices in integrated environments (Goldblatt, Wiles, Schwartz, & Weeks, 2013). The two documents, while created independently of one another, contain notable overlap in content of proposed competencies (Goldblatt et al., 2013). Efforts to understand the practices and perspectives of various healthcare disciplines, such as this proposed study, fit within recommended competencies for interprofessional education and collaboration, and can contribute to quality, team-based, integrative healthcare.

CHAPTER 2: REVIEW OF LITERATURE

Association Between Vaccine Hesitancy and CAM

Several studies have highlighted an association between CAM use and parental refusal or delay of childhood vaccinations (Benin, Wisler-Scher, D. J., Colson, Shapiro, & Holmboe, 2006; Downey et al., 2010; Gaudino & Robison, 2012; Jessop et al., 2010; Salmon et al., 2005; Smith et al., 2011; Zuzak, Zuzak-Siegrist, Rist, Staubli, & Simoes-Wust, 2008). A variety of quantitative research designs have been used to examine those who choose not to receive vaccination as recommended by the Advisory Committee on Immunization Practices of the CDC (henceforth referred to as CDC-ACIP recommended schedule), and report statistically significant associations with CAM use, including cross-sectional (Downey et al., 2010; Smith et al., 2011; Zuzak et al., 2008), prospective cohort (Jessop et al., 2010), retrospective cohort (Gaudino & Robison, 2012), and case-control studies (Salmon et al., 2005).

Results from a very large (n = 11,206), cross-sectional telephone survey of the US revealed that those who have refused a vaccine (or refused and delayed a vaccine) were significantly more likely than those who had not refused (or never refused nor delayed) a vaccine to report that their decision to vaccinate was influenced by a CAM provider (3.8% and 5.4% vs. 0.7% and 1.7%, respectively, $p < 0.05$) (Smith et al., 2011). A large cross-sectional study (n = 11,144) in Washington State observed, using logistic regression models, that children age one to two years that had ever seen a naturopathic physician were significantly less likely (OR 0.22-0.30, 95% CI 0.16-0.42) to receive vaccinations for Measles/Mumps/Rubella (MMR), Varicella, Diphtheria/Tetanus/ acellular Pertussis (DTaP), and Haemophilus influenzae type b (Hib); even more so if

they received exclusive care from a CAM provider (Downey et al., 2010). One notable strength of this study is the use of insurance claims, which limits recall bias often present in survey designs. This same study, upon review of a large number (n = 213,884) of children age one to seventeen years in Washington State, highlighted an increased likelihood (OR 1.44, 95% CI 1.12-1.86) of a history of a vaccine-preventable disease (VPD), most often chickenpox, in those who had ever consulted a naturopathic physician (Downey et al., 2010).

A descriptive qualitative study using grounded theory methods of thirty-three postpartum mothers and the decision making process to vaccinate their infants highlighted a central, recurrent theme of trust in health care providers (Benin et al., 2006). This study named trust in a naturopathic physician or other CAM provider as an inhibitor to choosing to vaccinate (Benin et al., 2006). Similarly, a retrospective cohort study of parents of elementary school children in Oregon (n = 2900) using multi-staged, population-proportionate, stratified probability sampling reported a greater trust in CAM providers among those who chose exemption from vaccinations (Gaudino & Robison, 2012). Additionally, a case-control study (n = 815 exempt children considered "cases", and n = 1630 fully vaccinated children considered "controls") across four states (Colorado, Massachusetts, Missouri and Washington) examined the factors that are associated with vaccine-refusal and reported that those who refused at least one vaccine were more likely to have a CAM professional as a PCP for their child, to report confidence in CAM providers, and to report them as a credible source of information about vaccinations (Salmon et al., 2005). If a CAM provider is the most trusted healthcare provider for a parent who is hesitant about vaccinating their child, then any

concerns about safety or relative benefit of vaccines on the part of that trusted provider have the potential to impact parental confidence in vaccines.

With the exception of two studies using insurance claims (Downey et al., 2010) and hospital records (Jessop et al., 2010), data sources of the aforementioned studies rely upon self-reporting which presents the possibility of recall bias. Response rates varied, ranging from 55-63%, which contributes to the possibility of nonresponse bias. The generalizability of the findings are limited, especially for those using non-probability sampling techniques (Jessop et al., 2010; Zuzak et al., 2008), or those conducted in a single state (Downey et al., 2010; Gaudino & Robison, 2012) or in a country outside of the US (Jessop et al., 2010; Zuzak et al., 2008). While the aforementioned studies have their unique limitations, the aggregate results across this range of research designs suggest an important association between CAM use and full or partial exemption from childhood vaccinations. Interpreting these results for naturopathic patients, as a subset of CAM users, is challenging because several studies combine a variety of CAM modalities into one group (Jessop et al., 2010; Salmon et al., 2005; Zuzak et al., 2008).

Naturopathic Patients and Vaccination Status

There are very few published articles reporting on the vaccination status of those who present for care at a naturopathic clinic (Busse et al., 2011; Wilson, Busse, et al., 2005). Children seen at a single naturopathic clinic in Ontario, Canada were found to have lower vaccination rates than Canadian population averages and greater use of CAM products was significantly ($r = 0.16$, $p < 0.01$) associated with partial or unvaccinated status (Wilson, Busse, et al., 2005). This study used a consecutive sample of charts at a single naturopathic clinic, which may reduce selection bias that is potentially present in

other surveys of CAM use. Additional bias may be present due to the fact that only 65.6% of charts reviewed included information on vaccine status, which was originally obtained by parental report and not confirmed with documentation of vaccine administration (Wilson, Busse, et al., 2005).

A cross-sectional survey using convenience sampling at nine naturopathic offices in Ontario included 129 patients with at least one child less than seventeen years of age (Busse et al., 2011). Very high rates of partial or unvaccinated status were reported among parents who seek naturopathic care: 50.5% of respondents reported full vaccination of all children, 26.3% stated they had at least one child who was partially vaccinated, and 23.2% stated they had at least one child who was completely unvaccinated (Busse et al., 2011). Notably, of those with a partially or fully unvaccinated child, most (69.9%) reported that they would be open to reconsidering their decision and almost half (44.2%) felt insufficiently informed to make a decision (Busse et al., 2011).

While the sample size of this study conducted by Busse et al. (2011) was moderate, the response rate was relatively high at 74%. Rigorous statistical methods were applied to the results, and after multivariate regression analysis and application of Hosmer-Lemeshow test for goodness of fit with 8 degrees of freedom, two of the four independent variables a priori hypothesized to be associated with an increased likelihood of partial or unvaccinated status of at least one child remained statistically significant ($p < 0.05$): (1) reporting feeling pressure to vaccinate their children, and (2) endorsing a naturopathic physician as the most trusted resource for information on vaccination (Busse et al., 2011). These findings are consistent with previously mentioned studies examining CAM use in general (as opposed to naturopathic use specifically) and vaccination status.

Using descriptive survey data, Busse et al. (2011) offer insight into the nature and consequences of parents' discussions with a naturopathic physicians about vaccinations. Nearly half of patients discussed vaccination with their naturopathic physician, and most (62.2%) reported it had no impact on their decision, however almost one in four felt less comfortable with vaccination after the conversation. Most felt comfortable continuing care with their naturopathic physician and felt they received a neutral view on vaccination (not strongly for nor against), whereas allopathic physicians were seen as providing "biased" only pro-vaccine information and led 28.3% of respondents to consult a naturopathic physician. Approximately one in three felt their naturopathic physician was the most trustworthy resource for vaccine information (Busse et al., 2011). Qualitative data obtained from the pilot-tested questionnaire were grouped into themes (vaccine safety/efficacy, a need for more information of vaccination, and effect of vaccine-refusal on relationships with healthcare providers), however there was no reporting on the relative trustworthiness of the data. Similar to previously mentioned studies, this cross-sectional survey (Busse et al., 2011) is susceptible to potential self-reporting bias, selection bias, and limited generalizability especially given the non-probability sampling technique.

Vaccine-Related Attitudes and Practices of Naturopathic Physicians

Little has been published about vaccine-related attitudes and practices of naturopathic physicians. A sole descriptive study of practice characteristics with an extremely small sample of naturopathic physicians in Massachusetts (n = 15) is frequently cited in the published literature (Lee & Kemper, 2000). Only 20% (n = 3) of respondents reported they actively recommended vaccinations, although the survey

question was not designed to determine which specific vaccines were indeed recommended for specific ages or if full vaccination following the CDC-ACIP schedule was recommended. One participant (7% of responses) openly opposed vaccinations, and the remainder (73%) either omitted the question or did not make any recommendations for or against vaccination (Lee & Kemper, 2000). Great caution must be taken when interpreting these results, as there is significant potential for non-response bias and very limited generalizability of this study.

Students at a naturopathic school in Canada (n = 525) were surveyed about their attitudes towards childhood vaccinations (Wilson, Mills, Boon, Tomlinson, & Ritvo, 2004). Convenience sampling of students in all four years of the academic program was used for the survey, which had a response rate of 59.4%. Of all respondents, 12.8% were willing to advise full vaccination, 74.4% would advise only partial vaccination and 12.8% would not advise vaccination at all (Wilson et al., 2004). Willingness to advise full vaccination decreased in students in later years of naturopathic training, and was associated with a high or moderate belief that vaccines are beneficial and a high or moderate level of trust in public health information. Lack of willingness to advise full vaccination was associated with a high or moderate belief that vaccines are risky, reliance on only CAM providers for vaccine-related information, and personal knowledge with someone with adverse vaccine reaction (Wilson et al., 2004). The "modified-HBM" offers a framework to interpret these findings, as themes arose related to perceived (lack of) benefits, perceived barriers/risks, and lack of trust. Concerns about harm and concerns about lack of benefit were the most common reasons for not recommending full vaccination, and trust in public health and conventional medicine was generally low

among naturopathic students and decreased in later years of their educational program (Wilson et al., 2004). A significant limitation of this survey is due to the cross-sectional nature of the study. It cannot be determined if student attitudes change over time, either as a result of formal naturopathic education or exposure to other students with concerns about vaccines, because year-specific cohorts were not surveyed longitudinally. There is a potential for both nonresponse bias as well as recall bias, and also item-specific nonresponse bias based on the observation that 13% of respondents omitted the primary question related to willingness to vaccinate and these were significantly different ($p < 0.0001$) from respondents in their increased likelihood of having a child under age three (Wilson et al., 2004).

With regard to perceptions of disease severity and support of vaccinations, it has been hypothesized that some individuals are not aware of the potential severity of vaccine-preventable diseases and are therefore less likely to support vaccinations now that many of the diseases (such as polio) are less prevalent in the developed world (Wilson, Mills, Norman, & Tomlinson, 2005). Wilson, Mills, et al. (2005) tested this hypothesis in a randomized trial among naturopathic students in their final year of training and found no statistically significant change in attitudes in either group (intervention group receiving a presentation from polio survivor or control group). However, a post hoc analysis revealed some students within the intervention group were less likely to support vaccination because they felt they had been part of a manipulative exercise that was not well balanced in presentation (Wilson, Mills, et al., 2005). This surprising observation may appear to contradict the HBM, because it was assumed that increased perception of disease severity after hearing from a polio survivor would lead to

increased support of vaccinations. However, researchers supposed that a process of cognitive dissonance resolution occurred in this particular example (Busse, Wilson, & Campbell, 2008).

A qualitative study using focus groups of naturopathic and chiropractic students in all four years of training was conducted in an effort to further understand the development of vaccine-related attitudes (Busse et al., 2008). While data have not been published or fully analyzed, a report of preliminary themes reveals overlap with the HBM, and is consistent with a prior systematic review of qualitative studies exploring parental beliefs and attitudes towards childhood vaccinations (Mills, Jadad, Ross, & Wilson, 2005). Busse et al (2008) report the following concerns among naturopathic and chiropractic students:

1. Belief that corporations that make vaccines cannot be fully trusted to provide impartial information on risks and benefits.
2. Concern that the immune systems of the very young can be overwhelmed by multiple vaccinations.
3. Concerns over the long-term effects of vaccination.
4. Concerns that vaccination may not offer similar protection to 'naturally acquired' immunity.
5. Concerns that additives such as preservatives used in vaccines (e.g., thimerosal) may be associated with harm.
6. Concern that mandatory vaccination is a violation of freedom of choice, and that parents may often be pressured into vaccinating their children without getting "all the facts".

7. Belief that there may be more holistic approaches to vaccination (e.g., some homeopathic applications) that could convey similar or better protection with little or no risk (Busse et al., 2008, p. 6241).

These themes cannot be appropriately evaluated as trustworthy given the absence of published information on methods, participants and data analysis. However, themes presented by Busse et al. (2008) appear to overlap with themes of the "modified-HBM". Themes #3 and #5 related to perceived barriers and risks, theme #4 relates to a perceived lack of benefits, theme #1 relates to lack of trust, and theme #7 relates to professional group norms.

More recently, a cross-sectional survey of 560 naturopathic medicine students was conducted in an attempt to understand their attitudes, education and sources of knowledge about childhood vaccinations, with a 19.4% response rate (Ali, Calabrese, Lee, Salmon, & Zwickey, 2014). While the complete study has yet to be published, results from a published abstract reveal that a majority of students (82%) support the general concept of vaccinations, and that some would regularly (26%) or occasionally (45%) recommend vaccines. Compared to the standard CDC-ACIP recommended schedule, most (96%) would recommend an alternative vaccination schedule, and many were concerned about vaccines given too early (73%), too many simultaneous vaccines (70%) and too many vaccines overall (59%). Additionally, there were concerns about the preservatives and adjuvants in vaccines (72%) and some (40%) stated a healthy diet and lifestyle as more important in preventing infectious diseases than vaccines (Ali et al., 2014).

A qualitative study of thirty-six CAM providers offers some insight into the vaccine beliefs and practices of naturopathic physicians using the HBM as a theoretical framework (Bean, 2014). The most significant themes impacting vaccine recommendations included perceptions of vaccine efficacy, benefits and risks, as well as disease susceptibility and severity. Interestingly, the author highlights the prevalence of naturopathic beliefs and advice throughout other CAM disciplines as well. "Practitioners of all other CAM modalities in this study mentioned studying naturopathic continuing education (CE) courses, or using alternate vaccine schedules promoted and published by naturopaths" (Bean, 2014, p.53).

Research Limitations

Because CAM providers are often placed into one broad category, existing research findings make it difficult to determine the beliefs, practices, and relative level of vaccine hesitancy specifically among naturopathic physicians and their patients. Additionally, while only two of the seven approved naturopathic medical programs in North America are located in Canada, most of the research specific to naturopathic practice and vaccinations is set in a single Canadian province (Ontario). The generalizability of findings is limited, as previously mentioned, especially in the absence of a clear understanding of how the beliefs and practice patterns of naturopathic physicians may differ from naturopathic students, and the geographic differences in patterns and beliefs that may exist. Also, the licensing process and scope of practice of naturopathic physicians varies significantly within the United States, which further complicates the application of study findings from one state to another. Small sample

sizes and less than ideal response rates provide additional limitations to research in this field.

Many of the existing studies of naturopathic practice are cross-sectional in design, which by virtue of the design itself does not allow for a temporal relationship between associated factors to be determined. Just because a correlation is noted, does not mean causality can be implied. One potentially confounding variable is that parents who seek naturopathic care may have a predisposition to vaccine-related concerns regardless of specific advice or guidance provided by their naturopathic physician. It is suggested that parents may choose health care providers who have a similar set of vaccine-related beliefs to their own (Mergler et al., 2013). Thus, a correlation between CAM use and vaccine hesitancy and/or partial or unvaccinated status may not necessarily be caused or even reinforced by the CAM providers themselves. Also, those who are drawn towards naturopathy as a career may be more likely to question vaccines, and their vaccine-related beliefs may not necessarily be a result of their formal education. Similarly, CAM use itself might be sought by patients due to a distrust of conventional medicine and safety concerns, which overlap with reported reasons for vaccine hesitancy. As suggested by a small pilot study, providers who see vaccine hesitant parents and administer vaccinations on an alternative schedule may be responding directly to parent requests and concerns (Gaudino & Robison, 2012). Additionally, state associations of naturopathic physicians have suggested in policy papers that their services may in fact increase vaccination rates by providing partial vaccination to a population who may otherwise completely refuse all vaccinations (Oregon Association of Naturopathic Physicians [OANP], 2012).

Finally, there is not consensus among naturopathic physicians regarding the approach to childhood vaccinations. Some websites of naturopathic physicians appear to be supportive of vaccines, whereas others may suggest that avoiding vaccines is the safest choice. The American Association of Naturopathic Physicians position paper on vaccinations, originally published in 1991 and most recently amended in 2011, does not specifically advocate for the administration of routine childhood vaccinations. Rather, it highlights the importance of the proper use of vaccines, obtaining signed informed consent from parents, respecting parental choice, and calls for increased research and safer, more effective vaccines to be developed. The paper also states that "it is documented that some of the current and past immunizing agents have been associated with significant morbidity and are of variable efficacy and varying necessity" (American Association of Naturopathic Physicians [AANP], 2011).

One state policy paper about naturopathic practices in Oregon references a training curriculum on vaccinations, developed by a team of naturopathic experts, that "provides in-depth evidence-based continuing education" (OANP, 2012), however details on this curriculum were not available. It may be that naturopathic physicians are advising patients and families to receive the CDC-ACIP recommended schedule, advising patients to receive some vaccinations but not others, advising an alternative schedule, recommending immune boosting supplements, and/or offering parents an individually-focused risk/benefit analysis of the CDC-ACIP recommended schedule, however details about the specific vaccine-related practices of naturopathic physicians are not readily available.

CHAPTER 3: METHODOLOGY

This study focused on the childhood vaccine-related perceptions and practices of naturopathic physicians. The study design will be presented in this chapter, along with participant selection, inclusion criteria, and protection of human subjects. Finally, a description of the survey instrument, development of the instrument, administration of the survey, and data analysis will be reviewed.

Research Design

This was a cross-sectional study using self-reported web-based surveys. The survey was administered to participants electronically using LimeSurvey software (GNU General Public License Version 2, 2007).

Setting

The setting for this study was two distinct states, Vermont and Oregon, in which naturopathic physicians who practice primary care are formally recognized as PCPs, and both public and private insurance plans cover medically necessary primary care services provided by a naturopathic physician. Statutes governing naturopathic practice in these two states allow naturopathic physicians to prescribe medications within their scope of practice, administer all vaccinations, and treat patients of all ages. The rationale for this setting was based upon an assumption that naturopathic physicians practicing in a state with insurance reimbursement, with prescriptive authority, and authorized to act as PCPs for patients of all ages will result in a greater number of primary care visits for pediatric patients during which vaccinations are administered or counseling related to vaccinations is provided.

Study Participants

The target participant population was naturopathic physicians in either Vermont or Oregon. Inclusion criteria were: (1) holding an active naturopathic license in Vermont or Oregon and (2) currently practicing naturopathic medicine in an office physically located in either Vermont or Oregon. As required by state laws in Vermont and Oregon, licensed naturopathic physicians hold a doctoral degree in naturopathic medicine from a CNME accredited (or equivalent) program.

Vermont participants were invited based on a list of actively licensed naturopathic physicians obtained from the Vermont Secretary of State's Office of Professional Regulation (OPR) in May 2014, then subsequently updated by the OPR in September 2014. Email addresses were obtained from the Vermont Association of Naturopathic Physicians (VANP) online member directory, or from health clinic websites with offices located in Vermont. Of the 311 individuals licensed in Vermont, only 54 had practices located in Vermont. Naturopathic physicians who were licensed in Vermont, with a contact mailing address in Vermont, and a known email address were invited to participate in the survey (n = 43).

Similarly, a list of actively licensed naturopathic physicians in Oregon was obtained in July 2014 from the Oregon Board of Naturopathic Medicine (OBNM). Of the 911 individuals who were licensed in Oregon, 748 had practices located in Oregon. Invitations to participate in the survey were sent to those naturopathic physicians who were actively licensed in Oregon, with a contact mailing address in Oregon, with a known email address obtained from the OBNM (n = 462).

This convenience sampling strategy was used due to feasibility and to maximize potential respondents. Additionally, naturopathic physicians who did not initially receive an invitation were able to contact the researcher in order to participate, provided they were actively licensed and practicing naturopathic medicine in either Oregon or Vermont.

Protection of Human Subjects

Approval from the Institutional Review Board at the University of Vermont was sought prior to data collection, and there were no incentives offered to participants. Voluntary completion of the survey served as passive informed consent, and each subject had a right to decline participation without penalty. Participation was anonymous, and any token identifiers used for invitation and follow-up purposes were not linked in any way to responses. De-identified data were entered directly into LimeSurvey, then analyzed and shared with the thesis committee and statistical support persons at the University of Vermont.

Survey Instrument

Survey items were developed through an iterative process. A semi-structured interview guide used in previous qualitative research (Bean & Catania, 2013), and a survey used in previous quantitative research of healthcare providers (Salmon et al., 2008; Mergler et al., 2013) were adapted to create draft survey items. Then, a focus group consisting of four naturopathic physicians licensed and practicing in Vermont reviewed survey items and provided extensive feedback. Discussion ensued regarding the naturopathic approach to childhood vaccinations and rationale for their perception that a majority of the initial survey items were "unanswerable" because many of their responses would depend on the specific patient/family. The survey was then significantly

revised based on focus group feedback, and additional items reflecting a naturopathic approach were created. Additionally, the revised survey was reviewed for face validity by the author of a recent research paper examining vaccine perceptions among CAM providers (Bean, 2014). The survey instrument was not evaluated for reliability.

Survey items included three categories: naturopathic physician characteristics, childhood vaccine practices, and childhood vaccine perceptions. Demographic characteristics included gender, age, number of years practicing as a naturopathic physician, year of completion of naturopathic education, and if childhood vaccine-related views have changed since graduation. Survey items related to childhood vaccine practices included provision of primary care services to pediatric patients, communication with PCPs, frequency and content of vaccine discussions with parents, resources perceived as trustworthy for vaccine-related information, use of the Vaccines Adverse Event Reporting System (VAERS), and provision of vaccinations. Items intended to assess childhood vaccine perceptions included vaccine safety for each childhood vaccine, practices that may reduce adverse effects or improve safety and efficacy of childhood vaccines, holistic alternatives to vaccines, and level of agreement with nineteen key vaccination beliefs using a five-point Likert scale. The full survey instrument is attached as Appendix B.

Procedures

Electronic survey procedures were informed by the Tailored Design Method (Dillman, Smyth, & Christian, 2009) to optimize response rates. An email recruitment letter was sent to eligible participants with a known email address, and included the purpose of the study, estimated time required to participate, and a hyperlink to the survey

with an embedded token identification generated by LimeSurvey to ensure only one completed response per individual. The recruitment letter is attached as Appendix A. Ten days following the initial email invitation, a reminder email was sent to all participants, either thanking them for their response or encouraging them to respond if not done already. Then, three weeks after the initial email invitation, a final email request for participation was sent to all non-respondents, with a reminder that the survey would be closing in one week. The survey was open for a total of four weeks. Data collection occurred between October 2014 and November 2014.

Data Analysis

Data were entered directly into LimeSurvey, and then subsequently analyzed using LimeSurvey statistical software. As needed the data were exported and analyzed using Statistical Package for the Social Sciences (SPSS), with the assistance of a statistician at the University of Vermont. Descriptive statistics were used to report frequencies, percentages, means, medians, and ranges of survey responses. Responses were not analyzed to determine differences between naturopathic physicians (such as geographic location, years in practice, or level of vaccine hesitancy) as this study was not designed to do so and there was no a priori hypothesis to be tested in this study. Responses to vaccination belief questions were dichotomized for analysis into two groups: "strongly agree, and agree" vs. "strongly disagree, disagree, and neither agree nor disagree".

Qualitative data were received for various questions in which participants had the option to clarify responses including: (1) how vaccine views have changed since graduation, (2) alternative vaccine schedules discussed with parents, (3) other topics

included in the discussion about vaccines with parents, (4) additional sources of trustworthy vaccine information, (5) VAERS reporting specifics, (6) reasons given for not administering vaccines, (7) safety concerns for specific vaccines, (8) approaches to improve safety and efficacy of vaccines, (9) approaches to reduce adverse effects of vaccines, (10) recommended supplements or homeopathic treatments, and (11) additional comments upon completion of the survey. Qualitative data were compiled for each open-ended survey question, read a minimum of four times, categorized, and subsequently frequencies of each category were tabulated. In some cases, such as comments offered upon completion of the survey, noteworthy quotes were extracted and included within the discussion of results. A complete qualitative analysis of the written data was not conducted, as this study was originally designed as a quantitative survey and the extensive written data obtained from open-ended questions were unanticipated.

CHAPTER 4: RESULTS

Survey Findings

Surveys were completed by 145 of the 505 invited participants, for a response rate of 28.7%. Respondents were primarily female (74.5%) and between the ages of 31-40 years (53.8%) or 41-50 years (22.4%). The mean time in practice as a naturopathic physician was 9.56 years, with a median of 7 years and a range of 35 years. The mean graduation year from naturopathic school was 2004, with a range from 1978-2013.

Since graduation from naturopathic school, 45 respondents (31%) stated their views on childhood vaccines had changed. Of those with changed views, 38% clearly stated they are more supportive of vaccines since graduation, 18% clearly stated they are less supportive, and 44% wrote comments in which the direction of their position change was not clear. Responses were characterized by three common themes: (1) review of evidence, (2) use of a modified schedule, and (3) importance of personal choice. Direct quotes from participants further elucidate these themes: (1) "I have gained more information through research and clinical practice that allows me to better understand the risks vs. benefits", (2) " … from not necessarily supporting them, to supporting them with a modified vaccination schedule", and (3)

> "I have become more attuned to the public health need for immunizations and less favorable toward the individualistic view, but still think it is best for every family to have good information and then be able to decide what is best for them."

The range of responses is demonstrated by the following two comments from respondents, from "I have changed from mostly supportive to completely supportive of the [CDC]-ACIP guidelines" to:

> "I was taught in school that vaccines are safe and effective, but it's better to use a modified schedule, to spread out the vaccine doses. What I have seen in clinical practice are both children and adults having minor to severe adverse reactions to vaccines. Their MD's refusal to acknowledge the association and the vast under-reporting of these events. Based on my experience and research, I cannot say that vaccines are either safe or effective. I no longer recommend them in my practice. Instead I have learned safe and effective alternative methods to build immunity to specific infections."

Finally, the following unsolicited comment from one participant highlights changes in views of recent naturopathic graduates:

> "As an administrator in a naturopathic medical school I can say definitively that there has been a tremendous shift in the options [opinions] of ND grads on vaccines over the last 5-10 years. As a broad generalization NDs have some significant concerns about the adjuvants used in vaccines, but also recognize their importance in public safety."

A majority of respondents (66%, n = 96) provide preventive visits (health supervision/well-child) for pediatric patients. Among those acting as pediatric PCPs (50%, n = 73), the mean panel size of pediatric patients is 69 (median 25, range 2-500). Of those naturopathic physicians who provide well visits for pediatric patients who also see another provider for primary care, 78% (n = 75) state that they have initiated communication with that child's PCP, and only 36.5% (n = 35) state that the child's PCP has initiated communication with them.

Conversations about childhood vaccinations are common during naturopathic visits, with 59.9% (n = 85) of respondents who always or frequently discuss vaccines, 22.5% (n = 32) only sometimes discuss them, and 17.6% (n = 25) rarely or never do so.

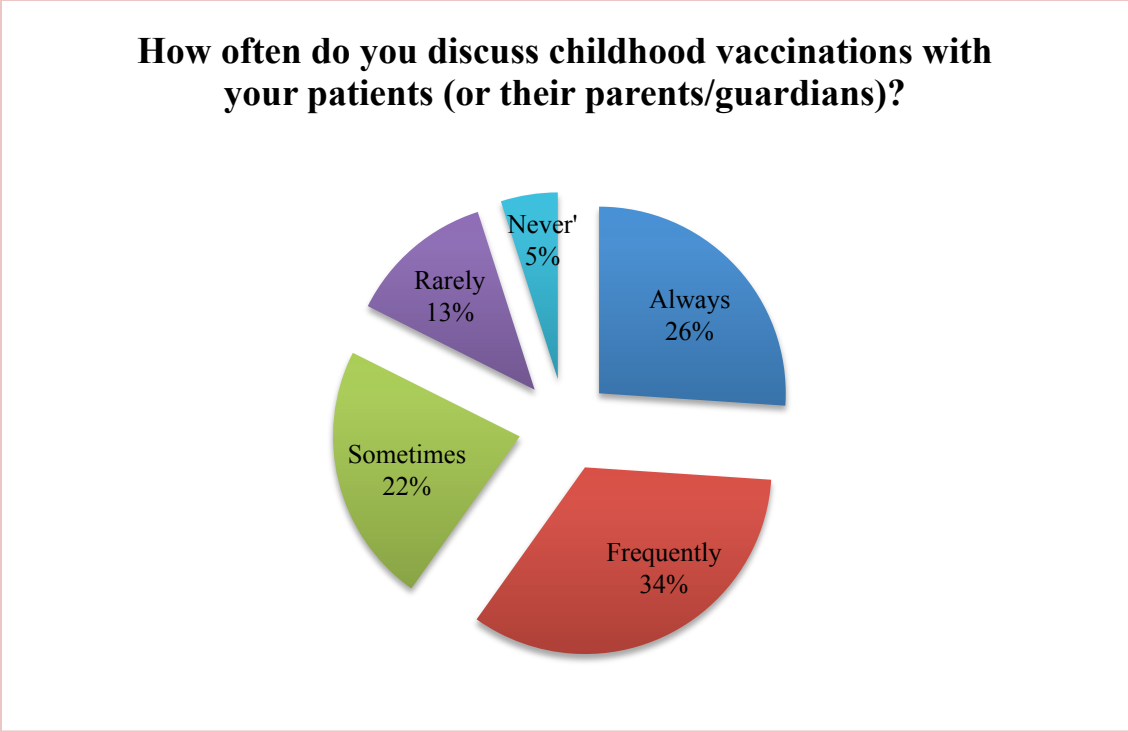


Figure 1: Frequency of childhood vaccination discussions

An in-depth question with multiple response options was asked to determine the content of discussions about childhood vaccinations. Of the 135 respondents (93%) who discuss vaccines with their patients, most discuss a majority of the listed topics. The following table lists the topics discussed in order of frequency. It is notable that even the least frequent topic is included in vaccine discussion by 63.7% (n = 86) of naturopathic physicians. Child risk factors, the most commonly discussed topic, included items such as gestational age, prenatal/perinatal events, vaginal birth history, breastfeeding history, medical history, developmental history, ethnicity, present illness and history of adverse vaccine reactions. Lifestyle risk factors such as travel, attendance at daycare, living on a

farm, parental smoking or drug use, exposure to IV needles, and socio-economic status were also commonly discussed. Family risk factors, frequently discussed, included the presence of older siblings in the home (daycare/school aged), parental employment in healthcare or educational setting, maternal vaccine history, and family history of atopy or developmental delays.

Table 1: Content of childhood vaccination discussions

Discussion topic:	Frequency	%
Assess child risk factors.	118	87.4%
Assess lifestyle risk factors.	117	86.7%
Assess family risk factors.	112	83.0%
Solicit parent preferences, knowledge and beliefs about vaccinations.	110	81.5%
Provide informational resources to parents.	110	81.5%
Discuss the risks of each vaccine.	108	80.0%
Discuss the benefits of each vaccine.	106	78.5%
Correct parental misperceptions of vaccines, if present.	104	77.0%
Review the CDC-ACIP recommended schedule.	103	76.3%
Discuss the individual's susceptibility to each VPD.	102	75.6%
Discuss the impact of vaccination choice on public/community health.	99	73.3%
Discuss each VPD including aspects such as severity, prevalence, course of illness, possible complications.	97	71.9%
Discuss the family's ability to manage illness	97	71.9%
Assist parents in creating a customized vaccine schedule based on their child(ren) and personal beliefs.	95	70.4%
Review an alternative vaccination schedule.	92	68.1%
Assess community risk factors.	92	68.1%

Discuss my professional recommendations based on naturopathic education or continuing education courses on vaccines.	90	66.7%
Discuss the option and process of exemption from school vaccination requirements.	86	63.7%
Other	13	9.6%

Of the 13 "other" responses, most comments highlighted the importance of personal choice, providing information to parents and refraining from offering their professional opinion of whether to vaccinate or not. Additional topics discussed include concerns about the potential effect of vaccines on the development of the immune system and neurological system, the importance of parents making a choice based on their own comfort level, and discussing the risks of choosing not to vaccinate. For example, one participant stated,

> "I typically provide resources for parents to learn about the above items. Books, articles, CDC recommendations, etc. I try very hard not to give an opinion but support the parents in making informed decisions about each vaccine and when to administer. I do not administer vaccinations in my practice, and will refer to the PCP for the administration. Most commonly, parents ask 'what would you do?' I typically say that there is no clear answer to that because it depends on each child's individual circumstances and what the parent is most comfortable with."

A majority (72.8%, n = 67) of those who discuss an alternative vaccine schedule with parents chose to elaborate on the specific approaches and/or vaccine schedule(s) most commonly discussed. The four most frequently mentioned approaches were: (1) to spread out the vaccine schedule (34.3%, n = 23), (2) to delay the start of vaccinations (31.3%, n = 21), (3) to use a customized schedule based on individual risk factors (22.4%,

n = 15), and (4) to give one vaccine at a time (17.9%, n = 12). In terms of specific schedules, the Vaccine Balancing Act (a continuing education course on vaccines taught by a naturopathic physician) was most commonly mentioned (22.4%, n = 15), followed by Dr. Robert Sears' Alternative Vaccine Schedule (13.4%, n = 9). Some participants mentioned more than one approach, and thus the cumulative percent of responses is greater than 100%.

The following table highlights the sources of vaccine information that survey participants felt to be trustworthy and helpful in advising patients and families considering vaccinations.

Table 2: Sources of vaccine information considered trustworthy

Sources of trustworthy vaccine information:	Count	%
Centers for Disease Control and Prevention	90	68.2%
American Association of Naturopathic Physicians	87	65.9%
State Department of Health (Vermont/Oregon)	60	45.5%
American Academy of Pediatrics	59	44.7%
American Academy of Family Physicians	54	40.9%
The Vaccine Book, by Robert Sears	53	40.2%
Vaccine Adverse Event Reporting System	51	38.6%
Vaccine Balancing Act - continuing education course	50	37.9%
National Vaccine Information Center	48	36.4%
Institute of Medicine - vaccine safety reports	36	27.3%
Other	24	18.2%
Vaccine Safety Datalink	15	11.4%

Among those who elaborated on the "other" sources of trustworthy vaccine information, research and education provided by Heather Zwickey, Ph. D. and Hilary Andrews, N.D. were the most frequently specified. Other sources specifically mentioned include Aviva Romm, M.D., Stephanie Cave, M.D., Randall Neustaedter, O.M.D., Johns

Hopkins School of Medicine, GreenMedInfo, US Preventive Services Task Force, and personal research on vaccines.

Approximately one-half of survey participants (51.7%, n = 75) state they have administered, ordered or prescribed vaccinations to pediatric patients. The most common vaccinations administered were DTaP, MMR, Hib and IPV, and the three least common vaccinations were Varicella, Influenza and Rotavirus.

Table 3: Vaccines administered, ordered or prescribed to pediatric patients

Vaccine:	Count	%
Diphtheria, tetanus and acellular pertussis (DTaP)	69	47.6%
Measles, mumps, rubella (MMR)	59	40.7%
Haemophilus influenza type b (Hib)	50	34.5%
Inactivated poliovirus (IPV)	49	33.8%
Hepatitis B (HepB)	43	29.7%
Tetanus and diphtheria (Td)	41	28.3%
Pneumococcal conjugate (PCV)	41	28.3%
Hepatitis A (HepA)	35	24.1%
Varicella (VAR)	31	21.4%
Influenza	27	18.6%
Rotavirus (RV)	21	14.5%

Among those who have never administered, ordered or prescribed vaccinations to pediatric patients (48.3%, n = 70), the majority (n = 49) stated they refer to another PCP who provides vaccinations. Other rationales were less frequently endorsed such as scope of practice (n = 20) and cost (n = 8), and only three participants chose the option, "I do not believe in vaccinations." A very small minority of all respondents (5.5%, n = 8) has ever submitted a report to the VAERS, including three reports for DTaP, one for MMR, one for Tetanus, and one for Hib.

When asked about safety concerns for specific vaccines, approximately two-thirds of the survey respondents (n = 97) had concerns with at least one of the named childhood

vaccines, one-third (n = 48) had no specific concerns about any of the individual vaccines, and nearly 20% (n = 27) had concerns with all of the childhood vaccines. The most commonly mentioned vaccine with safety concerns was Influenza (53.8%), followed by Hepatitis B (44.1%), MMR (44.1%), and Varicella (42.1%).

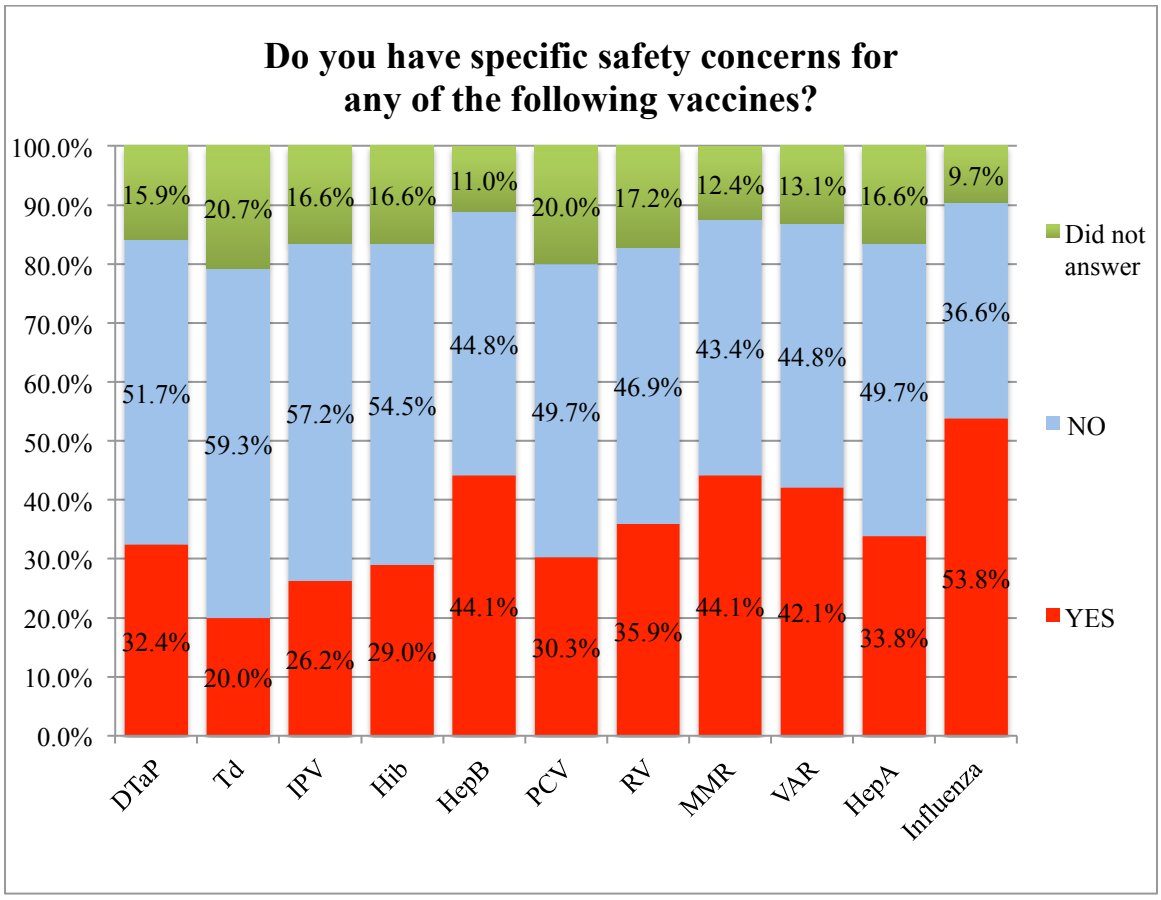


Figure 2: Prevalence of safety concerns by vaccine

Of the 97 survey respondents with safety concerns, 78 provided elaboration regarding their specific concerns for individual vaccines, yielding a plethora of qualitative data to be subsequently analyzed. The four most commonly mentioned categories of concern include questions about the necessity or efficacy of the vaccine, concerns regarding the schedule of doses (timing and quantity), risk of adverse effects of

vaccination, and concerns related to safety of vaccine ingredients. The following table includes a list of topics relating to each category of concern, both in general and for specific vaccines:

Table 4: Safety concerns – general and vaccine specific

Necessity/Efficacy

- Question the duration of immunity from vaccine, gives false sense of security
- Mutation effects of vaccines on public health (viral/bacterial)
- Necessity is based on individual/family/lifestyle risk factors
- Influenza – not necessary, better to get the illness for more complete immunity
- Varicella – not necessary, it is a mild illness, question duration of immunity into adulthood when needed most
- Hep B – minimal risk until teen/college years, question duration of immunity if given in first year
- RV – not necessary unless a preemie or in daycare
- IPV – not necessary in US
- Hep A – not necessary in US for many
- Hib – not necessary if breastfeeding

Schedule

- Too young/immature immune system – specifically mentioned concerns about immune development if administered before age 2, and birth dose of Hep B
- Volume of vaccines, total number of doses
- Too many doses given at a time
- Repeated administration of doses

Risk of adverse effects - general

- Impact on immune development – general concerns, unknown cumulative impacts, specifically mentioned imbalance of Th responses, development of atopy/allergies, increased autoimmunity, decreased immunity to fight illness, lack of opportunity to get illness and obtain natural immunity
- Impact on neurological development – general concerns, unknown cumulative impacts, specifically mentioned autism, behavioral disorders, seizures
- Long term health impacts unknown – possible contribution to chronic disease such as Alzheimer's disease, fibromyalgia
- Risk of contracting the vaccine-preventable disease from the vaccine
- Risks are unknown, greater in some patients who are genetically predisposed to have adverse reactions, all treatments have risks

Risk of adverse effects – vaccine specific

- MMR: autism spectrum disorders
- RV: intussusception, viral contamination
- IPV: Guillain-Barre
- Hib: idiopathic neurological reactions
- Hep B: idiopathic neurological reactions
- Pertussis: brain damage
- Influenza: chronic fatigue, fibromyalgia

Ingredient safety concerns

- Lack of double blind studies to prove safety
- Adjuvants – especially aluminum
- Preservatives, such as thimerosal in multi-dose influenza vials
- Growth media, foreign proteins
- Live viruses
- Allergic reaction to vaccine components

Despite highly prevalent vaccine safety concerns among respondents, nearly all (n = 133, 93%) felt there are things an individual can do to make vaccines safer and more effective. Similarly, 91% (n = 132) felt that an individual could take actions to reduce potential adverse effects of vaccinations. The following graphs include the options specifically made available to survey participants.

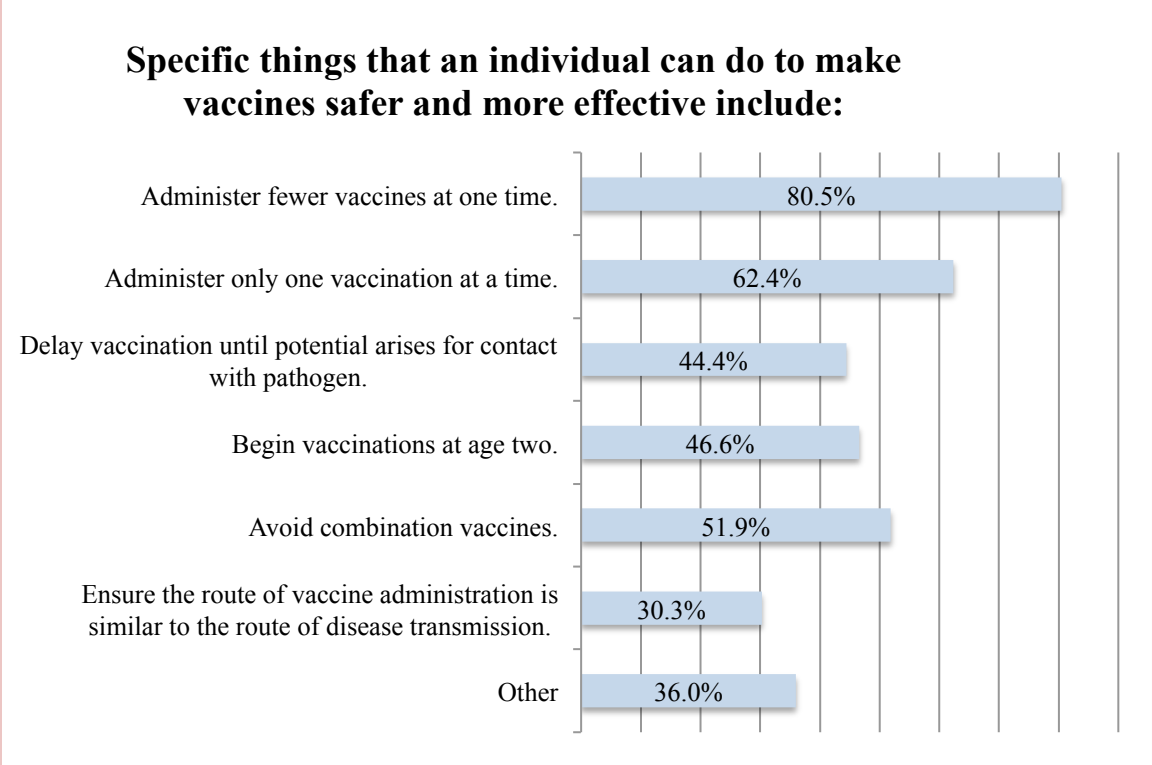


Figure 3: Naturopathic recommendations to make vaccines safer and more effective

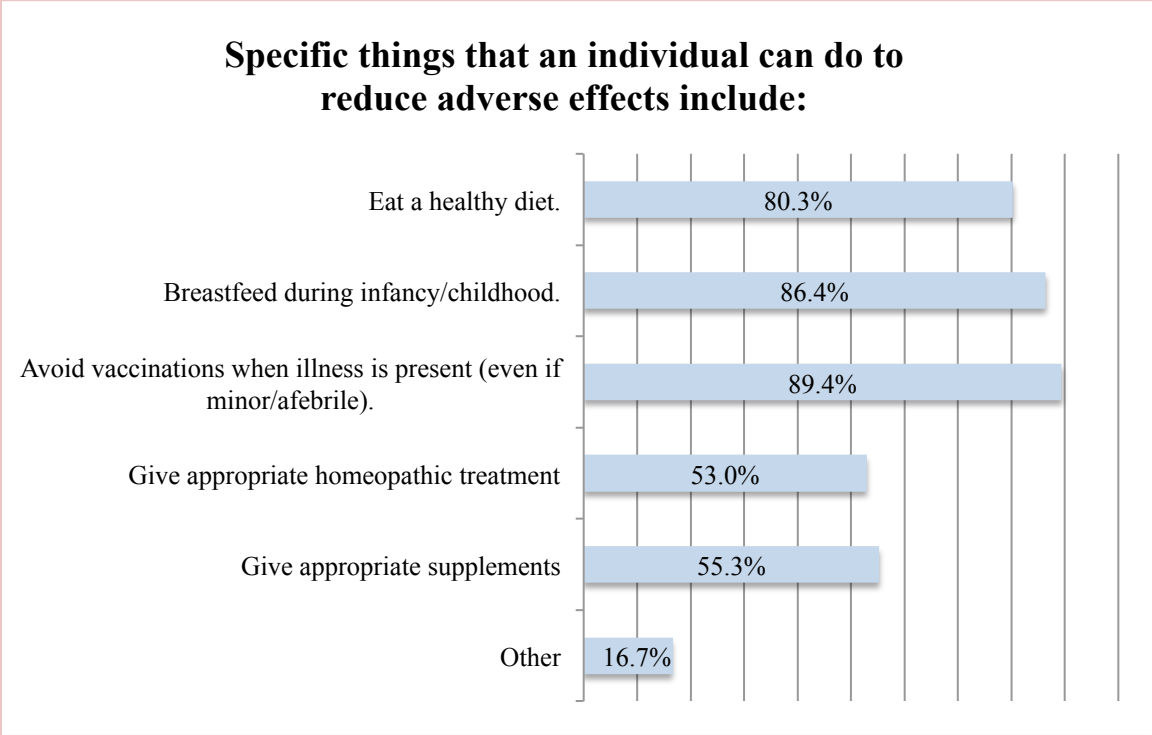


Figure 4: Naturopathic recommendations to reduce adverse effects of vaccines

Additionally, a notable proportion of respondents (up to 36%) provided further suggestions using the "other" category. A compilation of the comments elaborating upon strategies to make vaccines safer, more effective and to reduce side effects follows:

Table 5: Suggested strategies to make vaccines safer, more effective and reduce adverse effects

Safer:

- Use vaccines with fewer adjuvants and preservatives
  - Insist upon preservative free vaccines
  - Avoid micronized aluminum adjuvants
  - Avoid mercury, thimerosal

- Follow CDC-ACIP guidelines
- Avoid future vaccines if severe reaction
- Wait to administer vaccines until the child's immune system is mature and can mount a strong memory response to the vaccine
  - Delay vaccination until age 6 months, 1 year, 2 years, or later

- Only get vaccines that are appropriate for that child's risk factors. For example, are there smokers in the home? Were they breastfed? Does either parent work in a health care facility?

More effective:

- Lifestyle/dietary needs to ensure the immune system can respond appropriately
    - A good night of sleep before/after infection has been shown in at least 1 study to improve antibody formation
    - Probiotics may increase the memory immune response
    - Avoid immune suppressants such as sugar, processed food
    - Vitamin A supplement to support robust specific immune response
- Immune and liver support prior to vaccination
- Avoid use of Tylenol to decrease fever post injection due to its ability to deplete glutathione
    - Allow the fever to take its course, we are after all trying to provoke an immune reaction
- Hydrotherapy to site of injection to increase immune response to inoculation materials

Reduce adverse effects:

- Administer homeopathic medications concurrently with immunization to provide nervous system protection
- Individuals may take fish oil 1 week before and 1 week after to protect the nerve cells from neurotoxic damage
- Use hydrotherapy to give comfort/balance the immune and nervous system if the child becomes excessively uncomfortable post injection
- Do not introduce any new foods within a 2-week window surrounding vaccination.
- Give child plenty of rest before and after vaccines. Avoid over stress and over stimulation for 14 days
- Give appropriate NSAID at time of vaccination (only 1 respondent, many others recommended against use of acetaminophen)

Several complementary therapies (listed below) were mentioned by participants to reduce vaccine side effects and/or help make vaccines safer and more effective, including naturopathic treatments, botanical medicine, dietary recommendations, nutritional supplements and homeopathic remedies.

Table 6: Complementary therapies to make vaccines safer, more effective and reduce adverse effects

- Naturopathic treatments
    - Bio-therapeutic drainage
    - Warming socks treatment if fever gets too high
    - Wet sock hydrotherapy
    - Constitutional hydrotherapy
    - Eurythmy
    - Castor oil packs to abdomen for gentle liver detox support to help process preservative and additives
    - Epsom salt baths
    - Get adequate sleep

- Botanical medicine
  - Belladonna – for high fever following vaccination
  - Th1 herbs like echinacea, goldenseal, myrrh and elderberry to encourage a healthy Th1 response
  - Ashwaganda
  - Eleutherococcus (ginseng)
  - Astragalus – seems to help mount a good immune response without over doing it

- Dietary
  - Low in animal products
  - Low in sugar, wheat, dairy
  - Low in processed foods
  - Anti-inflammatory diet
  - Greens smoothies
  - Foods high in vitamin C
  - Make sure child does not have any nutrient deficiencies

- Supplements
  - VacciShield vitamin/probiotic supplement (contains vitamins C, D, E, zinc, selenium, L-Glutamine, Choline, Inositol, Bifidobacterium Lactis, and Lactobacillus Casei) to promote a robust immune response.
  - Cod liver oil per kg body weight dose to support immune system
  - Omega 3 fatty acids/EFAs
  - Fish oil
  - Vitamin D
  - Vitamin A
  - Vitamin E
  - Vitamin B-multi
  - Vitamin C – before and after vaccination
  - NAC [N-acetylcysteine] to increase glutathione production for older children
  - Gut protective nutrients
  - L-Glutamine
  - Gammadyn Mn-Cu (Genestra)
  - Nitric acid
  - Zinc
  - Selenium
  - Oral glutathione if developmental regression following vaccine
  - Oxicell (anti-oxidant) cream - topical

- Homeopathic Remedies
  - Ledum for the puncture wound
  - Thuja for protection against adverse effects of the immunization itself
  - Silica
  - UNDA Numbers 1, 2, and 3 (Seroyal products)
  - Arnica – oral/topical
  - Aconite
  - Apis
  - Sulfur
  - Combination homeopathic vaccine support formula (e.g. Professional Complementary Health Formulas) – to support efficient liver and kidney processing of toxins for optimized immune reaction and reduced toxicity
  - Vaccine nosodes

While a few participants mentioned vaccine nosodes, the majority of participants (n = 135, 96.4%) did not endorse homeopathic nosodes as a risk-free method to provide adequate protection against vaccine-preventable diseases. One participant notes, "Homeopathic treatments are given on an individual basis. I do not have a specific protocol I use for every patient getting every vaccine and I typically do not use a homeopathic unless it is warranted…" This individualized approach was reiterated in many of the comments, and it may also be that several of the above therapies are recommended as a complement to vaccination based on the individual as opposed to an alternative to vaccination.

Finally, participants ranked their agreement with nineteen beliefs about vaccinations using a five-point Likert scale. Dichotomized responses are presented in the following table, in which responses greater than 65% are highlighted in bold.

Table 7: Key vaccination beliefs held by naturopathic physicians

	Strongly agree / Agree	Other responses
1. It is my role as a naturopathic physician to advise about vaccinations.	**88.3%**	11.7%
2. Vaccines have an important role in preventing illness.	**81.9%**	18.1%
3. Many of the illnesses that vaccinations prevent are severe.	**74.8%**	25.2%
4. Vaccinations are one of the safest forms of medicine ever developed.	20.7%	**79.3%**
5. Vaccinations are getting better and safer all of the time as a result of medical research.	27.6%	**72.4%**
6. Vaccines strengthen the immune system.	19.3%	**80.7%**
7. I am concerned that a child's immune system could be negatively impacted by too many vaccinations.	**79.3%**	20.7%

8. I am concerned that vaccinations may do more harm than good in some children.	**69.0%**	31.0%
9. I am concerned about the potential for long-term adverse effects of vaccination in some children.	**81.4%**	18.6%
10. I am concerned that vaccinations may cause neurodevelopmental disorders in some children.	**71.7%**	28.3%
11. I am concerned that vaccinations may cause immune disorders in some children.	**71.0%**	29.0%
12. I am concerned because additives used in vaccines are associated with harm.	**84.1%**	15.9%
13. I am concerned that the Centers for Disease Control and Prevention (CDC) underestimates the frequency of vaccine side effects.	**77.9%**	22.1%
14. I am concerned that the CDC underestimates the severity of vaccine side effects.	**77.9%**	22.1%
15. In otherwise healthy children, it is better for them to develop immunity by getting sick than to get a vaccine.	49.0%	51.0%
16. Some healthy children may not need vaccinations.	39.6%	60.4%
17. Parents of healthy children have an ethical responsibility to vaccinate their children to help protect other children who are unable to be vaccinated.	29.2%	**70.8%**
18. Parents should be allowed to send their children to public school even if their child is not vaccinated.	**84.1%**	15.9%
19. Corporations that make vaccines cannot be trusted to provide impartial information on risks and benefits of vaccination.	**80.7%**	19.3%

Notably, the majority of respondents were in agreement with each other on nearly every vaccination belief, underscoring consistency in both concerns about vaccines and the importance of childhood vaccinations. Items numbered 7-14 were similar in both their category of inquiry (potential for harm and safety concerns) and level of agreement, ranging from 69-84% of participants who either agree or strongly agree with the statement. One exception was the belief of whether or not it is better for healthy children to develop immunity from illness rather than from a vaccine, in which there was a 49-51% split.

CHAPTER 5: DISCUSSION

This section examines survey findings within the context of the published literature, as well as limitations of the study. Recommendations for further research and implications for the advanced practice nurse are also discussed.

Childhood Vaccine Discussions

With the vast majority of naturopathic physicians (88.3%) in agreement that it is their role to advise about vaccinations, and two-thirds of study participants providing preventive visits for pediatric patients, there is a considerable opportunity for discussions about childhood vaccines between parents and naturopathic physicians. The mean pediatric panel is nearly 70 patients (range 2-500), and most (60%) report having vaccine-related conversations with parents at least frequently. The specific details of each discussion topic were not explored in depth for this study, nor were providers asked to rank topics in order of importance, both of which may be important to consider for future research.

Considering the breadth of topics often covered during these vaccine-related conversations, as reviewed in the previous chapter, time spent in discussion can be significant. Previous studies have reported relatively lengthy visits with naturopathic physicians; spending 70-120 minutes for an initial visit and 36 minutes for a follow-up visit (Lee & Kemper, 2000; Bean, 2014). The advantage of ample time to answer vaccine-related questions is one that naturopathic physicians may have to offer. Parents, especially those who may be hesitant about vaccines or conventional medicine, have the potential to significantly benefit from these conversations if given accurate information about vaccines.

Use of an Individualized Approach and Alternative Vaccination Schedule

Naturopathic physicians focus on an individualized approach towards vaccines, highlighted by the breadth of topics discussed with families. Several participants echoed this sentiment, as evidenced by this comment: "There is no 'naturopathic vaccine protocol' because our medicine inherently relies on the principle of treating the whole person. This means that in my own practice, no 2 vaccine schedules look the same." The use of an alternative vaccine schedule (as compared to the CDC-ACIP recommended schedule) was frequently mentioned throughout the results, including recommendations to delay the start of vaccinations, avoid those that are considered unnecessary based on individual risk factors, and/or reduce the overall number of vaccines administered or the number simultaneously administered. These results among practicing naturopathic physicians mimic those of naturopathic students (Ali et al., 2014) who report concerns about vaccines being given too early (73%), too many simultaneously (70%) and too many overall (72%).

The use of alternative vaccine schedules has been studied among pediatricians in Washington State (Wightman et al., 2011), providing some comparison between provider types. While most (61%) were comfortable using an alternative schedule if requested by a parent, only 4% would offer an alternative schedule in the absence of parental request. Among those pediatricians studied in Washington, 77% report that parents sometimes or frequently request the use of an alternative schedule (Wightman et al., 2011). The frequency of parental request for an alternative schedule was not specifically asked in this survey of naturopathic physicians, but is an important consideration and should be considered for future research. While not a direct comparison, consider that 92 of 135

survey respondents (68%) who discuss childhood vaccines with parents include a review of an alternative schedule in that conversation. This is consistent with previous research of naturopathic students, of whom 96% would recommend an alternative vaccine schedule (Ali et al., 2014) and qualitative research highlighting a naturopathic recommendation to avoid several vaccines and delay all (Bean, 2014).

Safety Concerns

Safety concerns among survey participants about childhood vaccinations were highly prevalent, with commonalities in concerns about the safety of ingredients, timing, adverse effects, and lack of necessity of some vaccines. Results are consistent with previous studies of naturopathic students in which concerns about potential harm of vaccine additives, long-term adverse effects and overloading of the infant immune system were mentioned (Busse et al., 2008). Similarly, Ali et al. (2014) reported 72% of naturopathic students were concerned about vaccine preservatives and adjuvants. While aluminum as a vaccine adjuvant hasn't been specifically mentioned in previous research, it was frequently named as a concern for respondents in this study, particularly within the qualitative comments received. Many comments were submitted regarding safety concerns and the naturopathic strategies used to improve vaccine safety and efficacy, which presents an opportunity for further inquiry and analysis.

Finally, the consistency of safety concerns in general was observed across multiple survey items, however specific concerns about individual vaccines tended to vary more markedly. While two-thirds of participants had safety concerns with at least one vaccine, it was notable that almost one-third had no safety concerns about individual vaccines whereas nearly 20% had concerns about every vaccine. This highlights the

individuality of naturopathic physicians and their concerns, and underscores the potential for vastly different vaccine-related conversations with parents.

Beliefs About Childhood Vaccinations

Two previous studies have examined key vaccination beliefs among healthcare providers (Mergler et al., 2013; Salmon et al., 2008). Salmon et al. (2008) compared responses from primary care providers of vaccinated children versus exempt children, while Mergler et al. (2013) examined the association of vaccine beliefs between parents of children with at least one vaccine exemption and their health care providers. Results cannot be directly compared to this study due to differences in survey methods, sample selection, data analysis, and perhaps most importantly the wording of survey items relating to key vaccination beliefs. Focus group participants during this survey development felt strongly that the wording of vaccine beliefs previously used in research (Salmon et al., 2008; Mergler et al., 2013) would need to be significantly adapted in order for naturopathic participants to be willing to provide a response. In some cases the belief questions were so significantly altered that meaningful comparisons simply cannot be made. For example, "children get more immunizations than are good for them" and, "immunizations do more harm than good" evolved to become in this study, "I am concerned that vaccinations may do more harm than good in some children." While consideration of focus group input in the development of the survey instrument may be considered a strength of this study, it is also possible that the striking commonalities and agreement in vaccine beliefs among survey participants was in part a result of the adaptation of survey item wording based on focus group input.

While direct comparisons cannot be made, an overview of the responses to key

vaccination beliefs among naturopathic physicians as compared with PCPs of vaccine exempt children (Salmon et al., 2008; Mergler et al., 2013) shows a trend towards increased vaccine hesitancy among naturopathic physicians. For example, less than one-third of survey participants in this study agreed or strongly agreed with the statement, "vaccinations are getting better and safer all of the time as a result of medical research." This item, worded nearly identically when used in previous research, resulted in 89% in agreement among providers in one study (Mergler et al., 2013), and 76-90% in agreement among providers in another study (Salmon et al., 2008). Similarly, 77.9% of naturopathic physicians are concerned that the CDC underestimates the frequency of vaccine side effects, as compared to 9-19% of providers studied by Salmon et al. (2008). Nearly half of naturopathic physicians in this study (49%) agreed or strongly agreed with the statement, "In otherwise healthy children, it is better for them to develop immunity by getting sick than to get a vaccine." In comparison, when asked if health care providers agreed with the statement, "For the overall health of a child, it is better for them to develop immunity by getting sick than to get a vaccine", only 5% agreed in one study (Mergler et al., 2013) and 4-15% agreed in another (Salmon et al., 2008).

In contrast to some previous findings in which CAM providers were typically vaccine-opposers, results suggest that naturopathic physicians fall under the "vaccine-conditional" category including those who "oppose or question one or more vaccines or the current vaccine schedule while articulating strong support for other vaccines" (Bean & Catania, 2013, p.1254). Bean and Catania (2013) define this group as those "… who weigh a vaccine's history and relevant efficacy/risk/benefit evidence in recommending some but not all vaccines" (p. 1261). A subsequent qualitative study of naturopathic

physicians reported similarly, that while none were unconditionally supportive of vaccines, most "expressed a narrow spectrum of vaccine positions, from conditional: delaying recommended vaccines or accepting only a few (n = 9, 82%); to opposing them all (n = 2, 18%) (Bean, 2014, p. 55).

This conditional acceptance of vaccines encompasses the apparent ambivalence among naturopathic physicians who both acknowledge the important role vaccines play in preventing serious illness, and also state reservations about safety or the vaccine schedule. Consistent with findings by Ali et al. (2014) in which 82% of naturopathic students support the general concept of vaccination, this study found that nearly 82% of licensed naturopathic physicians believe vaccines play an important role in preventing illness and nearly 75% agree that many vaccine-preventable diseases are severe.

Participant Fears

One incidental but surprising finding was the strong interest of participants in this study topic, combined with an apparent fear among some to speak about the issue of childhood vaccinations. Multiple participants inquired about the hypothesis of the study, the rationale and intention in conducting this study, and with whom the results would be shared. Some refused to participate for fear that their comments would be used to target the profession of naturopathy. One participant wrote,

> "Our clinic of 4 primary care NDs is proud to participate with the VT Dept. of Health's Immunization Program. Most of the patients coming to us with children have their own personal biases against, and fears of vaccines. We are able to educate them, and while they may all not chose an exact CDC schedule (and of course many do stick with the CDC schedule), are at least willing to get their child vaccinated if their naturopathic physician advised them to. As a result, we believe that many more Vermont children are being vaccinated by seeing a naturopathic physician, as their parents would likely have avoided pediatric visits from an MD. In fact, they tell us that their pediatrician/family

> practitioner refused to be their doctor in some cases. … We are doing good work, and helping a lot of people who would otherwise not be seeking medical care because of their distrust of conventional medicine. We respectfully ask that you present this profession in that light, as this issue has been used against us harshly by those intending to damage our profession."

Discussion during the focus group included this issue as well; with some suggesting that their peers may be hesitant to participate in the survey for fear that they would be portrayed in a negative light, especially if not 100% supportive of the CDC-ACIP recommended schedule. This issue may have been a contributing factor to the relatively low response rate of 28.7%.

Study Limitations

This study was limited by the lack of reliability testing of the survey instrument, which was developed specifically for this study. A single individual determined face validity, however other forms of validity were not determined. Assessment of test-retest reliability would have been beneficial to examine potential stability of results. Perceptions change over time, and the results of this study present a snapshot of participants' views and practices at a particular moment of time, as opposed to a static truth.

Study findings have limited external validity due to multiple factors including lack of a randomized sampling strategy, sub-optimal response rate, and selection of participants in only two different states. Professional group norms, practice patterns, and perspectives on childhood vaccines may have regional differences that were not examined in this study. These factors present obvious limitations to the generalizability of this study, and future research conducted in a randomized, representative sample of

naturopathic physicians using a reliable instrument could provide results with improved validity.

Additionally, the study design was inadequate to analyze the overwhelming abundance of qualitative data that were received. Open-ended questions and opportunities to clarify responses allowed participants to share a wealth of details that was incompletely analyzed due to constraints such as time and researcher experience.

Finally, there was potential for response bias within the study because it relied upon self-reporting on a volunteer basis. Since the topic of the survey was known prior to completion of the survey, it is possible that those with the strongest views may have been more likely to participate. Recall bias may be present, based on survey design and the need for participants to accurately recall their vaccine-related practices and perceptions. Also, the estimated time for survey completion (15-20 minutes) may have influenced willingness to participate, especially for those holding less passionate views. There was a potential for item-specific non-response bias, depending on who responded to particular questions, however this aspect was not fully evaluated. Selection bias may exist, as the search process for email addresses in Oregon and Vermont was not identical. For those licensed in Vermont, a more in-depth Internet search for email addresses was conducted due to a smaller sample size in Vermont, whereas those licensed in Oregon were simply invited based on the email addresses that were provided by the OBNM.

Recommendations for Future Research

This study provides a snapshot of the naturopathic approach towards childhood vaccinations, however leaves many unanswered questions. What is the evidence base that informs this approach and how are vaccine-specific recommendations made for each

individual? What is the impact of this approach on vaccine choices made by families? How do individual families evaluate the risks and benefits of each vaccine, and ultimately come to a decision? What are the impacts on vaccination rates and the ultimate public health impact of this approach? A deeper analysis of the qualitative data obtained in this study may provide a starting point, from which to further investigate the origins, implementation, scientific basis and implications of this individualized approach.

Additionally, further research may be conducted to evaluate the most prevalent safety concerns and therapeutic recommendations reported by this study, including a review of the existing scientific evidence and literature. Are these concerns or recommendations shared by health care professionals in other fields? Finally, given the high frequency of alternative vaccination schedules, there is a need for further investigation into the safety, efficacy and potential consequences of delaying vaccinations.

Implications for Advanced Practice Nursing

Advanced practice nurses caring for pediatric patients may benefit from an awareness and familiarity with all of the various health care practitioners who care for their patients. Findings in this study highlight a relative lack of communication between PCPs and naturopathic physicians, which underscores the importance of asking patients, "Have you seen another healthcare provider since your last visit here?" As recommended in Bright Futures Guidelines (Hagan, Shaw, & Duncan, 2008, p.21), "health care professionals should ask directly about the use of complementary and alternative care" as parents may fear disapproval and be reluctant to volunteer this information.

An advanced practice nurse may initiate communication with those who share in

the care for their patients, and make an attempt to develop a collaborative relationship with those providers. It may be beneficial to refrain from making assumptions and instead ask specifically about vaccine recommendations or concerns, as this may provide an opportunity for more in-depth and evidence-based conversations.

When discussing vaccinations with parents, the advanced practice nurse should allow sufficient time to answer questions and provide education about the relative risks and benefits of vaccinations, along with the rationale and scientific basis for vaccine recommendations. If families choose alternative therapies or alternate vaccines schedules, the advanced practice nurse can help them to evaluate the relative safety and efficacy of those choices, to the extent that is known. Parents who feel adequately heard and informed may be more satisfied with the care provided, trusting of the health care provider, and ultimately more accepting of vaccine recommendations made by that provider.

Conclusions

Results highlight a variety of childhood vaccine-related practices and perspectives held by naturopathic physicians, with commonalities in safety concerns and therapeutic recommendations among participants. Discussions about childhood vaccines are common during some visits with naturopathic physicians, and emphasize an individualized approach often including a customized vaccine schedule and in-depth conversations with parents. The impact of this approach on parental vaccine choice, patient satisfaction, and public health remains unknown. Results may promote discussion among all healthcare providers on this important public health issue, and may deepen understanding and evaluation of the scientific basis for the various therapeutic

recommendations and safety concerns regarding childhood vaccinations held by naturopathic physicians.

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APPENDIX A

Recruitment Letter

Dear Dr. (First Name) (Last Name),

Greetings! My name is Kate Whitman, and I am currently a Family Nurse Practitioner (FNP) student at the University of Vermont. Today I request your help, as a naturopathic physician, in understanding your perspectives and practices related to childhood vaccinations. The data collected from this online survey will be used for my master's thesis. Hopefully the results from this survey will benefit the naturopathic profession as well as the broader healthcare community and the families we collectively serve.

Your response to this survey is very important, and you have been selected from a small number of naturopathic physicians to participate. If you receive this email and are not the person named above, please either forward this email to the named person, or reply to Kate.Whitman@uvm.edu if you do not know the above named person. Similarly, if you know of someone who did not receive an invitation, but would like to participate in this survey, please contact me at the above email.

This survey contains 33 questions and may take approximately 15-20 minutes to complete. There will be no link between your email address and the survey data, and your participation will be anonymous. Your participation is entirely voluntary, there is no penalty should you choose not to participate, and there are no anticipated risks to your participation. By initiating and submitting the survey, you are providing voluntary consent for the use of your data in this research.

Please click on the link below to access the online survey (or copy and paste the survey link into your Internet browser):

https://survey.uvm.edu/index.php/survey/index/sid/723435/token/8xbqvsxs9jftff9/lang/en

Regarding your privacy, the survey link above contains an identifying token to provide you with access to the survey, however it is not stored together with your responses. It is managed in a separate database that will be updated to indicate whether you completed the survey or not. Reminder emails will be sent to those who have not submitted a survey, however there is no way of matching identification tokens with survey responses.

If you have any questions or concerns, you may contact me directly at Kate.Whitman@uvm.edu. You may also contact Nancy Stalnaker at the University of Vermont Research Protections Office (802-656-5040), should you have any questions about your rights in this study.

Thank you for your consideration in completing this survey. I greatly appreciate your time and participation!

Sincerely, *Kate Whitman*

APPENDIX B

Survey Instrument

Childhood Vaccine Perceptions and Practices Among Naturopathic Physicians



Greetings!

My name is Kate Whitman, and I am a family nurse practitioner student at the University of Vermont.

This survey contains 33 questions and may take approximately 15-20 minutes to complete. Your participation is entirely voluntary and anonymous. The data collected from this online survey will be used for my master's thesis. Hopefully these results will benefit the naturopathic profession as well as the broader healthcare community and the families we collectively serve.

Please feel free to contact me at Kate.Whitman@uvm.edu if you have any questions.

I greatly appreciate your time and participation!

There are 33 questions in this survey

Eligibility Criteria

Please submit a response to the eligibility criteria, even if you choose not to participate or are ineligible. Thank you!

[]To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria? *

Please choose **only one** of the following:

- ○ YES, and I am WILLING to participate
- ○ YES, but I am NOT WILLING to participate
- ○ NO, I do not meet these criteria

Provider Characteristics

Please note that using the arrow keys or enter key may inadvertently change your responses.

Please avoid using these keys or double check your responses prior to submission of the completed survey.

Thanks for your understanding!

[]What is your gender?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **all** that apply:

- ☐ Female
- ☐ Male
- ☐ Transgender

[]What is your age?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ < 30 year
- ○ 31-40 years
- ○ 41-50 years
- ○ 51-60 years
- ○ 61-70 years
- ○ > 70 years

[]How many years have you actively practiced as a naturopathic physician?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Only numbers may be entered in this field.

Please write your answer here:

[]In what year were you awarded your naturopathic degree?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Only numbers may be entered in this field.

Please write your answer here:

[]Have your views on childhood vaccines changed since you graduated?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

[]If yes, how have they changed?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'Yes' at question '6 [viewschanged]' (Have your views on childhood vaccines changed since you graduated?)

Please write your answer here:

Childhood Vaccine Practices

Throughout this section, the following abbreviations will be used.

Childhood vaccinations:
Diphtheria, tetanus & acellular pertussis (DTaP)
Inactivated poliovirus (IPV)
Haemophilus influenzae type b (Hib)
Hepatitis B (HepB)
Pneumococcal conjugate (PCV)
Rotavirus (RV)
Measles, mumps, rubella (MMR)
Varicella (VAR)
Hepatitis A (HepA)
Influenza

Vaccine-preventable disease (VPD)
Centers for Disease Control and Prevention (CDC)
Primary Care Provider (PCP)

Note: This survey does NOT include adolescent/adult vaccinations, including:
Zoster, Meningococcal, Human papillomavirus (HPV), Pneumococcal polysaccharide (PPSV23)

[]Do you provide preventive (health supervision/well-child) visits for pediatric patients?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

[]Are you the PCP for any pediatric patients?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '8 [wellvisits]' (Do you provide preventive (health supervision/well-child) visits for pediatric patients?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

[]If yes, approximately how many?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '9 [pcpforpeds]' (Are you the PCP for any pediatric patients?)

Only numbers may be entered in this field.

Please write your answer here:

[]If any of your pediatric patients also see another provider for primary care, have you ever initiated communications with that child's PCP?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '8 [wellvisits]' (Do you provide preventive (health supervision/well-child) visits for pediatric patients?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

[]If any of your pediatric patients also see another provider for primary care, has that child's PCP ever initiated communication with you?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '8 [wellvisits]' (Do you provide preventive (health supervision/well-child) visits for pediatric patients?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

[]How often do you discuss childhood vaccinations with your patients (or their parents/guardians)?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ Always
- ○ Frequently
- ○ Sometimes
- ○ Rarely
- ○ Never

[]When discussing childhood vaccinations with parents/guardians, what do you typically include?

Only answer this question if the following conditions are met:
Answer was 'Frequently' *or* 'Always' *or* 'Rarely' *or* 'Sometimes' at question '13 [oftendiscuss]' (How often do you discuss childhood vaccinations with your patients (or their parents/guardians)?)

Please choose **all** that apply:

- ☐ Discuss each VPD including aspects such as severity, prevalence, course of illness, possible complications.
- ☐ Discuss the individual's susceptibility to each VPD.
- ☐ Discuss the risks of each vaccine.
- ☐ Discuss the benefits of each vaccine.
- ☐ Review the CDC recommended schedule.
- ☐ Review an alternative schedule. (Please specify below)
- ☐ Discuss my professional recommendations based on naturopathic education or continuing education courses on vaccines.
- ☐ Discuss the option and process of exemption from school vaccination requirements.
- ☐ Discuss the impact of vaccination choice on public/community health.
- ☐ Assess family risk factors (e.g., older siblings in daycare or school, parental employment in healthcare or educational setting, maternal vaccine history, family history of atopy or developmental delays).
- ☐ Assess child risk factors (e.g., breastfed, vaginal birth, gestational age, prenatal/perinatal events, ethnicity, present illness, developmental history, medical history, prior adverse vaccine reactions).
- ☐ Assess lifestyle risk factors (e.g., travel, child in daycare, live on a farm, parental smoking or drug use, exposure to IV needles, socio-economic status).
- ☐ Assess community risk factors (e.g., population density, recent VPD outbreaks, local vaccination rates).
- ☐ Discuss the family's ability to manage illness (e.g., proximity to hospital, ability to pay for healthcare expenses, insurance status, ability to care for sick child at home, family/community/social support of choice to vaccinate or not).
- ☐ Solicit parent preferences, knowledge and beliefs about vaccinations.
- ☐ Provide informational resources to parents.
- ☐ Correct parental misperceptions of vaccines, if present.
- ☐ Assist parents in creating a customized vaccine schedule based on their child(ren) and personal beliefs.
- ☐ Other (Please elaborate in text box below)

[]Other topics you discuss:

Only answer this question if the following conditions are met:
Answer was at question '14 [whatdoyoudiscuss]' (When discussing childhood vaccinations with parents/guardians, what do you typically include?)

Please write your answer here:

[]Please specify the alternative schedule(s) you review:

Only answer this question if the following conditions are met:
Answer was at question '14 [whatdoyoudiscuss]' (When discussing childhood vaccinations with parents/guardians, what do you typically include?)

Please write your answer here:

[]Please select the following sources of vaccine-related information that you consider trustworthy and helpful in advising your patients and families.

Only answer this question if the following conditions are met:
Answer was 'Sometimes' *or* 'Frequently' *or* 'Always' *or* 'Rarely' at question '13 [oftendiscuss]' (How often do you discuss childhood vaccinations with your patients (or their parents/guardians)?)

Please choose **all** that apply:

- ☐ American Academy of Pediatrics
- ☐ American Academy of Family Physicians
- ☐ American Association of Naturopathic Physicians
- ☐ Centers for Disease Control and Prevention
- ☐ Institute of Medicine - vaccine safety reports
- ☐ National Vaccine Information Center
- ☐ State Department of Health (Vermont/Oregon)
- ☐ The Vaccine Book, by Robert Sears
- ☐ Vaccine Adverse Event Reporting System
- ☐ Vaccine Balancing Act - continuing education course
- ☐ Vaccine Safety Datalink
- ☐ Other (Please list in text box below)

[]Please list additional sources.

Only answer this question if the following conditions are met:
Answer was at question '17 [trustedsources]' (Please select the following sources of vaccine-related information that you consider trustworthy and helpful in advising your patients and families.)

Please write your answer here:

[]Have you ever submitted a report to the Vaccine Adverse Event Reporting System (VAERS)?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

[]If yes, please specify vaccine(s) and adverse event(s):

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '19 [VAERSreport]' (Have you ever submitted a report to the Vaccine Adverse Event Reporting System (VAERS)?)

Please write your answer here:

[]Have you ever administered, ordered, OR prescribed vaccinations to pediatric patients?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

[]If yes, please select the specific vaccines:

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '21 [evergiven]' (Have you ever administered, ordered, OR prescribed vaccinations to pediatric patients?)

Please choose **all** that apply:

- ☐ DTaP
- ☐ Td
- ☐ IPV
- ☐ HepB
- ☐ Hib
- ☐ PCV
- ☐ RV
- ☐ MMR
- ☐ VAR
- ☐ HepA
- ☐ Influenza

[]If no, please indicate why not.

Only answer this question if the following conditions are met:
Answer was 'No' at question '21 [evergiven]' (Have you ever administered, ordered, OR prescribed vaccinations to pediatric patients?)

Please choose **all** that apply:

- ☐ It is out of the scope of my practice.
- ☐ Economic reasons.
- ☐ I do not believe in vaccinations.
- ☐ I refer to another PCP who provides vaccinations to my patients.
- ☐ Other: _____

Childhood Vaccine Perceptions

Throughout this section, the following abbreviations will be used.

Childhood vaccinations:
Diphtheria, tetanus & acellular pertussis (DTaP)
Inactivated poliovirus (IPV)
Haemophilus influenzae type b (Hib)
Hepatitis B (HepB)
Pneumococcal conjugate (PCV)
Rotavirus (RV)
Measles, mumps, rubella (MMR)
Varicella (VAR)
Hepatitis A (HepA)
Influenza

Vaccine-preventable disease (VPD)
Centers for Disease Control and Prevention (CDC)
Primary Care Provider (PCP)

Note: This survey does NOT include adolescent/adult vaccinations, including:
Zoster, Meningococcal, Human papillomavirus (HPV), Pneumococcal polysaccharide (PPSV23)

[]For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines?

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose the appropriate response for each item:

	YES	NO
DTaP	○	○
Td	○	○
IPV	○	○
Hib	○	○
HepB	○	○
PCV	○	○
RV	○	○
MMR	○	○
VAR	○	○
HepA	○	○
Influenza	○	○

[]If you checked YES to any of the vaccines above, please specify your concerns.

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (DTaP))

-------- or Scenario 2 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (Td))

-------- or Scenario 3 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (IPV))

-------- or Scenario 4 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (Hib))

-------- or Scenario 5 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (HepB))

-------- or Scenario 6 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (PCV))

-------- or Scenario 7 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (RV))

-------- or Scenario 8 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (MMR))

-------- or Scenario 9 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (VAR))

-------- or Scenario 10 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (HepA))

-------- or Scenario 11 --------

Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?) *and* Answer was 'YES' at question '24 [safetyconcerns]' (For an otherwise healthy child, do you have specific safety concerns for any of the following vaccines? (Influenza))

Please write your answer here:

[]There are things that an individual can do to make vaccines safer and more effective.

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ Agree
- ○ Disagree

[]Specific things that an individual can do to make vaccines safer and more effective include:

Only answer this question if the following conditions are met:
Answer was 'Agree' at question '26 [makesafer]' (There are things that an individual can do to make vaccines safer and more effective.)

Please choose **all** that apply:

- ☐ Administer fewer vaccines at one time.
- ☐ Administer only one vaccination at a time.
- ☐ Delay vaccination until potential arises for contact with pathogen.
- ☐ Begin vaccinations at age two.
- ☐ Avoid combination vaccines.
- ☐ Ensure the route of vaccine administration is similar to the route of disease transmission, such as tetanus (intramuscular) or influenza (intranasal).
- ☐ Other: _____

[]There are things that an individual can do to reduce potential adverse effects of vaccinations.

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ Agree
- ○ Disagree

[]Specific things that an individual can do to reduce adverse effects of childhood vaccinations include:

Only answer this question if the following conditions are met:
Answer was 'Agree' at question '28 [reduceadverse]' (There are things that an individual can do to reduce potential adverse effects of vaccinations.)

Please choose **all** that apply:

- ☐ Eat a healthy diet.
- ☐ Breastfeed during infancy/childhood.
- ☐ Avoid vaccinations when illness is present (even if minor/afebrile).
- ☐ Give appropriate homeopathic treatment (such as thuja, ledum) before/after vaccination. Please specify below.
- ☐ Give appropriate supplements (such as vitamin C, echinacea) before/after vaccination. Please specify below.
- ☐ Other: _____

[]Please use this box to specify homeopathic treatments, recommended supplements or other things you may recommend to make childhood vaccines safer, more effective, and to reduce adverse effects.

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was 'Agree' at question '28 [reduceadverse]' (There are things that an individual can do to reduce potential adverse effects of vaccinations.) *and* Answer was at question '29 [howreduceadverse]' (Specific things that an individual can do to reduce adverse effects of childhood vaccinations include:)

-------- or Scenario 2 --------

Answer was 'Agree' at question '28 [reduceadverse]' (There are things that an individual can do to reduce potential adverse effects of vaccinations.) *and* Answer was at question '29 [howreduceadverse]' (Specific things that an individual can do to reduce adverse effects of childhood vaccinations include:)

Please write your answer here:

[]Homeopathic nosodes convey adequate protection against vaccine-preventable diseases with no risk.

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose **only one** of the following:

- ○ Agree
- ○ Disagree

[]In this section, you will be asked questions about how you feel, in general, about vaccines.

Only answer this question if the following conditions are met:
Answer was 'YES, and I am WILLING to participate' at question '1 [eligibility]' (To complete this survey, you must be licensed and located as a naturopathic physician in the state of Vermont or Oregon. Do you meet these criteria?)

Please choose the appropriate response for each item:

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
It is my role as a naturopathic physician to advise about vaccinations.	○	○	○	○	○
Vaccines have an important role in preventing illness.	○	○	○	○	○
Many of the illnesses that vaccinations prevent are severe.	○	○	○	○	○
Vaccinations are one of the safest forms of medicine ever developed.	○	○	○	○	○
Vaccinations are getting better and safer all of the time as a result of medical research.	○	○	○	○	○
Vaccines strengthen the immune system.	○	○	○	○	○
I am concerned that a child's immune system could be negatively impacted by too many vaccinations.	○	○	○	○	○
I am concerned that vaccinations may do more harm than good in some children.	○	○	○	○	○
I am concerned about the potential for long-term adverse effects of vaccination in some children.	○	○	○	○	○
I am concerned that vaccinations may cause neurodevelopmental disorders in some children.	○	○	○	○	○
I am concerned that vaccinations may cause immune disorders in some	○	○	○	○	○

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
children.					
I am concerned because additives used in vaccines are associated with harm.	○	○	○	○	○
I am concerned that the Centers for Disease Control and Prevention (CDC) underestimates the frequency of vaccine side effects.	○	○	○	○	○
I am concerned that the CDC underestimates the severity of vaccine side effects.	○	○	○	○	○
In otherwise healthy children, it is better for them to develop immunity by getting sick than to get a vaccine.	○	○	○	○	○
Some healthy children may not need vaccinations.	○	○	○	○	○
Parents of healthy children have an ethical responsibility to vaccinate their children to help protect other children who are unable to be vaccinated.	○	○	○	○	○
Parents should be allowed to send their children to public school even if their child is not vaccinated.	○	○	○	○	○
Corporations that make vaccines cannot be trusted to provide impartial information on risks and benefits of vaccination.	○	○	○	○	○

Thank you for your participation!

[]

If you have comments or additional thoughts to share, please feel free to use the space below.

Please write your answer here:

Thank you very much for your participation!

You will receive a confirmation email shortly, if your survey was successfully submitted and received.

Your contribution to this research effort is very greatly appreciated!

11-29-2014 – 18:36

Submit your survey.
Thank you for completing this survey.