

Uncovering Public Perceptions of Older Adults' Vaccines in Canada: A Study of Online Discussions from National Media Sources

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Résumé

Cette étude a exploré les perceptions associées aux vaccins pour les personnes âgées chez un sous-groupe de Canadiens par l'intermédiaire d'une analyse qualitative de commentaires postés en réponse à des articles de nouvelles nationales publiés sur internet. Une analyse thématique réflexive de 147 commentaires provenant de 31 sections de commentaires d'articles de journaux publiés en ligne entre 2015 et 2020 par cinq sources de nouvelles nationales (CBC, National Post, Global News, Globe & Mail, Huffington Post Canada) a été effectuée. Ces articles portaient sur trois maladies et les vaccins correspondants destinés aux personnes âgées : la grippe, le pneumocoque et le zona (herpès zoster). Trois thèmes ont permis de regrouper les similitudes et les différences dans les débats visant ces trois maladies : 1) l'influence des expériences personnelles sur la position déclarée quant à l'adoption ou au rejet des vaccins, 2) la remise en question de la recherche et des recommandations liées aux vaccins, et 3) les critiques ciblant les inégalités dans l'accès aux vaccins offerts par les gouvernements des diverses provinces canadiennes. Les résultats ont mis en évidence que les perceptions concernant la vaccination des personnes âgées dépendaient du type de vaccin. Des suggestions s'appuyant sur ces résultats sont émises pour les futurs chercheurs, et soulignent notamment la nécessité de ne pas traiter le sujet de la recherche sur les « vaccins pour les personnes âgées » de façon monolithique. Une meilleure compréhension des perceptions associées aux vaccins pour les personnes âgées au Canada permettra aux professionnels de la santé publique d'élaborer des stratégies de communication efficaces qui, ultimement, amélioreront les taux de vaccination des personnes âgées.

Abstract

This study explored how a subsection of Canadians perceive older adults' vaccines through a qualitative analysis of comments posted in response to national online news articles. We used reflexive thematic analysis to analyse 147 comments from 31 news article comments sections published between 2015 and 2020 from five different national online news sources (CBC, National Post, Global News, Globe & Mail, and Huffington Post Canada) that focused on three older adults' diseases and vaccines: influenza, pneumococcal pneumonia, and herpes-zoster. Three themes encompassed the similarities and differences in how these three diseases were discussed: (1) the importance of personal experiences on stated stance in vaccine uptake or refusal, (2) questioning vaccine research and recommendations, and (3) criticisms of the government's unequal vaccine opportunities across different Canadian provinces. Our findings identified that perceptions regarding older adult vaccination were dependent on the vaccine type, and, therefore, we make suggestions for future researchers to build on our findings, particularly the need not to treat the research subject of "older adults' vaccines" as one entity. Gaining a better understanding of how older adults' vaccines are perceived in Canada will enable public health professionals to develop effective communication strategies that should ultimately improve vaccination rates for older adults.

In Canada, the rates of vaccine uptake in older adults remains low, particularly compared with that in other countries (National Institute on Ageing, 2018). While Canada's goal for national vaccination rates has been set at 80 per cent, the rate of coverage for older adults remains below this goal for influenza, pneumococcal pneumonia, and herpes-zoster (referred to as "shingles" for the remainder of this article) (Public Health Agency of Canada, 2019). Recent Canadian research examining older adults' perceptions of these vaccines has attempted to understand why older adults' vaccination targets are not being met (MacDougall et al., 2016; Schneeberg et al., 2014).

In this article, we report on an exploratory study in which we analysed comment sections in Canadian online news articles relating to older adults' vaccines. Unlike traditional print news

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articles, online news articles often feature immediate interactivity through a dedicated section that allows readers to post comments. This feature allows for the expression of diverse opinions, and analysis of these comments can be viewed as a way to access “public” perceptions that have not been influenced by the presence of a researcher (Gregg, Patel, Patel, & O’Connor, 2017; Kozinets, 2020.) Once collected, this type of data can be analysed similarly to traditional interview or focus group data, using qualitative and quantitative methods. For this study, we used a qualitative approach—Braun and Clarke’s Reflexive Thematic Analysis (Braun & Clarke, 2006)—and a realist framework (Pawson, 2006) to inductively identify themes in the online news article comments at the semantic level (Braun & Clarke, 2006). Braun and Clarke’s reflexive thematic analysis works well with research that is attempting to understand people’s experiences (Braun & Clarke, 2006), and using a realist framework meant that we took the discussions at face value, describing what participants were discussing online (Pawson, 2006). Through this analysis, we begin to identify how older adults’ vaccines are being discussed in these online news article comment sections, and we make recommendations for future researchers to build on our findings.

Research examining Canadian older adults’ perceptions of the effectiveness and value of vaccines has helped to shed light on some of the reasons for low vaccine uptake. Results from a nationally representative study revealed a low awareness of the need for adult vaccines, with participants believing that all important vaccines were administered in childhood (MacDougall *et al.*, 2015). Another survey revealed that the most common reason that older adults refused influenza, pneumonia, and shingles vaccines was the belief that the vaccines were unnecessary (Public Health Agency of Canada, 2019). Other survey research with Canadian older adults has revealed that many were unaware that they are at risk for influenza-related complications (Andrew, Gilca, Waite, & Pereira, 2019; Pereira, Gilca, Waite, & Andrew, 2019). Finally, vaccine cost (Pereira *et al.*, 2019; Public Health Agency of Canada, 2019) and mistrust in both pharmaceutical companies and government agencies have been common barriers to vaccine uptake (Dubé *et al.*, 2016; MacDougall *et al.*, 2015). Still, while common barriers exist for older adults’ vaccine uptake, perceptions regarding adult vaccination can vary according to vaccine type (MacDougall *et al.*, 2015). Specific to the pneumococcal pneumonia vaccine, older adults who were unvaccinated reported that they had never heard of the vaccine (Public Health Agency of Canada, 2019; Schneeberg *et al.*, 2014), and pneumococcal pneumonia vaccine coverage for older adults has been found to be significantly higher in females than males (McLaughlin *et al.*, 2019; Public Health Agency of Canada, 2019).

Although these findings can help inform practical guidelines to increase vaccination rates, further research is needed to address the gap in knowledge and practice. Specifically, qualitative research on vaccine perceptions and the vehicles through which misinformation is being transmitted, such as social media, have been recommended to increase vaccination uptake (Brewer, Chapman, Rothman, Leask, & Kempe, 2017; De Maeseneer, Anastasy, Bourek, & Barry, 2019). One specific type of social media—comments appended to online news articles—has been recognized as a valuable way to document public opinion, particularly because researcher intervention is not required, therefore making it less time consuming, resource intensive, and expensive (Thomas-Meyer, Mytton, & Adams, 2017) Using online comments is an especially effective approach for understanding public communal perceptions, as the method does not involve any artificial settings or

constructs. Subjects are not posed any specific questions, but instead they comment on whatever the news article and others’ comments elicit. In some ways, social media provides a way for more people to be included in research: when compared with traditional methods, such as interviews or surveys, participating in a social media discussion has a lower threshold for public involvement (Evans-Cowley & Griffin, 2012). Online newspaper articles are usually archived, which means that researchers can access not only current but also past discussions, adding a temporal component and consequently widening the scope of research (Lynch & Mah, 2018). Still, these practical benefits must also be considered in light of such factors as ethical questions and the trustworthiness of data (Kozinets, 2020; Markham & Buchanan, 2012; Tiidenberg, 2018). Regardless of the challenges, researchers have increasingly advocated for utilizing social media for health research applications (Rowbotham, McKinnon, Leach, Lamberts, & Hawe, 2019; Sinnenberg *et al.*, 2016).

Previous research examining Canadian online news article comments about vaccines (although not specific to older adults) has found that these comment sections contain inaccurate beliefs regarding vaccines (Feinberg *et al.*, 2015; Henrich & Holmes, 2011; Meyer *et al.*, 2016; Pereira *et al.*, 2013, 2019). Adding to this literature through an analysis of comments attached to online news articles about older adults’ vaccines specifically, the present study seeks to increase our understanding of Canadians’ perceptions of vaccines for this population.

Materials and Methods

Data Collection

This article does not contain any studies with human participants performed by any of the authors. However, we followed the ethical recommendations of previous researchers who used publicly available social media data. For example, although we used exact wording from the social media discussions in the Results and Discussion sections, we protected participants’ identities by omitting participants’ names/nicknames or any identifying characteristics (Giles & Adams, 2015; Gregg *et al.*, 2017; Markham & Buchanan, 2012; Mcdermott, Roen, & Piela, 2013).

Figure 1 provides our data collection process, which covered online news articles published between October 2015 and January 2020. We first identified Canadian news Web sites using a combination of first-hand searching of six Web sites that listed Canadian national news sources and examining the sources used in previous Canadian studies of online news article comment sections (Feinberg *et al.*, 2015; Henrich & Holmes, 2011; Meyer *et al.*, 2016; Pereira *et al.*, 2013). This search ended when we could not identify any more national-level Canadian news Web sites. We identified seven Canadian online news Web sites: CBC, National Post, Globe & Mail, CTV News, Global News, Macleans, and Huffington Post Canada. We excluded two online news Web sites (CTV News and Macleans) because they did not allow for comments to be posted in response to their articles.

On each of the remaining five online news Web sites, we conducted a preliminary search to identify key search terms used in articles on older adults’ vaccines. We determined that the term “seniors vaccine” was most frequently used in these articles. We then searched for articles on each Web site and included any article that met the following inclusion criterion: it contained the key term

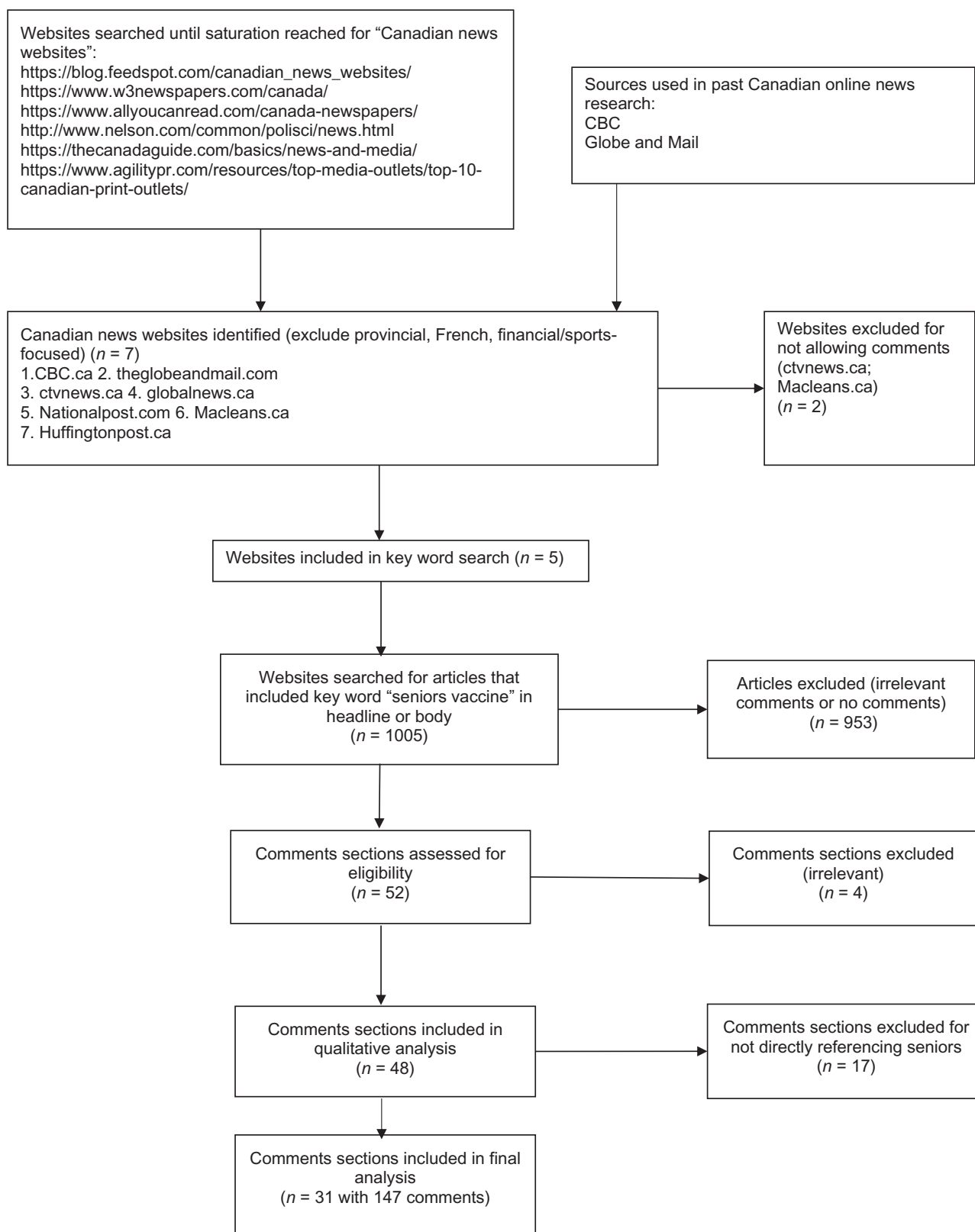


Figure 1. Flow diagram of inclusion and exclusion of articles and comments

“seniors vaccines” anywhere in the article body or the title. A total of 1,005 articles were identified in this search. The 1,005 articles were searched to determine if they included relevant comments. From this search, 953 articles were excluded because they did not include comments or the comment sections were deemed irrelevant to our study. Irrelevance of comment sections was determined through discussions between authors Lynch and Thomas. The remaining 52 comment sections were imported into NVivo 12 (QSR International), a qualitative analysis software, for coding and analysis.

Working in NVivo, we next conducted a final assessment of the eligibility of the 52 comments sections and following discussions among all three authors, and we excluded an additional 4 comment sections for being irrelevant to our study goal.

Finally, we searched the 48 remaining comment sections with the following key terms: senior, elder, granny, grandma, grandpa, long term care, frail, old, retire, veteran. These key terms were identified through previous articles as well as through recurring terms in the online news articles themselves. Through this search, we identified 31 comment sections that included 147 individual comments referencing older adults’ vaccines. In sum, 147 individual comments that directly referenced older adults were drawn from 31 news article comments sections from five national online news Web sites (CBC, National Post, Global News, Globe & Mail, Huffington Post Canada) and were included in the final analysis.

Analysis

Analysis of the data followed the five-step reflexive thematic analysis approach as detailed by Braun and Clarke (2006). An important aspect of reflexive thematic analysis is how unique it is in that it is not restricted to any particular theoretical framework and can be used within numerous theoretical frameworks. Thus, Braun and Clarke (2006) emphasize that researchers using this approach need to explicitly state their theoretical framework and approach to data coding when reporting their results. For our analysis of the online news comments, we applied an inductive approach to data coding. Using this approach, the codes and themes were derived from the content of the data themselves—so that what we mapped during analysis closely matched the content of the data. We applied a realist framework, which aims to provide explanations of the experiences, meanings, and realities of the participants (Pawson, 2006). Through this framework, we identified themes at the semantic level, which refers to the explicit or surface meaning of the data (Braun & Clarke, 2006). In the following paragraph, we describe the five-step reflexive thematic analysis of the online news article comments.

First, we familiarized ourselves with the data by reading and rereading the online comment sections. We made notes on the data and asked questions such as this: How do participants make sense of their experiences? Second, we generated initial codes, which identified and provided a label for a feature of the data potentially relevant to our research question. For example, initial codes included “money” and “mainstream media.” As our coding progressed, we modified existing codes to incorporate new material. Third, we created themes, which involved collapsing or clustering codes that seemed to share some unifying feature, so that themes reflected and described a coherent and meaningful pattern in the data. This phase also involved reviewing the coded data to identify areas of similarity and overlap among codes. Fourth, we reviewed developing themes in relation to the coded data and entire data set. Key questions included the following: What are the boundaries of this theme (what does it include and exclude)? Fifth, we defined and

named themes by ensuring that each had a clear focus, scope, and purpose, and that together the themes provided a coherent overall story respecting the data. As a result of this process, three major themes were developed.

Data Profile

We noted that commenters appeared to be older adults themselves (“I got my flu shot still in November. I hope that all seniors did the same”); individuals caring for older adults (“I now have to pay unless they will give me an exemption because my 90-year-old mother and I live together.”); and those who did not mention personal characteristics but were expressing opinions on older adults’ vaccines (“\$75 is more than most single seniors spend on food in a week. Since when did we decide that the poor should choose between important medication and food?”). We included all these comments in the analysis, as they enabled us to build a stronger picture of how this subsection of Canadians perceive older adults’ vaccines.

Results

Analysis of the online news article comments suggested that the public views different vaccines for older adults in distinct ways. In particular, as we discuss in the following three themes, we noted clear differences between comments about influenza and pneumonia and those about shingles. These findings have implications for how public health leaders can communicate messages encouraging vaccine uptake amongst older adults.

“Rooted In Experience”: The Importance of Personal Experiences as the Reason for One’s Stance on Vaccine Uptake or Refusal

Personal experiences shaping stances on vaccine uptake or refusal was the most prevalent theme in both the breadth and depth of comments that featured strongly worded, emotional language. This theme included all comments referring to a disease or vaccine experience that were standalone comments (i.e., not replying to a vaccine effectiveness question) and excluded any comment questioning vaccine effectiveness. We observed how participants described both variable experiences with pneumonia and influenza and expressed variable opinions on being either in favour or against the vaccines for these diseases. In contrast, participants described exclusively negative experiences with shingles, which resulted in their being both in favour of the vaccine and in persuading other participants to get vaccinated.

First, when participants discussed their experiences with both influenza and pneumonia, we observed a mix of comments encouraging and discouraging vaccines, such as that of the following participant who described a negative experience with influenza.

I never bothered with the flu shot before either. Christmas 2018 I was stuck in isolation at the hospital for four days with influenza A virus. Have never been so miserable and sick in my life. I can tell you for certain I do not ever want to relive that experience, so even if the flu shot only works half the time, bloody right I’m going to up my chances of not getting sick. Anyone silly enough to think otherwise is just rolling the dice with higher odds of getting sick. I should have known better considering my grandmother got her flu shot every year religiously until she turned 100... she didn’t make it to get one that year... she got the flu... and died just before her 101st birthday. (Huffington Post)

There were several comments specifically focused on describing negative side effects or experiences with influenza and pneumonia vaccines. One participant stated their belief about contracting pneumonia from the influenza vaccine.

I used to take the flu shot and each time I did I would be terribly sick afterwards. I would usually get pneumonia. The last straw was 10 years ago when I came down with Bell's Palsy and I was bed-ridden for over a month. I am not anti-vaccine with the exception of the flu shot and that stance is rooted in experience (CBC).

What is noteworthy about this comment is how it presents pneumonia as a relatively minor illness that the participant experienced every year after receiving the influenza vaccine.

Similarly, another participant left a detailed comment describing her negative experience with receiving the pneumococcal pneumonia vaccination.

I also received an injection last week for pneumococcal pneumonia and immediately knew the nurse injected too high in my deltoid. I had on a patient gown so there was no reason to inject high on the arm. I felt the fluid go into my arm like an explosion! I called the office and reported the incident to the nurse practitioner and she prescribed prednisone so I could go on my scheduled cruise vacation the following day. As soon as I got back, I went to see an orthopedist and they told me to go the physical therapy route for 3 weeks before they would do an MRI. I am still in pain now with limited range of motion in my left arm which prevents me from doing most tasks. As a registered nurse for 35 years I can hardly believe this happened! The nurse used poor technique! I went into the doctor's office just for an annual physical exam, healthy, with no pain, and now I'm in pain and have limited movement in my arm!! (National Post)

Second, for the participants in this study, the online news article comment sections were frequently used to share their personal, painful, and often detailed experiences with shingles. Even when described as "mild cases of shingles" the pain was still experienced as "devastating," "horrific," and even as "I've never experienced pain like that before in my life... Drug-free childbirth hurt less." Participants expressed their fears and traumatic experiences with shingles and frequently emphasized how the vaccine cost should not be a deterrent for any older adult when deciding whether or not to get the shingles vaccine. In fact, most participants instead framed the shingles vaccine cost as being a "small price to pay," "well worth the money spent if it prevents shingles," that she/he "would pay triple what I scoffed at a year ago" to avoid shingles, and urged others to get the vaccine:

I am currently enduring the fourth week of what my Doctor says is a mild case of shingles (small rash on the left chest under arm area). I just turned 62 and about a year ago I went to the pharmacy in Fredericton and asked about the shingles vaccine and when I was told it would cost \$240 I turned around and walked out thinking "too much". I can tell you that I wished I had said please give it to me at that time. This "mild" case of shingles that I have been experiencing has left me exhausted at times, with interrupted sleep and constant pain. How would I describe the pain would be like this: it is like someone has poured gasoline on my left chest area, set me on fire and then when I have called for help, someone has tried to put out the fire with a hunting knife. It comes and goes in severity but is always there to spoil your day or night. I am worried that I may be one of the unfortunate few whose pain goes on for months or years as my pain so far has not been reduced or gone away at all. I believe that everyone that is at risk should get the vaccine and I believe that provinces would save millions of dollars by allowing this vaccine to high risk folks for free to encourage them to get it. (CBC)

Even when commenters were not older adults, we observed them describing their experiences of witnessing neighbours and family members with shingles, and then citing those experiences as convincing them to get vaccinated as soon as the vaccine was available, having "no desire to be a victim myself." Another participant described this experience.

I've had the Shingrix vaccine and the previous one as well. My mother had shingles and for her it was horrific. She had permanent nerve pain in her back that she said felt like a severe burn for the last ten years of her life. The cost of the vaccine is a small price to pay for prevention of what can be a terribly painful and debilitating experience. (Globe & Mail)

"I Was Considering the Pneumonia Shot for Myself in a Few Years after Reading about It, Now I Am Less Sure. I've Become Much More Hesitant after Witnessing How It Isn't Really as Effective as Claimed": Questioning the Effectiveness of Vaccines and Vaccine Research

We viewed this theme as a continuum that begins with comments regarding vaccine questions (appearing to result from lack of knowledge) and progresses to comments expressing strong, informed commentary supporting opposition to vaccines. This theme included any comment questioning the effectiveness of who conducts vaccine research, who funds that research, and who recommends the vaccines. This theme also included personal experiences but only if they were in response to a question about vaccine effectiveness, differentiating this theme from the first theme which consisted only of standalone comments about experiences.

At one end of this spectrum are questions about the effectiveness of older adults' vaccines, and they included mention of all three vaccines. In two different comment sections on CBC articles, participants asked "I am wondering; if seniors take high doses of a vaccine such as Fluzone, would it interfere with their body's ability to create antibodies naturally?" and "Are seniors more likely to develop shingles? Or is it harder for seniors to recover from it?" Such comments often went unanswered. When questions did generate replies from other participants, the responses to questioning vaccines' effectiveness were typically brief statements about influenza and pneumonia, such as "Flu in seniors is very serious, and can often lead to pneumonia and death" (CBC). When the effectiveness of shingles vaccine was questioned, the replies mainly referenced personal experiences. At the other end of this spectrum were comments stating the need to (1) distrust the pharmaceutical companies producing vaccines, (2) question recommendations from physicians, and (3) question the media who were promoting vaccine uptake, with all three suspicions appearing to originate in beliefs about a profit motive. These comments were almost entirely regarding influenza and pneumonia and only very occasionally included shingles. One participant posted the following argument against the pneumonia vaccine.

With both pneumonia & influenza we have multiple strains, variants, mutations. That makes it virtually impossible to determine vaccine effectiveness. That problem does not exist with nearly all other vaccines. Because other vaccines deal with individual things, which makes it very easy to determine vaccine effectiveness. We know for example a very high percentage of people will get sick with Measles & chicken pox if exposed. Once we started vaccinating people for those two things the incident rate dropped to the point of being wiped out. Not so with influenza, incident rates haven't changed at all since they came into being after the 2nd World War. Which tells us the flu shot doesn't do

anything. It's beginning to appear the pneumonia vaccines is going to be the same way. (Globe & Mail)

Suspicion of pharmaceutical companies profiting appeared to be the driving force behind distrust in vaccines, with participants referring to vaccines as a "scam", "cash grab", and "scheme". We noted mistrust concerning the intentions of pharmaceutical companies, stemming from the vested interests and profits of "Big Pharma", who were suspected of strategically manufacturing ineffective or unsafe vaccines for profit. As one participant commented on a CBC article: "I will not be getting a flu shot or pneumonia shot or any other kind of shot...I avoid needles whenever possible. How about a flu pill? Must be doable. Who is making tons of money off this scheme?" Another comment intervened thusly

My gosh the surprise: 'For instance, emerging research suggests people who get repeat flu shots every year may actually experience reduced immunity in subsequent years. That could have implications for seniors who receive a high dose of the flu shot, she said.' Of course. I think many of us knew this already, without needing to fund a study and the huge expense (on the taxpayer's dime) of years of a flu shot program that seems to have limited effect (often because there's no protection against a specific strain of the flu for a given year). (Globe & Mail)

As said, we further observed how suspicion surrounding the motives of pharmaceutical companies extended to include both physicians recommending vaccines and the media promoting vaccination. Participants described a distrust of physicians from a belief that physicians have been, as one participant explained

educated by colleges obligated to follow the studies produced by large Pharma that bankroll the college. Yes. This older generation has done their own research and have lived long enough, have seen enough and are mature enough to make informed decisions. Read the majority of the comments to get the answer to why the majority distrust these vaccines (CBC).

The media was another recurrent target of suspicion, as some participants posted comments about how they believed mainstream media, such as the CBC, publish "another infomercial for pharma...Never have risked the shot, never will." (CBC). Some comments even referred to media as "propaganda": "Hmmm? Let me think, feeling pretty good at 63 but the propaganda from some says I NEED a flu shot! Some risk of an impending heart failure and or pneumonia, I DON'T THINK EVER!" (CBC).

Finally, we observed how personal experiences intertwined with suspicions of those promoting vaccines, such as in the following interchange between two participants in a CBC discussion section.

Participant 1: I was considering the pneumonia shot for myself in a few years after reading about it, now I am less sure. I've become much more hesitant after witnessing how it isn't really as effective as claimed. My father in law developed pneumonia often, always resulting in Hospitalization, even with the pneumonia shot which he got at least twice. The line in the article.... 'The infection, which causes most bacterial pneumonia cases, is preventable with a vaccination' makes me even more skeptical of the pneumonia shots effectiveness. It tells me they think it works but don't really have any evidence to support it much like the flu shot.

Participant 2: Yeah...even though it costs approximately \$130 for healthy seniors in Ontario, and I'm financially comfortable, I did a lot of digging on this issue before actually getting the shot (pharmacies can do the injection for an added charge), and I'm still sitting on the fence.

There's other complementary shots you can get, ironically about half the price to cover other invasive strains...I'm having second thoughts on this again.

In contrast to comments around influenza and pneumococcal vaccines, the rare shingles vaccine comment that included distrust of pharmaceutical companies resulted in either no engagement from other participants or encouraged other participants to argue for the importance of the shingles vaccine, such as in this discussion of a CBC article.

Participant 1: 1 in 3 adults over 60 will get shingles. Get the vaccine.

Participant 2: I bet the numbers are hogwash. The pharmaceutical industry is the biggest benefactor. They can't be trusted"

Participant 1: You bet do you ...Why don't you do some research, and then bet again. The World Health Organization, Centre for Disease Control, Health Canada, Mayo clinic, etc., all agree that 1 out of 3 adults will get some form of shingles in their lifetime. (CBC)

"Our Governments Have Done a Terrible Job Providing Reliable Information and Accessible Vaccinations for Adults Who Want to Stay Fully Immunized": Criticizing Government for Unequal Vaccine Opportunities across Canada

Our third theme involved criticisms regarding how federal and provincial governments communicated vaccine recommendations and made vaccines available for older adults. This theme involved comments that discussed any level of government (we identified comments about federal and provincial governments).

Participants were unclear about whether influenza, pneumococcal pneumonia, and shingles vaccines were available to older adults and at what cost in different provinces. They often questioned the motives of their provincial governments when they realized that vaccine costs were not uniform across Canada, making such comments as this.

A better flu vaccine is available on the market that has been specifically designed for use in the seniors population...However...this flu vaccine is not available to anyone in Canada (CBC).

Participants criticized the federal government for not making vaccines available and accessible, including this participant who self-identified as a physician.

Every 10 years I review my own personal vaccination history (I just turned 60), and get booster shots and/or check my antibody levels. This year I had the Shingrix (shingles) vaccine and the Prevnar-13 (pneumococcal) vaccine. It's actually a lot of work to figure all this out, get good advice and keep track of everything...and I'm a physician! No wonder so many Canadians are unprotected. Our governments have done a terrible job providing reliable information and accessible vaccinations for adults who want to stay fully immunized (Globe & Mail)

In some of these discussions, participants who identified as older adults urged other older adults to be proactive and contact their provincial health authorities regarding vaccines.

My observation is that seniors are most likely to get their vaccinations, and are at the highest risk of hospitalization and death, but our health authorities cheap out on the vaccine and give them a substandard product. If you are a senior I would suggest writing to your provincial health minister to express your concerns (CBC).

Finally, and as with our second theme's subject of effectiveness and research, although we identified the occasional criticism of government regarding shingles vaccinations, we again observed how differently comments were replied to compared with those focusing on influenza and pneumococcal pneumonia. These participants again focused on their personal experiences with shingles, such as in the following interaction among participants from a CBC comment section.

Participant 1: They highly recommend Canadians over the age of 50 get the vaccine as this will end up costing the health system far less in the long run. But they want us to pay for it until we hit the age of 65. No, I think I'll take my chances, save the 200 bucks and if I get it, then OHIP can pay for my hospital stay then. How's that sound Ontario?"

Participant 2: And therein lies the problem with coverage decisions, because they're more concerned with upfront costs, which are almost always a drop in the bucket in comparison to the downstream costs in the absence of the intervention!

Participant 3: You really really do NOT want to get shingles, get the vaccine please.

Participant 4: You will suffer far more than OHIP if you get shingles.
Participant 5: Yeah, get really sick with an agonizing illness to prove a point. That'll show em.

Participant 6: I had shingles on my back shoulder and chest, it was extremely painful, I then got my sisters and wife the vaccine. Trust me unless you really enjoy pain get the vaccine!

As might be expected, the three themes we developed in this study do not represent exclusive categories. Occasionally, we identified comments touching on all three themes, such as the following quote which, although it opens with focus on government, demonstrates how the three themes can interact in a single comment.

Most people are appalled at the lengths pharmaceutical giants will go to get you to buy their crap. Now they get our Government puppets to spend our tax dollars on this crap and try to scare us into accepting it as fact. Here is a fact. A close friend was advised by her doctor to get the flu shot three years ago. She was a perfectly healthy 53-year-old country girl, married and retired with her whole retired life ahead of her. My wife asked her why she was going to get the flu shot. She was obviously healthy. Because her doctor suggested it and she thought a lot of his opinion. On Thursday afternoon she had her visit and got the flu shot. Two days later she got a terrible cold. On the very next Saturday she was dead. She succumbed to pneumonia. How many more examples of this very same thing happening with doctors saying it wasn't the flu shot. I say to them. BULL... Now ask again why so many refuse to take the flu shot. Because I'm not buying this crap and neither are they (CBC).

Discussion

This analysis of online comments of national news articles related to three vaccines for older adults – influenza, pneumococcal pneumonia, and shingles – identified three major themes that provide insight into public perceptions of the vaccines and possible avenues to increase vaccine uptake. The first and most dominant theme that emerged in the analysis was the importance of personal experience in shaping opinions, both positive and negative, about the vaccines. Some comments revealed confusion around the different diseases

that the vaccines prevent, which has been found in other studies in Canada and other countries (Cummings & Kong, 2019; Ho et al., 2017; Pereira et al., 2013; Teo, Smith, Lwin, & Tang, 2019). Comments presenting such negative vaccination experiences may be important in light of past research that has identified Canadian adults' reasons for vaccine refusal as including fear of needles and complications following vaccinations (Dubé et al., 2016; Eilers, Krabbe, & de Melker, 2014; McIntyre, Zecevic, & Diachun, 2014).

Our findings regarding older adults' comments about shingles—the sharing of personal experiences with the disease and urging others to get vaccinated regardless of cost—were unlike those of previous research, which identified financial issues as a major concern for Canadians considering vaccinations (MacDougall et al., 2015; Public Health Agency of Canada, 2019). However, the findings regarding the importance of personal experiences were consistent with research involving older American adults, who stated that personal experiences with diseases and vaccines were the most important factor in their vaccine decision-making process (Kaljee et al., 2017). When discussing shingles, we found that the online participants used anecdotal experiences rather than evidence-based research to encourage vaccine uptake. Therefore, focusing on personal experiences may be beneficial for encouraging vaccine uptake, as peer-reviewed literature is typically harder to access and often beyond the average person's scientific literacy level (Meyer et al., 2016), and vaccine *refusers* tended to use personal stories in place of scientific data (Brewer et al., 2017; Meyer et al., 2016).

The second theme that emerged from our study was a mistrust of pharmaceutical companies and medical professionals leading to questions about vaccines safety and effectiveness. In line with other research (Dubé et al., 2016; Feinberg et al., 2015; Henrich & Holmes, 2011; MacDougall et al., 2015; Meyer et al., 2016), we noted mistrust concerning the intentions of pharmaceutical companies, stemming from the vested interests and profits of "Big Pharma," who were suspected of strategically manufacturing ineffective or unsafe vaccines for profit. However, our findings regarding suspicion of physicians merit further research, given that previous research has emphasized the importance of the way in which medical professionals can positively influence older adults' vaccine uptake (Eilers et al., 2014; Eilers, Krabbe, & de Melker, 2015; Kizmaz, Kumtepe Kurt, Cetin Kargin, & Doner, 2020; McIntyre et al., 2014; Public Health Agency of Canada, 2019). It may be beneficial for medical professionals to participate in these social media discussions, providing advice and addressing concerns. Harnessing social media in this way could offer practitioners another way to engage with the public, as has been demonstrated in other fields during program and policy development and evaluation (Nik-Bakht & El-Diraby, 2015). For these reasons, we recommend that future researchers continue to probe how different factors interact to influence older adults' vaccine uptake. For example, the question of how social media comments interact with other sources of vaccine information, such as peers, family, and medical professionals, to determine older adults' vaccine decisions. How do online participants respond to having practitioners reply to their comments on online news articles? Moreover, older adults have been found to hold misconceptions regarding influenza and influenza vaccine, particularly those who do not typically opt for annual influenza vaccination (Andrew et al., 2019; Pereira et al., 2019). Although previous research identified that participants believed that the influenza vaccine was safe, 41% believed that vaccination would not protect them from influenza, or they believed that they

could acquire influenza from receiving the influenza vaccine (Public Health Agency of Canada, 2019).

The third theme that emerged from the analysis of online comments was a criticism of governments, and mistrust in government recommendations. Some of the comments expressed a need for more information on adult vaccinations, and confirm previous Canadian research that found there to be a lack of knowledge and information about personal adult vaccination (Dubé *et al.*, 2016; MacDougall *et al.*, 2015; McIntyre *et al.*, 2014); they suggest further that lack of vaccination among older adults may relate to limited awareness of recommendations as opposed to anti-vaccination resistance. This may be explained in part because in Canada, decisions about vaccine funding are a provincial and territorial matter and as a result, there are discrepancies in vaccine coverage across the country (Government of Canada, 2021). Briefly, all older adults (65 years of age and older) are recommended to receive the influenza vaccine annually (Public Health Agency of Canada, 2019). However, there are two options for the influenza vaccine: the standard dose, and the high dose. Seven provinces and the territories provide universal funding for the standard-dose influenza vaccine (National Institute on Ageing, 2018). Older adults are recommended to get one dose of the pneumococcal polysaccharide vaccine, which is publicly funded in all provinces and territories for older adults (Public Health Agency of Canada, 2019). Lastly, the Canadian government recommends that adults over the age of 50 receive one dose of the shingles vaccine; however, the vaccine is publicly funded only in Ontario for seniors over 65 years of age (Public Health Agency of Canada, 2019). There is some concern that because the shingles vaccine is not funded publicly by governments whereas others are, it may lead Canadians to believe that the vaccine is not necessary (Public Health Agency of Canada, 2019). Interestingly, these criticisms of government and distrust in government vaccine recommendations expand on findings from previous research that noted many Canadians' questioning the government's intentions when advocating for certain vaccinations (MacDougall *et al.*, 2015; Meyer *et al.*, 2016).

Conclusions

The present exploratory study represents the first analysis of social media comments regarding older adults' vaccines. Although social media discussions represent a valuable approach to uncovering and describing themes in public perceptions, attitudes, and experiences, we must concede that like any research approach, this one comes with limitations. Social media data often present a sampling bias, because of how the data are collected, which can result in certain individuals being left out of the research process. Social media discussion participants are not necessarily representative of the general public and with most types of social media discussions, it is difficult to verify specific demographic information on individual participants, making it uncertain how representative the findings are (Ovadia, 2015). This sampling bias can raise questions about the credibility of claims made on the basis of these data sets, which, in turn, could skew interpretations of public opinion. Additionally, some researchers have observed that social media discussion analysis research tends to result in an unbalanced view of a topic (Klein & Spiegel, 2013) and in the case of the present study, it is possible that individuals who did not comment hold different opinions about older adults' vaccines. However, the self-selection bias presents a similar challenge to the more traditional data collection methods (Feinberg *et al.*, 2015), and we note how we observed a

wide range of both pro- and anti-vaccination opinions being voiced in the comments. Finally, relying on social media comments to gauge public opinion eliminates the ability to interact with participants and ask follow-up questions, to probe, and to seek clarification (Lynch & Mah, 2018). Regardless of the limitations, research findings from social media discussion should be viewed in the same way as findings from in-depth interviews, and other qualitative approaches. As with other qualitative approaches, social media discussion analysis aims to offer propositions that can inform future research, and be theoretically generalizable, rather than empirically generalizable. Results encourage broader and new perspectives, and generate hypotheses (Kozinets, 2020).

For the present study, we attempted to compensate for those limitations by conducting a broad search of seven major news outlets in Canada, and by analyzing comments from 31 different news articles that contained data on vaccines for older adults in five different online news sources. Some of our findings align with past research into Canadian older adults' vaccine perceptions, but our study also produces original findings from the online comments; specifically, the differences between comments about shingles and those about influenza and pneumonia. We thus echo the findings of previous research, which identified that perceptions regarding adult vaccination are dependent on the vaccine type (Brewer *et al.*, 2017; Klett-Tammen, Krause, Seefeld, & Ott, 2016; MacDougall *et al.*, 2015), and thus we point to the need not to treat the research subject of "older adults' vaccines" as one entity. For example, although we see higher-than-average rates of COVID-19 vaccination uptake among older adults ($\geq 90\%$ with two doses, among those 60 years of age and older) than in younger age groups (range from 80% to 87%) in Canada (Government of Canada, 2021), sustained research will be needed to understand the evolving beliefs and attitudes towards vaccines. Moreover, public health and policy attention will be needed to achieve similarly high levels of the third dose of COVID-19 vaccine among older adults, and likely ongoing boosters, and simultaneously to maintain and improve uptake of other vitally important vaccines. We encourage researchers and practitioners interested in improving vaccination uptake among older adults to consider different communication strategies of encouragement, beginning with the need to understand those who are uninformed and misinformed with incorrect information, and also to consider the determinant influence of personal narratives.

By utilizing the social media discussions, we also identified opportunities for better health education that could improve public health outcomes. We suggest a number of ways in which future research could build on our findings with an aim to determine how generalizable the findings are across the Canadian population. Particularly important is that our findings, along with previous research, highlight the need for further investigations into the reasons behind this distrust in governments, the media, and physicians. Additionally, because our study focused exclusively on the online comments appended to national-level news sources, we encourage future researchers to examine provincial and municipal online news stories, combine social media discussion analysis with other sources, consider using social media analysis as first step and then following up with interviews and focus groups, and examine other types of social media, such as Facebook and Twitter. Finally, future researchers should consider examining both articles and their comment sections, as the framing of the issue in each individual article may have influenced commenters' perceptions of events. Such research will result in an even greater understanding of perceptions of older adults' attitudes towards vaccines, and

consequently should lead to increased older adult uptake of vaccination.

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