

# Association between media attention and presentation of vaccination information on Canadian chiropractors' websites: a prospective mixed-methods cohort study

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## Abstract

**Background:** Historically, some chiropractors have been critical of vaccination, and this has been the subject of recent media attention in Canada. We explored the association between media attention and public dissemination of vaccination information on Canadian chiropractors' websites.

**Methods:** In 2016, we identified all Canadian chiropractors' websites that provided information on vaccination by extracting details from the regulatory college website for each province using the search engine on their "find a chiropractor" page. We assessed the quality of information using the Web Resource Rating Tool (scores range from 0% [worst] to 100% [best]), determined whether vaccination was portrayed in a positive, neutral or negative manner, and conducted thematic analysis of vaccination content. We revisited all identified websites in 2019 to explore for changes to posted vaccination material.

**Results:** In July 2016, of 3733 chiropractic websites identified, 94 unique websites provided information on vaccination: 59 (63%) gave negative messaging, 19 (20%) were neutral and 16 (17%) were positive. The quality of vaccination content on the websites was generally poor, with a median Web Resource Rating Tool score of 19%. We identified 4 main themes: there are alternatives to vaccination, vaccines are harmful, evidence regarding vaccination and health policy regarding vaccination. From 2012 to 2016, there was 1 Canadian newspaper story concerning antivaccination statements by chiropractors, whereas 51 news articles were published on this topic between 2017 and 2019. In April 2019, 45 (48%) of the 94 websites we had identified in 2016 had removed all vaccination content or had been discontinued.

**Interpretation:** In 2016, a minority of Canadian chiropractors provided vaccination information on their websites, the majority of which portrayed vaccination negatively. After substantial national media attention, about half of all vaccination material on chiropractors' websites was removed within several years.

With about 9000 practitioners, chiropractic is Canada's third-largest regulated health care profession.<sup>1</sup> Twelve percent of Canadians, largely adults, report having attended a chiropractor in the previous 12 months, predominantly for conservative management of low back and neck pain.<sup>2,3</sup> The chiropractic profession comprises a range of providers, from evidence-based practitioners who focus on musculoskeletal complaints to traditional practitioners ("vitalists") who maintain historical beliefs that malpositioned spinal vertebrae ("subluxations") interfere with the nervous system, leading to a wide range of complaints and diseases.<sup>4</sup> Historically, some prominent chiropractors have been extremely critical of vaccination,<sup>5</sup> and some traditional practitioners maintain these attitudes.<sup>6,7</sup>

A survey of students attending the Canadian Memorial Chiropractic College showed that, in 2000, only 40% of

graduating students endorsed vaccination.<sup>8</sup> Readministration of the survey at the college in 2011/12 showed that 83% of graduating students were in favour of vaccines in general;<sup>9</sup> however, the repeat survey had a 33% response rate, versus 75% for the original administration. In a 2002 survey of all 643 licensed chiropractors in Alberta (response

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rate 78%), 27% reported that they advised their patients against vaccinating themselves or their children.<sup>10</sup>

Beginning in 2017, multiple national news stories highlighted antivaccination statements by Canadian chiropractors. We explored the prevalence and content of information regarding vaccination on Canadian chiropractors' websites and whether media attention was associated with any changes to such online material.

## Methods

### Setting

We conducted a prospective mixed-methods cohort study to explore the impact of media attention on vaccination content provided by Canadian chiropractors' websites between July 2016 and April 2019. We selected this period because from 2017 to 2019, there was considerable media attention regarding online antivaccination material by some Canadian chiropractors, which provided the opportunity for a natural experiment.

### Data sources

We considered all Canadian chiropractors' websites that provided information on vaccination as of July 2016. We generated a database of all licensed Canadian chiropractors in June 2015 by extracting details from the regulatory college website for each province using the search engine on their "find a chiropractor" page and leaving all fields blank so that every member was listed.<sup>11–21</sup> The Canadian Chiropractic Association's "find a chiro" search engine includes only the 10 provinces, and we could not find any online presence for chiropractic colleges in the Yukon Territory, the Northwest Territories or Nunavut.

For each licensed member, we performed a Google search with variations of his or her name, clinic name and location to determine which chiropractors maintained an English-language website. From July 2015 to March 2016, 2 reviewers (Y.K., A.M.A.) independently explored each unique website for vaccination content using the websites' search function with the root words vacc\* and immun\*. All identified websites with vaccination content were active as of July 22, 2016.

Two reviewers (Y.K., A.M.A.) independently evaluated the quality of all vaccination content using the Web Resource Rating Tool,<sup>22</sup> a 13-item tool that was developed in response to a 2012 systematic review that failed to identify any reliable and practical instrument focused on assessment of the quality of evidence used to support online information.<sup>22</sup> The Web Resource Rating Tool assesses the quality of evidence (e.g., "Is the Web resource informed by published systematic reviews/meta-analyses?"), transparency ("Are peer-reviewed sources provided for each claim/recommendation?") and usability (e.g., "Is the information easy to follow?") of online health information and assigns an overall score ranging from 0% to 100%, with higher scores representing better reporting quality, and a star rating, which ranges from 0 (lowest quality) to 5 (highest quality). The tool has been shown to be highly reliable, with an intraclass

correlation coefficient for the total score of 0.99.<sup>22</sup> The same pairs of reviewers classified each website as providing positive, negative or neutral information regarding vaccination. Any disagreements were resolved by discussion or by an arbitrator (J.W.B.) when necessary.

In April 2019, using the same review processes, we reviewed the same chiropractors' websites that we had identified in 2016 to determine any changes to their vaccination content following media attention to this issue (see media review below).

### Media review

After we had abstracted material on vaccination from chiropractors' websites in 2016, there were multiple national news stories highlighting antivaccination statements by Canadian chiropractors, including members of regulatory colleges.<sup>23–32</sup> We explored media trends on this topic by first searching Google, from Jan. 1, 2012, to Dec. 31, 2019, using the terms "chiropractor," "vaccination," "immunization" and "Canada" and limiting the search region to Canada. We then searched individual Canadian news sites (e.g., *Globe and Mail*, *National Post*, *Toronto Star*) with the same search terms. We reviewed each identified citation in full to confirm that the article discussed vaccination statements by Canadian chiropractors.

### Statistical analysis

We generated frequencies for all collected data. Categorical data were reported as proportions and continuous data as means and standard deviations if normally distributed and as medians and interquartile ranges if not. We aggregated Web Resource Rating Tool scores for websites providing positive and neutral information and used an independent samples Mann–Whitney test to explore for differences between scores from websites providing negative portrayals. All comparisons were 2-tailed, and we set our level of significance at  $p < 0.05$ . We performed all analyses using SPSS Statistics, version 25.0 (IBM Corp.).

### Thematic analysis

We used thematic analysis to synthesize information regarding vaccination provided on chiropractors' websites into meaningful themes and subthemes.<sup>33,34</sup> Two reviewers (Y.K., A.M.A.) used an open coding process to establish the primary categories of information from relevant material from each website, independently and in duplicate, and then connected the categories to derive main themes. Any disagreements were resolved by discussion. Five team members (Y.K., A.M.A., S.N., A.G., J.W.B.) then reviewed the results and confirmed the main themes and subthemes of our study findings.

### Ethics approval

As per Article 2.2 (a) of the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*, research is exempt from research ethics board review if it relies exclusively on publicly available information that is legally accessible to the public and protected by law.<sup>35</sup>

## Results

We identified 9131 registered Canadian chiropractors in the 10 provinces, who were associated with 3733 publicly available websites in 2016 (Figure 1, Table 1). Most websites (3590 [96.2%]) did not mention vaccination or immunization. The remaining 143 websites (3.8%) provided vaccination content, which reduced to 94 unique root domain websites (e.g., some chiropractors' websites contained multiple pages with information regarding vaccination).

The majority (59/94 [63%]) of websites providing information on vaccination were negative in their messaging, 19 (20%) were neutral, and 16 (17%) were positive (Appendix 1, available at [www.cmajopen.ca/content/8/2/E338/suppl/DC1](http://www.cmajopen.ca/content/8/2/E338/suppl/DC1)). The quality of vaccination content was generally poor, with a median Web Resource Rating Tool score of 19% (interquartile range 14%–30%). The quality did not differ based on whether the messaging was negative or not ( $p = 0.48$ ) (Table 2).

### Thematic analysis

We identified 4 main themes that emerged from our analysis of chiropractors' website vaccination content in 2016: there are effective alternatives to vaccination, vaccines are danger-

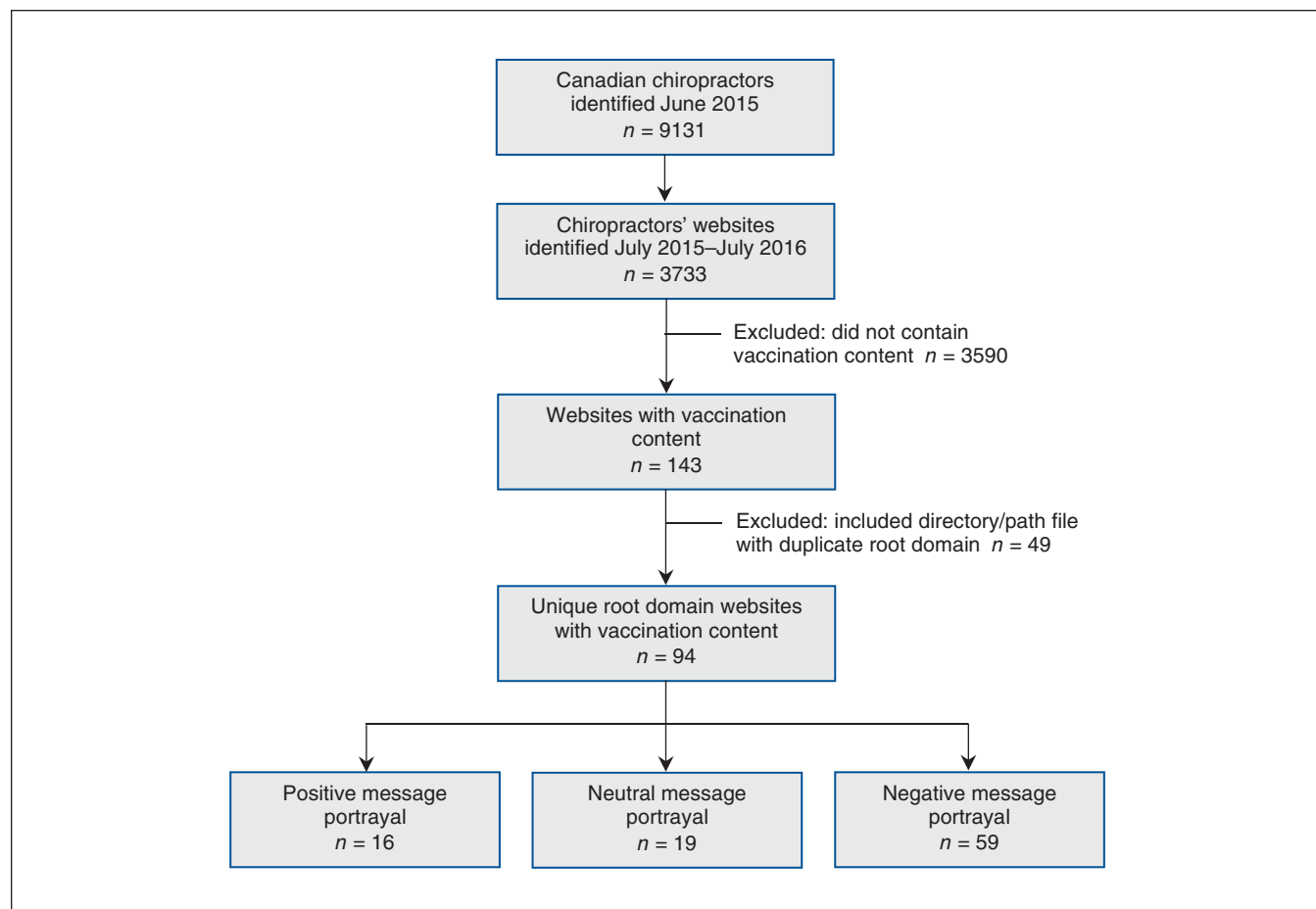
ous, evidence regarding vaccination and health policy regarding vaccination (Table 3). Representative quotes are presented in Table 4. Of the 16 websites with positive messaging, 15 (94%) provided statements that vaccination had been established as effective. Among the 19 websites with neutral messaging, the most common statement (endorsed by 7 websites) was that the public should be provided with the current best evidence regarding vaccination in order to make informed decisions. Of the 59 websites with negative messaging, 51 (86%) made claims that vaccination was dangerous.

### There are effective alternatives to vaccination

Twenty-one websites indicated that chiropractic care was an alternative to vaccination. Another 14 websites suggested that naturopathic remedies could replace vaccination. Five websites promoted environmental improvements rather than vaccines as responsible for falling rates of vaccine-preventable diseases.

### Vaccines are dangerous

Most websites portraying vaccination negatively included content that attributed severe adverse effects to vaccines or concluded that vaccines caused disease. Twenty-six websites made claims that vaccines contain harmful components, such as formaldehyde, aluminum and mercury.



**Figure 1:** Flow diagram showing identification of Canadian chiropractors' websites with vaccination content.

**Table 1: Canadian chiropractors and English-language websites identified, by province, 2016**

Province	No. (%) of chiropractors <i>n</i> = 9131	No. (%) of chiropractic websites <i>n</i> = 3733	No. of chiropractic websites with vaccination content <i>n</i> = 143
British Columbia	803 (8.8)	285 (7.6)	7
Alberta	726 (8.0)	302 (8.1)	5
Saskatchewan	184 (2.0)	41 (1.1)	0
Manitoba	319 (3.5)	132 (3.5)	9
Ontario	5797 (63.5)	2461 (65.9)	106
Quebec	1003 (11.0)	373 (10.0)	3
New Brunswick	79 (0.9)	32 (0.9)	7
Nova Scotia	148 (1.6)	76 (2.0)	4
Prince Edward Island	7 (0.1)	5 (0.1)	0
Newfoundland and Labrador	65 (0.7)	26 (0.7)	2

**Table 2: Quality of vaccination content on chiropractic websites in 2016 as assessed with the Web Resource Rating Tool**

Component	Positive messaging <i>n</i> = 16	Neutral messaging <i>n</i> = 19	Negative messaging <i>n</i> = 59
Median score* (IQR)	18 (12–19)	22 (14–39)	21 (14–32)
Star rating, † no. (%) of websites			
0	14 (88)	13 (68)	4 (7)
1	1 (6)	5 (26)	34 (58)
2	1 (6)	1 (5)	11 (19)
3	0 (0)	0 (0)	9 (15)
4	0 (0)	0 (0)	1 (2)

Note: IQR = interquartile range.  
 \*Rated from 0% to 100%, with higher scores representing better reporting quality.  
 †0 = lowest quality, 5 = highest quality.

### Evidence regarding vaccination

Although many websites commented on the evidence for vaccination, most such sites claimed there was evidence of ineffectiveness. Some sites claimed the evidence was biased or was presented selectively to highlight potential benefits and downplay possible harms, or that evidence was conflicting and there was still uncertainty regarding the harms of vaccination.

Fifteen websites acknowledged that current evidence was supportive of vaccination, and these largely highlighted the position statement of the Canadian Chiropractic Association.<sup>36</sup>

### Health policy regarding vaccination

A minority of websites (17) provided content regarding vaccination policy, with most claiming that the dangers of contracting certain vaccine-targeted infections had been exagger-

ated, as had the effectiveness of some vaccines. The majority of such claims focused on influenza. Other subthemes were that industry was active in lobbying for health care policy that would benefit companies financially. Some sites claimed that mandatory vaccination was an infringement on personal liberty and provided links to the National Vaccine Information Center website, a leading source of antivaccination views,<sup>37</sup> and advised that the public should be better educated about vaccination in order to make informed decisions.

### Vaccination content following media attention

We found only 1 Canadian newspaper article on chiropractic and vaccination from 2012 to 2016; however, from 2017 to 2019, there was a substantial increase in media stories regarding this topic, with 3 published in 2017, 21 in 2018, and 27 in 2019 (Figure 2).

In 2019, several years after Canadian media outlets began exploring antivaccination statements by some chiropractors, almost half of the websites we identified in 2016 (45/94 [48%]) had been discontinued, or all content regarding vaccination had been removed. This predominantly involved sites that had published information portraying vaccination negatively; specifically, 33 (73%) of 45 websites with negative messaging had been discontinued or their vaccination content removed. Of the 49 websites that were still active in 2019, 26 (53%) provided negative information regarding vaccination (Appendix 2, available at [www.cmajopen.ca/content/8/2/E338/suppl/DC1](http://www.cmajopen.ca/content/8/2/E338/suppl/DC1)).

### Interpretation

In 2016, there were 3733 active websites maintained by Canadian chiropractors, 4% of which provided information regarding vaccination, the majority of which was negative. The quality of vaccination information was generally poor, and common themes were that there are effective alternatives to vaccination; vaccines are dangerous and can cause disease; the evidence on vaccination is often biased, conflicting or shows that vaccines are ineffective; and vaccination should not be mandatory. In 2019, following a large increase in national media attention to anti-vaccination statements by some Canadian chiropractors (including members of regulatory colleges), about half of chiropractors' websites providing information on vaccination were discontinued or the information regarding vaccination was removed.

The Canadian Chiropractic Association is supportive of vaccination and has published a statement that vaccination is not within the scope of practice for chiropractors,<sup>38</sup> a position that is supported by 4 provincial regulatory colleges (Appendix 3, available at [www.cmajopen.ca/content/8/2/E338/suppl/DC1](http://www.cmajopen.ca/content/8/2/E338/suppl/DC1)). However, the history of regulating information on vaccination by chiropractic colleges is complex. In

**Table 3: Themes and subthemes of vaccination content from chiropractors' websites in 2016**

Theme; subtheme	Frequency of endorsement
<b>There are effective alternatives to vaccination</b>	
Chiropractic can boost immunity	21
Naturopathy can boost immunity	14
Better living conditions, improved sanitation and improved nutrition are more effective than vaccination	5
<b>Vaccines are dangerous</b>	
Cause severe adverse effects	51
Have toxic components (e.g., mercury)	26
Compromise immunity	22
Cause autism	14
Increase rates of various chronic diseases	13
Cause Guillain-Barré syndrome	9
Cause allergies	8
Cause sudden infant death syndrome	5
Cause asthma	5
Increase risk of cancer	4
Cause diabetes	3
Cause attention deficit hyperactivity disorder	2
Cause Crohn disease	2
Cause shingles	2
Increase risk of Alzheimer disease	2
Cause ear infections	1
<b>Evidence regarding vaccination</b>	
There is insufficient evidence to support vaccination	51
Evidence in favour of vaccination is poor quality and/or biased	20
Evidence supports vaccination as effective	15
Evidence for vaccination is conflicting	7
Evidence suggests that the harms of vaccination outweigh the benefits	2
<b>Health policy regarding vaccination</b>	
Dangers of vaccine-targeted diseases are exaggerated by public health agencies and the media	17
Vaccines should not be mandatory	15
The Centers for Disease Control and Prevention has important conflicts of interest regarding vaccination	11
The public should be better educated about vaccination	7

2004, following media attention on antivaccination statements by some chiropractors, the College of Chiropractors of Ontario (CCO) approved a Standard of Practice (S-015) requiring their members to refrain from discussing vaccina-

tion with patients or the general public. Traditional chiropractors disagreed strongly with this standard, and some responded by seeking and acquiring elected positions on the CCO council.<sup>31,39</sup>

The change in leadership at the CCO appears to have had several consequences. According to some media reports,<sup>31,40</sup> Standard of Practice S-015 was not enforced. In addition, the standard (which was later incorporated into Standard of Practice S-001) was revised on Feb. 8, 2011 to allow chiropractors to provide “balanced” information on vaccination to the public.<sup>39</sup> Similar issues may have affected the British Columbia College of Chiropractors.<sup>41</sup>

Following recent media attention, the CCO Standard of Practice S-001 was amended in 2018 and 2019 to prohibit chiropractors from “providing information on vaccination on a member’s website or social media account.”<sup>42</sup> On Dec. 2, 2019, the Canadian Chiropractic Association updated its position statement to state explicitly that vaccination and immunization are safe and effective public health practices for the prevention of infectious diseases.<sup>43</sup>

The Canadian media have drawn attention to antivaccination statements by chiropractors and seemingly had a large impact on curbing publication of such online material. Although this is laudable, chiropractic regulatory colleges should monitor chiropractors’ websites and social media accounts for misleading information and enforce their Standards of Practice. It may also be helpful for medical and public health associations to work with Canadian chiropractic associations to collaborate on promotion of vaccination programs,<sup>44–46</sup> as has been done by the American Public Health Association.<sup>47</sup>

## Limitations

Strengths of our study include a rigorous approach to identify all practising chiropractors in Canada and any associated websites. In addition, rating of the quality of vaccine information, thematic analysis and the overall messaging (i.e., positive, neutral or negative) was conducted independently and in duplicate by pairs of reviewers to increase reliability. Our study is limited by the dynamic nature of the Internet, where websites can appear, disappear or be moved to other addresses overnight. We included only English-language websites, and our findings may not extend to websites in other languages. It is possible that our search of chiropractic college membership lists did not identify all practitioners; however, we identified 9131 chiropractors, and the Canadian Chiropractic Association advises there are about 9000 licensed chiropractors practising in Canada,<sup>1</sup> which suggests that our results were comprehensive.

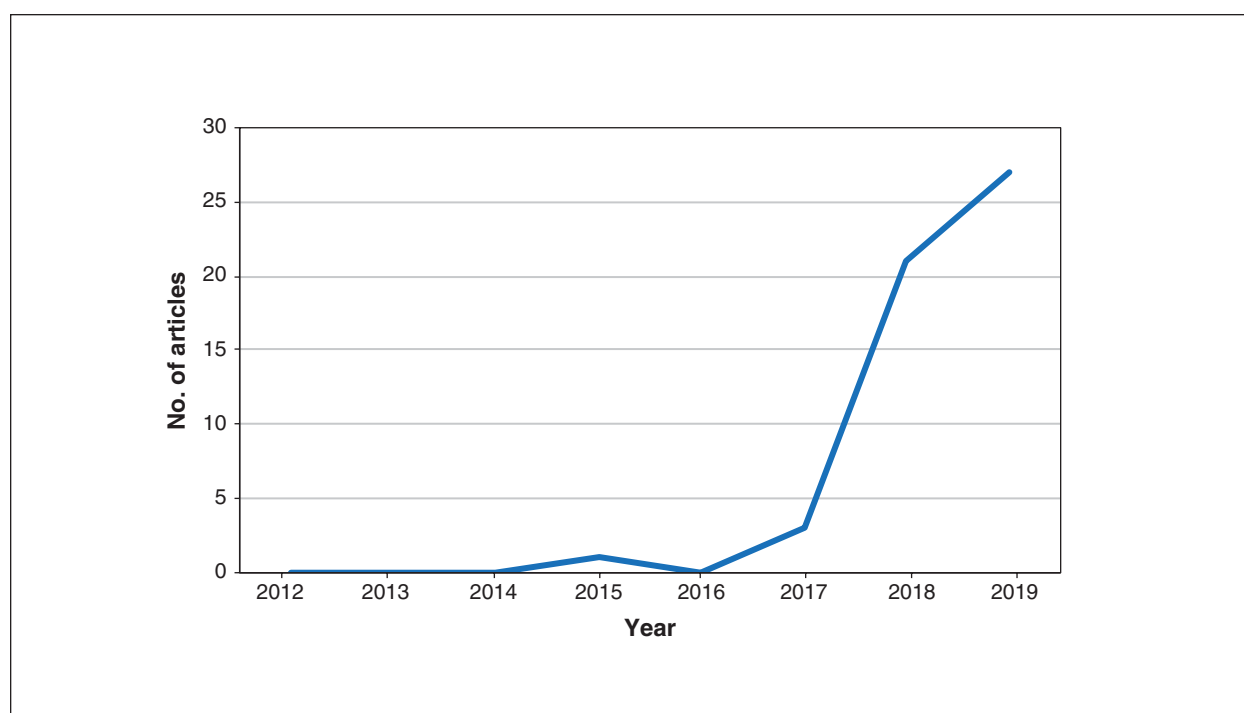
Our study was not designed to make causal attributions between media attention and removal of information regarding vaccination from chiropractors’ websites, and other factors may have influenced these decisions. For example, on Mar. 14, 2019, the CCO issued a Professional Advisory instructing their members not to offer advice on vaccination;<sup>48</sup> however, this advisory may also have been influenced by media attention, including negative media



**Table 4: Quotes illustrating themes**

Theme	Representative quotes*
There are effective alternatives to vaccination	<p>People who receive regular chiropractic adjustments have immune system competency that is 200% greater than those who don't. (<a href="http://wellingtonchiropracticandwellnessgroup.com/health_page.php?page=/dcnewsletter/jan11">http://wellingtonchiropracticandwellnessgroup.com/health_page.php?page=/dcnewsletter/jan11</a>)</p> <p>A healthy alternative to the conventional flu shot is a homeopathic natural immune boost shot. Homeopathy works by gently stimulating the body's innate ability to heal itself and there are virtually no side effects. (<a href="http://www.mypurebalance.ca/health-programs/natural-immune-boost-for-flu/">www.mypurebalance.ca/health-programs/natural-immune-boost-for-flu/</a>)</p> <p>In light of these vital statistics, Palevsky finds it more reasonable to assume that the reason for the reduction in incidence and mortality rates of these diseases was predominantly due to the implementation of other public health strategies, including: clean water, better living conditions, improved sanitation and improved nutrition, than to the introduction of vaccines. (<a href="https://dynamishealthcentre.com/articlesresources/vaccinations/points-of-doubt-regarding-vaccine-efficacy/">https://dynamishealthcentre.com/articlesresources/vaccinations/points-of-doubt-regarding-vaccine-efficacy/</a>)</p>
Vaccines are dangerous	<p>Vaccinations seem to, at least temporarily, increase one type of immunity while decreasing general immunity to many other forms of viruses and other ailments. (<a href="http://www.minoruchiropractic.com/article/2253.html">www.minoruchiropractic.com/article/2253.html</a>)</p> <p>There is a growing concern that one of the major threats to the development of healthy immune systems has been the increasing emphasis on artificial immunity through vaccines. ... At the same time, rates of asthma, autism, allergies, digestive disorders, autoimmune diseases, cancer, and many other chronic conditions are also rising. Many scientists, chiropractors, medical doctors and parents have become alarmed that this massive volume and combination of inoculations is jeopardizing the long-term health of individuals and future generations. (<a href="http://paramountfamilychiropractic.com/hylnet/clientapp/healtharticles.php?id=214">http://paramountfamilychiropractic.com/hylnet/clientapp/healtharticles.php?id=214</a>)</p> <p>A shocking research study published on May 4, 2011, shows a link between the number of vaccinations given to infants and an increase in infant mortality rate. (<a href="http://www.focuschiropractic.ca/article/2177.html">www.focuschiropractic.ca/article/2177.html</a>)</p> <p>The final ingredient in a vaccine is a stabilizer like formaldehyde, a known cancer-causing agent for which there is no safe allowable limit for your body. (<a href="http://www.alconachiropractic.ca/hylnet/clientapp/healtharticles.php?id=214">www.alconachiropractic.ca/hylnet/clientapp/healtharticles.php?id=214</a>)</p> <p>Joseph Mercola, M.D., says that many authors have noted a direct correlation between the number of flu shots and the incidence of Alzheimer's, attributed to the aluminum and mercury in every flu shot. (<a href="http://nrfc.ca/187/the-flu-shot/">http://nrfc.ca/187/the-flu-shot/</a>)</p>
Evidence regarding vaccination	<p>Mass vaccination was halted in Third World countries because it didn't work. (<a href="http://chetday.com/smallpoxepidemic.htm">http://chetday.com/smallpoxepidemic.htm</a>)</p> <p>Just like all vaccines there are side-effects with the flu shot. The [Centres for Disease Control and Prevention] and other organizations would have you overlook them for the supposed benefit of being inoculated against the flu. (<a href="http://nrfc.ca/187/the-flu-shot/">http://nrfc.ca/187/the-flu-shot/</a>)</p> <p>Research linking autism to vaccines is conflicting. Thimerosal, a preservative in vaccines that is 49 percent ethyl mercury, was removed from childhood immunizations in 2001. However, some flu vaccines may still contain thimerosal. (<a href="http://www.edwinlauchiropractic.com/newsletters/OHU-2009%2001-12.pdf">www.edwinlauchiropractic.com/newsletters/OHU-2009%2001-12.pdf</a>)</p> <p>The Canadian Chiropractic Association recognizes that vaccination and immunization are established public health practices in the prevention of infectious diseases. (<a href="http://www.physioimed.ca/blog/general-tips/surviving-cold-flu-season/">www.physioimed.ca/blog/general-tips/surviving-cold-flu-season/</a>)</p>
Health policy regarding vaccination	<p>The flu vaccine may not give the benefits that were previously advertised. (<a href="http://www.focuschiropractic.ca/article/1793.html">www.focuschiropractic.ca/article/1793.html</a>)</p> <p>A February 11, 2007 story appearing in the <i>Washington Post</i> and no less than 72 different news publications has exposed the fact that a major drug company, Merck &amp; Co. is behind the large lobbying effort to have 18 states pass laws making their vaccine required for 6th grade girls. If these laws pass, Merck, which last year showed revenues of \$22.6 billion, stands to earn hundreds of millions of dollars. (<a href="http://www.robieatspringgardenchiropractic.com/article/1592.html">www.robieatspringgardenchiropractic.com/article/1592.html</a>)</p> <p>As more vaccines have been recommended and mandated by government health officials, [the National Vaccine Information Center] is receiving more reports from Americans describing how they are being harassed for trying to make informed vaccine choices for themselves and their children. (<a href="http://www.nvic.org/reporting-systems.aspx">www.nvic.org/reporting-systems.aspx</a>)</p> <p>Vaccinations are a controversial subject and it's imperative to inform yourself before deciding whether or not to vaccinate yourself or those under your care. (<a href="https://dynamishealthcentre.com/articlesresources/vaccinations/">https://dynamishealthcentre.com/articlesresources/vaccinations/</a>)</p>

\*These quotes were active on chiropractors' websites as of July 2016.



**Figure 2:** Frequency of Canadian news articles regarding vaccination statements by chiropractors, 2012–2019.

attention specifically targeting antivaccination statements made by CCO council members in executive positions.<sup>32</sup>

Finally, our study captured only vaccine information on chiropractors' websites, which does not represent the frequency of discussion with patients on this topic.

## Conclusion

Although a minority of Canadian chiropractors provided vaccination content on their websites, the quality of information was often poor, and most sites did not explicitly support vaccination. Following national media attention, almost half of all such online material was removed.

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