

# Vaccinations, children, 91.1% had at least one dose

[Business](#), [Decision Making](#)



Vaccinations, widely regarded by experts as one of the greatest achievements in public health in the past century, have contributed greatly to reduced incidence and childhood mortality from certain infectious diseases.

1, 2 Despite these achievements, vaccinations are not without their detractors. Overall national vaccination coverage remains high despite opposition to vaccination programs. 3 A 2013 report by the US Centers for Disease Control found that in children, 91.1% had at least one dose of the measles, mumps, and rubella vaccine and 83.

1% had at least four doses of the diphtheria, tetanus, and acellular pertussis vaccine. 3 However, over the past 20 years, rates of non-medical exemptions that allow parents to refuse vaccinations on philosophical or religious grounds have been steadily increasing. 4, 5 A recent survey suggests that approximately 40% of parents delay or refuse vaccinations for their children.

6 Vaccine refusal is associated with an increased risk of acquiring vaccine-preventable illness. 7.

One study investigating national measles outbreaks between 1985 and 1992, found that among unvaccinated individuals, those with vaccine exemptions were 35 times more likely to contract measles compared to vaccinated children. 8 A second study using data from Colorado from 1987 to 1998 found that children with vaccine exemptions were 22 times more likely to contract measles compared to vaccinated children. 9 A recent study investigating vaccine-preventable disease occurrence in unvaccinated children found that of 970 measles cases reported between 2000 and 2015 that included sufficient information about vaccine status, 574 cases occurred

in unvaccinated individuals and of those cases, 70.6% were intentionally unvaccinated due to non-medical exemptions.

7 Individuals with the disease who received non-medical exemptions represented a total of 41.8% of reported cases. Similarly, higher exemption rates are associated with higher rates of pertussis in both unvaccinated and vaccinated populations.

7 Among reported pertussis cases, 24-45% of individuals were unvaccinated with 59-93% of individuals having been intentionally unvaccinated. 7 Among statewide pertussis outbreak reports that contained sufficient information about the vaccination status of individuals with the disease, 70% of unvaccinated pertussis cases in a 2012 outbreak in Oregon and 84% of cases in a 2013 outbreak in Florida were among children with vaccine exemptions.

10, 11 One case-control study found that among pertussis cases between 1996 and 2007, individuals with vaccine exemptions were 20 times more likely to contract pertussis. 12 However, despite the associations between vaccine refusal and an increased likelihood of disease acquisition, many parents choose to delay or refuse vaccination for their children. 13 Among parents who choose to delay or refuse vaccination, there is an association with the use of complementary and alternative medicine (CAM), defined by the National Institutes of Health as a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine and includes chiropractic medicine, Chinese medicine and acupuncture, massage, and naturopathic medicine. 14 Parents who use CAM have been shown to express a greater concern about vaccine

side effects and a higher likelihood of refusing vaccination for their children. 15 Parents who prefer CAM therapies have been found to be more skeptical about the benefits of vaccination and are more likely to believe misconceptions about vaccines. 15, 16 Additionally, evidence suggests that use of CAM and vaccine skepticism are both parts of a common attitudinal stance and set of psychosocial values.

17 Among CAM providers, including chiropractors and naturopathic physicians, there have been mixed findings on attitudes toward vaccination. The attitudes of naturopathic physicians in particular have not been well-studied but published reports suggest that the minority support full vaccination. 13 In one study of Massachusetts naturopathic physicians, researchers found that 20% recommended vaccination, 7% actively opposed vaccination, and the rest, a vast majority, made no recommendation.

18 CAM usage among children is estimated to be lower than usage among adults. Among Washington insurance claims in 2002, only 6% of children under age 17 had used any form of CAM during the calendar year. 19 A 2010 study of CAM providers, including chiropractors, acupuncturists, massage therapists, and naturopathic physicians, in the state of Washington investigated practices among 11, 144 pediatric patients based on insurance records from two non-Medicaid insurance companies.

13 In this study, fewer than 4% of children had any visits with a CAM provider. Researchers investigated rates of vaccination and incidence of ten vaccine-preventable illnesses based on federal pediatric vaccination guidelines. The results of the study suggest that children seeing naturopathic

physicians were more likely to be unvaccinated and that the use of naturopathic medicine by pediatric patients was associated with an increased likelihood of a diagnosis of a vaccine-preventable illness (OR 1.67, 95 percent CI 1.31-2.15). Despite these data, relationship causality cannot be established as it is possible that parents who are already vaccine-hesitant choose to seek out CAM providers for pediatric care. While use of CAM has been associated with parental refusal of childhood vaccines and with an increased risk of vaccine preventable diseases, attitudes and practices regarding vaccination among providers and students of CAM are still poorly understood. A 2004 study conducted at the Canadian College of Naturopathic Medicine in Toronto, Canada, assessed the attitudes of naturopathic medicine students regarding vaccination. 20 This study found that only 12.8% of students would recommend full vaccination according to the recommended schedule and 74.4% of students would recommend partial vaccination. Researchers found that willingness to advise full vaccination and overall trust in public health and conventional medicine decreased in later years of the program.

A previous version of the current survey, administered at National College of Natural Medicine in Portland, Oregon, in 2013 found that 100% of naturopathic medicine students would recommend an alternative vaccination schedule and that the majority of students would regularly or occasionally recommend vaccines in their future practice. The current study aims to assess

the attitudes, education, and sources of information surrounding vaccination among students at three U. S.-based naturopathic medicine programs.

**METHODS** Three naturopathic medicine schools, National College of Natural Medicine (NCNM), Bastyr University, and University of Bridgeport, were chosen to participate in the study. The naturopathic medicine programs at these schools require students to matriculate with a previous bachelor's degree and coursework in basic life sciences. Graduates of these programs complete academic coursework related to basic sciences, pathology, clinical diagnosis, and laboratory diagnosis, as well as botanical medicine, physical medicine, clinical nutrition, and pharmacology. In addition to their academic training, students complete numerous clinical rotations under the supervision of naturopathic physicians in a variety of primary care and adjunctive care settings. Naturopathic physicians are currently licensed in 21 U.

S. states and territories. Researchers received approval from the institutional review boards of the three naturopathic medical schools and Yale University to distribute a survey to all naturopathic medicine students. The survey was developed in 2013 by a team of researchers using a variety of quantitative, scale, and open-ended response questions combining questions from previous surveys and expert opinions. The survey was aimed at assessing 1) where students were educated about vaccinations in their medical programs, 2) what other resources students use to educate themselves on vaccinations, 3) the perceived credibility of educational and supplemental information sources, 4) attitudes about vaccination, and 5) intended future practices.

The 2015 survey was updated to include questions related to the 2014-15 Disneyland measles outbreak and proposed laws mandating vaccination. The 59 question survey was distributed to students using Qualtrics web-based software. Students received a link to complete the survey from the dean or associate dean of naturopathic medicine at each college.

Students were given three weeks to complete the survey. It was estimated that the study would take 20 to 30 minutes to complete. In order to incentivize participation in the study, upon completing the survey, participants were able to enter their name and email address to be entered in a drawing for an Apple Watch which would be awarded to one participant at the end of the study period.

Of the 59 questions in the survey, 20 questions were focused on assessing the students' naturopathic medical education surrounding vaccines. In addition to basic demographic information about program and year in school, questions in this section included queries into which classes provided information about vaccinations. Students were also asked which sources of information they used to supplement their classroom education on vaccines. Additionally, information on perceived credibility of both naturopathic and conventional medical education was assessed. The second section was comprised of 16 questions related to opinions about vaccinations and their safety and effectiveness.

This section questioned students on their opinions about the safety and effectiveness of vaccines as well as perceived and observed adverse effects of vaccination. The third section was comprised of nine questions

regarding public perceptions about vaccines and current events involving vaccination, including the Disneyland measles outbreak. The final section of the survey included 15 questions focused on students' intended future practices regarding vaccination. This section included questions on whether or not participants intended to recommend vaccinations, how scope of practice would influence their recommendation, and whether they would use additional or alternative therapies in conjunction with or instead of vaccination. RESULTS A total of 242 students provided responses (20.1%).

Of these respondents, 108 were from Bastyr University, 103 were from NCNM, and 28 were from University of Bridgeport. Respondents represented all years of the naturopathic programs with 52 first year students, 54 second year students, 52 third year students, and 81 students from years four, five, and six providing responses. In response to the question, "In which of your courses have you learned about vaccines?" participants were asked to select all courses that applied from a list of six choices: immunology, microbiology, pediatrics, pharmacology, public health, or other class or elective. A total of 211 participants (87.2%) provided responses to this question. Of these responses, 81% indicated they learned about vaccines in immunology; 78% in microbiology; 43% in another class or elective; 40% in pediatrics; 30% in public health; and 30% in pharmacology (see Table 1). In addition to classroom education, students provided responses on additional sources of information regarding vaccination. In response to the question, "Do you consult other sources of information to learn about vaccines in addition to your standard classroom education?" students were asked to select all



options that applied from an extensive list of conventional, alternative, and vaccine-skeptical information sources.

A total of 224 participants provided responses to this question (92.6%). Of these responses, 72% of students indicated that they consulted the Centers for Disease Control Advisory Committee on Vaccination Practices (CDC-ACIP); 55% consulted current peer-reviewed scientific literature; 54% consulted mentors or other clinicians; 34% consulted the American Association of Naturopathic Physicians; 34% consulted alternative vaccine schedule sources such as Dr. Sears; and 32% consulted vaccine skeptical sources such as Mercola.com, Mothering.

com, or NaturalNews.com (see Table 2). Students were also asked to evaluate the credibility of these information sources.

A total of 152 students (62.8%) provided responses to the question, “How trustworthy do you think these various sources of information are?” Students were asked to score each source on a scale of untrustworthy, represented as a value of zero, to very trustworthy, represented by a value of two. More trustworthy sources received values closer to two while sources perceived as less trustworthy received scores closer to zero (see table 3). Respondents rated the American Association of Naturopathic Physicians as the most credible source with a score of 1.26. Current peer-reviewed scientific literature and personal clinical experience were ranked as the second most credible sources each with scores of 1.24. Conventional sources including the CDC-ACIP and the American Academy of Pediatrics were rated as slightly less credible with scores of 1.

16 and 1.14, respectively. Alternative vaccine schedules such as Dr. Sears were rated as less credible with a score of 0.96.

Vaccine skeptical sources such as Mercola.com, Mothering.com, and NaturalNews.com were rated as the least credible sources of information with a score of 0.33. A total of 192 students (79%) provided responses to the question, "Do you support the general concept of conventional vaccinations for the prevention of infectious diseases in children and adults?" Of these respondents, 77% answered "yes," while 23% answered "no" (see Table 4). In response to the question, "What is your general opinion of pediatric vaccine schedules?" students were asked to select all options that applied (see Table 4).

Two-thirds (67%) of students answered that children should be evaluated on an individual basis; 62% of students responded that children should be given some or all vaccinations but these should be administered at different ages and/or intervals than the schedule suggests; 35% of respondents answered that children should be given some, but not all, scheduled vaccinations; 22% of respondents answered that children should be vaccinated according to the CDC-ACIP vaccination schedule; and 7% of respondents indicated that children should be entirely vaccine free. In response to the question, "What do you believe are problems related to vaccination programs?" a total of 157 students provided responses (64.9%). Students were asked to select all answers that applied (see Table 5). Of these responses, 84% of students indicated that preservatives or adjuvants were a problem associated with vaccines; 83% of students responded that multiple vaccines administered

simultaneously was a problem; 76% of students responded that vaccines are given too early; 64% of respondents indicated that vaccine adverse events were under-reported; 62% responded that there are too many vaccines given overall; and 34% of respondents indicated that autism spectrum disorders being linked to vaccines was a problem.

In response to questions about future practices, 80% of students responded that they would offer vaccinations in their clinics if insurance or state and federal programs (such as the Vaccines for Children federal program) cover the costs for naturopathic physicians to administer vaccinations. Additionally, 43% of respondents indicated that they would regularly prescribe or recommend vaccination to their patients; 30% would occasionally recommend; 14% would rarely recommend; and 12% would never recommend. A total of 73% of respondents would recommend an alternative schedule for vaccinations based on patient health status (91%), to reduce the number of vaccines given simultaneously (87%), and based on their patient's age (87%). To guide their decision making in prescribing an alternative schedule, 78% of respondents indicated they would use current peer-reviewed scientific literature; 69% would consult the American Association of Naturopathic Physicians; and 67% would consult other clinicians or mentors (see Table 6).

**DISCUSSION** The results of the current study can be compared to the 2013 pilot survey administered at NCNM to observe possible trends in education and information regarding vaccines. The 2013 study had a similar total response rate to the 2015 study but overall, fewer participants answered

each question so the validity of any comparison between the two studies is limited. Still, it is important to note that there were several changes in the answers between responses in 2013 and 2015. In the 2013 survey, 100% of respondents indicated that they would recommend an alternative vaccination schedule for their patients; in 2015, only 62% of students indicated that they would recommend an altered schedule and 22% of students responded that they would recommend the full CDC-ACIP schedule for their patients.

In the 2013 study, 100% of respondents indicated that they use alternative vaccination schedules to supplement their classroom education on vaccines; this number was 34% in 2015. In 2013, 54% of students indicated that they would consult vaccine-skeptical sources such as Mercola.com, Mothering.com, NaturalNews.com, and others for information on vaccines; in 2015, less than one-third of students (32%) indicated they would use these sources. Reported perceived credibility of various sources of information also changed between 2013 and 2015. In both surveys, students were asked to rate sources on a scale of not credible (0) to credible (2). Scores closer to two indicate higher credibility.

In 2013, students rated alternative vaccination sources as the most trustworthy source of information on vaccines with a score of 1.21; in 2015, alternative vaccination schedules scored 0.96. The CDC-ACIP was scored at 0.96 in 2013 but increased to 1.16, and ranked as the fourth most credible source, in 2015. Similarly, the American Academy of Pediatrics was scored at 0.79 in 2013 and increased to 1.

14 in 2015. Vaccine-skeptical sources were scored as the least credible sources in both surveys and decreased from a score of 0.57 in 2013 to 0.33 in 2015.

Responses to questions about the perceived problems associated with vaccinations also changed between the two surveys. In 2013, nearly all participants (96%) indicated that preservatives and adjuvants were problematic; while still the most common response, in 2015, only 84% of participants indicated that this was a problem. Vaccinations given too early was the second most common response in 2013 with 92% of respondents indicating this was a problem; in 2015, only 76% of respondents chose this option. In 2013, almost half of respondents (46%) indicated that an association between autism and vaccines was a problem with vaccination; in 2015, only 34% of respondents chose this option. While the sample size of each survey was too small to be representative, comparisons of the results from the 2013 and 2015 surveys provide interesting points for further study. Based on the results of the two surveys, it appears that more students are consulting conventional sources of information on vaccines and that they find these sources to be overall more credible than vaccine-skeptical sources.

The results also suggest that alternative vaccination schedules are used by fewer students in 2015 than in 2013 although the majority of students in both surveys indicated that they would advise an altered vaccination schedule for pediatric patients. The results of the current study are also consistent with results of a 2004 study conducted at the Canadian College of Naturopathic Medicine. <sup>20</sup> While this survey and our study used different study tools with

different questions, the results in the 2004 study suggest that 74.4% of respondents would recommend partial vaccination which is comparable to the 62% who would recommend the same in our study. Additionally, the data in our study are consistent with a study of practicing naturopathic physicians in Massachusetts in which 20% of respondents would actively recommend vaccinations and 7% would openly oppose them; the results in the current study suggest that 22% of students support the full CDC-ACIP vaccine schedule and 7% believe that children should be entirely vaccine-free. 18 Our results offer an interesting comparison to vaccination attitudes studied in conventional allopathic medicine students. A recent study of students at the University of Central Florida found that most students reported strongly positive attitudes toward vaccination. 21 Despite their attitudes, only 29% of students reported receiving adequate education regarding vaccines in their medical education.

Of particular interest to the comparison with naturopathic students, 55% of respondents indicated that alternative vaccination schedules were an acceptable way to minimize parental stress. This is comparable to the 62% of naturopathic students in our study who indicated that they would vaccinate according to an alternative schedule. The current study has several limitations. First, the sample size, 242 students (20.8%), is not large enough to be considered representative. Because the survey was administered at NCNM in 2013 and again in 2015, it is possible that the same students responded to both surveys or that completely different students responded to each survey making comparisons between the results of the two surveys impossible to evaluate with any level of certainty.

Secondly, the entire sample population did not respond to each question in the survey leading to the potential for non-responder bias. Finally, it is outside the scope of this study to determine whether the attitudes regarding vaccination reported by naturopathic medicine students are fostered by their naturopathic education or whether they are previously held attitudes that remain unchanged despite their medical education. Evidence suggests that support of CAM and vaccine skepticism are components of a common set of attitudes and values so it is possible that students of naturopathic medicine subscribe to a set of beliefs that makes them more likely to pursue a career in CAM as well as maintain skepticism of vaccines and conventional medicine. 17 The results of the current study suggest that the majority of respondents support the general idea of vaccination but would advise pediatric patients to receive vaccinations on an altered schedule. The public health implications of these data are significant.

Recent research suggests a correlation between the attitude and personal practices healthcare providers and their knowledge regarding vaccinations. 22 While naturopathic physicians represent only a small number of providers in the US medical system, they have the potential influence many parents through CAM-affiliated websites and literature. 23, 24 Engaging students and practitioners of naturopathic medicine in productive dialogue regarding vaccination would provide benefit to public health programs aimed at increasing vaccination rates in children whose CAM providers. CONCLUSION Education regarding vaccination among naturopathic medicine students comes from a variety of sources. Students consult a

number of conventional, alternative, and vaccine-skeptical sources to supplement their classroom education on vaccines.

These sources have varying levels of perceived credibility. The attitudes naturopathic students hold regarding vaccination and their intended future practices may have considerable impacts in public health. Public health officials should promote dialogue with naturopathic students and providers in an effort to improve vaccine compliance.