

# Attitudes toward vaccination: A cross-sectional survey of students at the Canadian Memorial Chiropractic College

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**Introduction:** *The purpose of this study was to conduct an online survey of chiropractic students in the 2011/12 academic year at CMCC in order to determine their attitudes toward vaccination, their history of vaccination and their opinions towards their level of preparedness and confidence to discuss vaccination with patients.*

**Method:** *All students enrolled in the program at CMCC were eligible to participate in this anonymous survey modeled after a similar survey administered in 1999/2000.*

**Results:** *The response rate was 43%. Over 90% of all students reported they had been vaccinated. Roughly half of students felt they were well prepared to discuss vaccination with their patients and two-thirds felt they were confident to do so. Between 83.9% and 90% of students in various years of the program expressed a positive attitude toward vaccination.*

**Discussion:** *Separate Welch t-test for each year of study indicated statistically significant differences between our survey and the survey published in 1999/2000, with students in our study expressing a more positive attitude toward vaccination.*

**Conclusion:** *Students enrolled in the chiropractic program at CMCC in the 2011/12 expressed a positive attitude toward vaccination.*

**KEY WORDS:** vaccination, chiropractic, survey, attitudes

**Introduction :** *L'objet de cette étude était de mener une enquête en ligne auprès des étudiants en chiropratique de l'année scolaire 2011-2012 à CMCC afin de connaître leurs attitudes envers la vaccination, leurs propres antécédents de vaccination, et leurs opinions sur leur niveau de préparation et de confiance pour discuter de la vaccination avec leurs patients.*

**Méthodologie :** *Tous les étudiants inscrits au programme à CMCC étaient admissibles à participer de façon anonyme à cette enquête modelée sur une enquête similaire menée en 1999-2000.*

**Résultats :** *Le taux de participation a été de 43 %. Plus de 90 % des étudiants ont indiqué qu'ils ont été vaccinés. Environ la moitié des étudiants s'estimaient être bien préparés pour discuter de la vaccination avec leurs patients, et les deux tiers pensaient le pouvoir faire en toute confiance. Entre 83,8 % et 90 % des étudiants de différentes années du programme ont exprimé une attitude positive envers la vaccination.*

**Discussion :** *Un test t de Welch distinct pour chaque année d'étude a indiqué la présence de différences statistiquement significatives entre notre enquête et celle publiée en 1999-2000, révélant une attitude plus positive des étudiants de notre enquête envers la vaccination.*

**Conclusion :** *Les étudiants en chiropratique à CMCC de l'année 2011-2012 ont représenté une disposition positive envers la vaccination.*

**MOTS CLÉS :** vaccination, chiropratique, enquête, attitudes

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## Introduction

Dating back to the time of the Palmers<sup>1,2</sup>, chiropractors have held very divisive attitudes toward the use of vaccination. These attitudes may be a reflection of a person's upbringing, their undergraduate education, their graduate education or perhaps this may be a reflection of their chiropractic education.<sup>3,4</sup> Busse and his colleagues<sup>3</sup> sought to identify the attitudes of chiropractic students in the 1999/2000 academic year enrolled at the Canadian Memorial Chiropractic College (CMCC). Using an 11-item cross-sectional survey, the researchers found that the proportion of students who had negative attitudes toward vaccination increased along with the year of study, increasing from 4.5% among first year students to 29.4% of students in the fourth (and final year) of study. Moreover, 36% of students reported their attitudes had become more negative during their studies, whereas only 5% of students indicated their attitude had become more positive during that time. It was found that students who relied on informal sources of information (chiropractic trade magazines, student club speakers) were more likely to have anti-vaccination attitudes.<sup>3,4</sup> Since this was a cross-sectional, 'snap-shot' survey of students c1999, it is unknown if the attitudes of students declined during their progression through their undergraduate education and internship. Even so, this study did not go unnoticed by outside observers in the medical community, with one paediatrician characterizing these attitudes among chiropractic students as 'disturbing'.<sup>5</sup>

When the results of the Busse *et al*<sup>3</sup> study was published, one of the authors of this study (BJG) opined that it may have been influenced by a subgroup of some charismatic students who were enrolled at CMCC at the time, students who championed the Palmer postulates that advocated against the use of vaccination. In order to ascertain if the attitudes of CMCC students toward vaccination had changed over the intervening decade, a decision was made to re-administer the Busse *et al*<sup>3</sup> survey (with some modification as described below) to a new cohort of chiropractic students.

The purpose of this study, therefore, was to conduct a cross-sectional survey of chiropractic students enrolled in the 2011/2012 academic year at CMCC in order to assess their attitudes toward vaccination, and to determine if these attitudes were statistically different from a similar study that surveyed CMCC students enrolled in the

1999/2000 academic year. Unlike the Busse *et al*<sup>3</sup> study, however, we did not seek to learn what sources of information students relied upon in order to develop their attitudes toward vaccination.

## Methods

The Research Ethics Board (REB) at CMCC granted approval for this study.

### *Inclusion criteria*

This was a descriptive, cross-sectional study that analyzed survey results of CMCC students at a specific point in time. To be eligible to participate in this study, respondents had to be currently enrolled at CMCC in the 2011-2012 academic year. Students from all four years of the program were eligible to participate in the survey. There was no control group as all participants in the study completed the same survey. Respondents were not offered any compensation to participate in the study. This study consisted of an online survey using Survey Monkey and was distributed electronically to all students in all four academic years. The survey was open between October 2011 and March 2012. Several reminders (approximately one per month) were sent out over the college-wide email and announcements were made during various classes.

### *Confidentiality*

Respondents were assured their responses were anonymous. Participation was voluntary. The survey contained a consent form that a prospective respondent had to complete in order to participate in the survey. Survey Monkey would only accept one complete survey from each student email address.

### *Survey instrument*

The survey consisted of demographic information (year of study, gender, age range and country of origin) as well as the original 11 questions from the Busse *et al*<sup>3</sup> study. In addition, we asked non-attitudinal questions (inquiring whether or not the respondent had received various vaccines for example), as well as questions about their attitudes toward their preparedness and interest in discussing vaccination with their future patients (see Table 1).

Identical to the Busse *et al*<sup>3</sup> study, respondents were given three answer options: "Yes", "No" or "Undecided". Each answer was scored as '0', '1' or '2' based on whether

Table 1:  
Responses to questionnaires about attitudes towards vaccinations among chiropractic students  
in the 2011-2012 academic year.

Question		Year 1 (n=114) RR <sup>^</sup> = 32.8%		Year 2 (n=74) RR = 43%		Year 3 (n=80) RR = 38.5%		Year 4 (n=60) RR = 72.2%	
		n	%	N	%	n	%	n	%
1*	The risk of a few adverse reactions to vaccines is acceptable if the majority of the population is protected against infectious disease	95	83.3	63	85.1	65	81.3	52	86.7
2*	There is little scientific proof that immunization prevents infectious disease	7	6.1	0	0.0	6	7.5	2	3.3
3*	Vaccines have not substantially changed the incidence of any major infectious disease	10	8.8	3	4.1	5	6.3	5	8.3
4*	Vaccines actually cause more disease than they prevent	2	1.8	0	0.0	4	5.0	1	1.7
5*+	The risk of H1N1 Influenza vaccine outweighs its usefulness in preventing the disease	20	17.5	13	17.6	23	28.8	15	25.0
6*	Vaccines should never be given to elderly persons	11	9.6	1	1.4	6	7.5	0	0.0
7*	Vaccines should never be given to infants under 1 year of age	18	15.8	14	18.9	17	21.2	8	13.3
8*	In general, contracting an infectious disease naturally is safer than being vaccinated against it	9	7.9	3	4.1	7	8.8	5	8.3
9	Did you receive all of your childhood vaccinations? (DPT, Hep B, MMR)?	112	98.2	72	97.3	76	95.0	54	90.0
10	Do you feel as though everyone should be receiving these vaccinations?	90	78.9	62	83.8	55	68.8	43	71.7
11*	Would you want your children to be vaccinated against infectious disease with any currently recommended vaccine?	95	83.3	62	83.8	64	80.0	48	80.0
12	Did you receive the H1N1 vaccine?	32	28.1	27	36.5	7	8.75	10	16.7
13	Do you receive the annual flu shot?	18	15.8	11	14.9	4	5.0	9	15.0
14	Do you think the elderly should be vaccinated annually with the flu shot?	64	56.1	53	71.6	47	58.8	41	68.3
15	Do you think that all kids should receive the MMR vaccine?	74	64.9	66	89.2	60	75.0	48	80.0
16	Do you support the use of vaccines to prevent HPV?	74	64.9	47	63.5	46	57.5	27	45.0
17	Do you believe there is a direct link between vaccination and autism?	2	1.8	1	1.4	5	6.3	0	0.0
18*	If you were required to travel to a country in which certain infectious diseases were endemic and prevalent, would you undergo prior vaccination?	111	97.4	66	89.2	69	86.3	55	91.7
19	Do you think we should have the right to discuss vaccinations with patients?	69	60.5	57	77.0	46	57.5	44	73.3
20	Do you feel that your education at CMCC has prepared you to talk about vaccinations?	2	1.8	33	44.6	31	38.8	34	56.7
21	Do you feel confident talking to patients about vaccines?	17	14.9	32	43.2	38	47.5	37	61.7
22*	Are you in favour of vaccination and immunization in general?	92	80.7	68	91.9	61	76.3	50	83.3

(<sup>^</sup>) RR = Response Rates

(\*) denotes questions were derived from the survey by Busse *et al*<sup>3</sup> with the exception of Question 5 (+).

In that question, we changed ‘pertussis/whooping cough’ to ‘H1N1 influenza’ since it is a more contemporary concern.

Table 2:

*Average scores of responses for positive attitudes toward vaccinations among CMCC students in the 2011-2012 Academic Year*

Class of	Mean Score	%	N	St. Dev	Max	Min
Year 4	19.3	87.7%	60	3.9	22	5
Year 3	18.5	84.2%	80	5.0	22	2
Year 2	19.8	90.0%	74	3.3	22	4
Year 1	18.4	83.9%	114	3.3	22	8

the statement supported vaccination or not. A score of ‘2’ indicated the most positive attitude toward vaccination, a score of ‘1’ indicated “undecided” and a score of ‘0’ indicated the most negative attitude toward the statement. For some questions, a ‘2’ may be associated with a “yes” (for example, the question “are you in favor of vaccines in general?”) and for other questions a ‘2’ would be associated with a “no” response (for example, the question “there is little scientific proof that immunization prevents infectious disease”). When we compared our responses with those from the Busse *et al*<sup>3</sup> study, we excluded questions that did not assess a respondent’s attitudes toward vaccination (for example, “did you receive all of your childhood vaccinations?” and “do you feel confident talking to patients about vaccines?”). In other words, we were able to analyze responses in our study to the same 11 questions that were used in the Busse *et al*<sup>3</sup> study. Although a few questions could be interpreted as inquiring about a student’s attitudes toward vaccination [‘do you think the elderly should be vaccinated annually with a flu shot’] we decided to discuss the questions not asked in the Busse *et al* study separately. This allowed for a statistical comparison of our results to those from Busse *et al*.<sup>3</sup> Using those 11 questions, therefore, the highest possible attainable score was ‘22’ (indicating the strongest favorable attitude toward vaccination) and ‘0’ being the lowest possible attainable score (indicating the strongest negative attitude toward vaccinations).

Table 3:

*Two-sample t-test with unequal variances of all 4 years between the Academic Year of 2011-2012 and Busse’s study of the Academic Year of 1999-2000*

Class of	t-value	P-value	Degrees of freedom
Year 4	-5.3728	0.0000	158.690
Year 3	-3.6256	0.0004	176.047
Year 2	-3.9500	0.0001	162.398
Year 1	-3.2701	0.0013	152.879

Based on the score out of 22, percentages of each response were calculated from the total number of responses. We performed a Welch’s t-test for two samples having possibly unequal variances to calculate if there were any statistically significant differences in the opinions between all students from our study to the Busse *et al*<sup>3</sup> study, as well as comparing students by year of study from our study to the students in each year of study to the previous study by Busse *et al*<sup>3</sup>.

### Results

The total response rate for the survey was 43% (328 of 760). Specifically, 114 of 199 first year students (57.2%), 74 of 192 second year students (38.5%), 80 of 186 third year students (43%) and 60 of 183 fourth year students (32.8%) responded to our survey. A list of the survey questions and the number of ‘yes’ responses per class are recorded in Table 1. Welch t-test scores are recorded in Table 2 and 3.

### Non-Attitudinal Questions

A number of questions in our survey sought to obtain general information from our respondents but did not ascertain any information with respect to the respondent’s attitudes toward vaccination. Less than 15.8% of all respondents received an annual flu shot (highest among first year students, lowest among third year students) and the number of students by academic year who had received

the vaccine against H1N1 showed a wide discrepancy, varying between 36.5% among second year students but only 8.75% among third year students. Roughly half to two-thirds of students thought the elderly should receive an annual flu shot.

Over 90% of respondents reported they had received their childhood vaccines (DPT, MMR), with the highest number (98.2%) among first year students and the lowest (90%) among fourth year students. Third year students, when asked if *'everyone should receive these vaccines?'* were least in favor (68.8%) whereas first year students were most in favor (78.9%). Numbers were similar when respondents specifically were asked if they thought children should be vaccinated against MMR, ranging from 89.2% among second year students to as low as 64.9% among first year students. Of particular note, when specifically asked if they thought there was a link between the MMR vaccine and autism, the highest number of respondents who thought there was were in third year (6.3%) but that percentage dropped to 0% by fourth year.

When asked *'would you want your children to be vaccinated against infectious disease with any currently recommended vaccine?'* responses were very consistent, varying between 80% and 83.8%. However, when asked if they supported vaccination to prevent against human papilloma virus (HPV), roughly two-thirds of first year students agreed but this number dropped for all successive years, to a low of 45% among fourth year students.

Three questions inquired about the respondent's opinion with respect to their perception of how well they have been educated on the topic of vaccination, how confident they would be to discuss this topic with patients and if they should be legally entitled to do so. Not surprisingly, only 1.8% of first year students thought the academic program at CMCC prepared them to discuss vaccination, but this number jumped to 44.6% by second year and 56.7% in third year (this is most likely due to the fact courses on immunology, pathology and public health are all positioned later in the academic program). Students were asked about their level of confidence in discussing vaccination with their patients. Specifically, only 14.9% of first year students stating they were confident to have that discussion; this number rose to 61.7% by fourth year. As far as legal entitlements, 60.5% of first year but 73.3% of fourth year students responded that they thought they

should have the right to speak to their patients about vaccination.

### *Attitudes toward vaccination*

We examined the responses from our survey to the same 11 questions asked by Busse *et al*<sup>3</sup>. Out of a possible high score of '22' (indicating most favorable attitude towards vaccination), the mean score for the first year class was 18.4 (standard deviation 3.3), the mean score for the second year class was 19.8 (standard deviation 3.3), the third year class had a mean score of 18.5 (standard deviation 5.0) and the fourth year class had a mean score of 19.3 (standard deviation 3.9); these results are listed in Table 2. When asked if *'the risk of adverse reaction to vaccines is acceptable if the majority of the population is protected against infectious disease?'* over 80% of current students throughout the program agreed with this statement, with the highest number among fourth year students (86.7%). Similarly, when asked *'there is little scientific proof that immunization prevents infectious disease'* 6.1% of current first year students but only 3.3% of current fourth year students agreed.

Students were asked their attitudes toward two similar statements. These were: *'vaccines have not substantially changed the incidence of any major infectious disease'* and *'vaccines actually cause more disease than they prevent'*. In general, very few students in any year of study agreed with either of these statements.

One interesting finding in our study was with respect to students' attitudes towards the H1N1 vaccine. Between 17% and 28.8% of students across the college felt that the risk of the H1N1 vaccine outweighs its usefulness in preventing the disease (Question 5), and no more than 15% of students in any one year stated they received an annual flu shot (Question 13).

When asked: *'are you in favor of vaccination in general'*, 80.7% of first years, 91.9% of second years, 76.3% of third years and 83.3% of fourth year agreed with this statement.

A comparison between CMCC students in the 2011-2012 academic year and students in the Busse *et al*'s study was then performed. Since we had independent samples in all cases, we did separate Welch t-tests for all four years independently. We used the Welch's t-test for two samples having possible unequal variances. Since our standard errors were in fact half the standard errors for the Busse *et*

Table 4:  
*Arguments Against Vaccination*<sup>9-11</sup>

i.	Immunizations are not effective
ii.	Vaccines are harmful
iii.	Vaccinations are unnecessary
iv.	Medical experts argue over the Effectiveness of Vaccinations
v.	Immunizations are a product of the Medical-Pharmaceutical Complex
vi.	Since vaccinations are compulsory, they infringe on a person's civil liberties
vii.	Accepting vaccination as a part of wellness is to repudiate chiropractic philosophy

*al*<sup>3</sup> study, we recognize that the data sets represent different populations. However, although we recognize this, we considered the robustness of the t-test as a validation of analysis. All four t-tests found a statistically significant difference between the two samples, with the current academic year having a more positive attitude towards vaccination (Table 3).

We reviewed aggregate scores from our survey to all attitudinal questions; this included the 11 common questions from the Busse *et al*<sup>3</sup> study as well as 5 other questions we developed. Out of a possible score out of '32' (indicating the most favorable attitude toward vaccination), first year students scored 26.3, second years scored 28.2, third year students 26 and fourth year students scored 27.1.

## Discussion

The chiropractic profession has had a long history of divergent opinions with respect to vaccination, and these attitudes have impacted perceptions among chiropractors, the political landscape as well as issues of jurisprudence and ethics.<sup>6-8</sup> There are many reasons why students and chiropractors may have negative attitudes toward vaccination (see Table 4), and although these reasons have been deconstructed in recent commentaries<sup>9-11</sup> and despite the accrual of scientific evidence demonstrating the effectiveness of vaccination in general, it is likely anti-vaccination attitudes will persist within the profession. It should be

mentioned that similar negative attitudes toward vaccines have been observed among naturopathic students.<sup>4</sup>

The results from our study were fundamentally different than the results of a virtually identical study conducted a decade earlier. Students in our study overall had a more positive attitude toward vaccination than they did in the Busse *et al*<sup>3</sup> study. The highest favorable score (by percentage) among students from the Busse study were second year students (73.2%); all students in our study had more favorable attitudes toward vaccination in each class (between 83.9% and 90%). Not only were more students in each year more favorably disposed toward vaccination in our study, but the second highest number of anti-vaccination attitudes were reported by fourth year students, a finding in stark contrast to the Busse's study where the lowest number of pro-vaccination attitudes were reported by fourth year students. Although the results of our study are statistically different than those from the Busse *et al*<sup>3</sup> study, since both studies were cross-sectional studies it can not be said with any certainty if this represents a trend toward a more favorable attitude with respect to vaccination among chiropractic students at CMCC.

## Limitations

The most significant limitation of our study is the response rate. In the Busse *et al*<sup>3</sup> study the overall response rate was 75.2%, and a relatively consistent number of students responded across all four years of study, ranging

from 112 to 121 (there were approximately 150 students in each year of study at that time). In our study, however, the response rate was 43% overall, and the number of respondents declined from a high of 114 respondents in first year (response rate of 57.2%) to a low of 60 respondents in fourth year (response rate 32.8%). This represents a significant non-response bias that disproportionately affected students in the later years of study. It is possible that students with anti-vaccination views chose not to respond to our survey. If that was indeed the case, and had those students responded, it would have significantly altered our results.

### Conclusion

When surveyed, students enrolled in the 2011-12 academic year at CMCC reported an overall consistently favourable attitude toward vaccination, with percentages ranging between 76.3% and 91.9%. The majority of respondents were in favour of having children and the elderly vaccinated, and few respondents believed there was a link between vaccination and autism. The majority of respondents thought they should have the legal right to discuss this topic with their patients (highest percentage among interns) and, not counting first year students, over half of respondents reported they were prepared to discuss this topic with their patients and felt confident enough to do so. In all categories and across all years of study, students in this survey reported favourable attitudes toward vaccination.

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