

# Vaccination policy strategies in Ontario: Transitioning from parental vaccine hesitancy to vaccine acceptance

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## Abstract:

Vaccination is considered to be one of the greatest public health achievements, contributing to a substantial decline in infectious disease mortality in Canada. However, a growing threat of vaccine hesitancy has led to an upsurge in the prevalence and incidence of vaccine-preventable diseases across the globe, including Canada. Vaccine hesitancy is on the rise in the province of Ontario. Parental vaccine hesitancy, vaccine misconceptions, rising non-medical vaccine exemption rates, and low childhood vaccination coverage has led to a resurgence in vaccine-preventable diseases, especially measles. Given the importance of achieving high vaccine coverage to avoid vaccine-preventable diseases and their dire consequences, vaccine hesitancy is an important issue that needs to be addressed. There is no perfect solution to address vaccine hesitancy. Understanding the complex mix of factors that determine individual and collective vaccination behaviour is vital to designing effective vaccination policies, programs, and targeted interventions. This article critiques current vaccine policy strategies and outlines a policy approach to address parental vaccine hesitancy and prevent future vaccine-preventable disease outbreaks, specifically in Ontario, and more broadly within Canada. Providing support to healthcare providers and primary care physicians; and empowering parents, schools, students, families, and communities in Ontario, will slowly but surely mitigate vaccine hesitancy and enable healthy vaccination behaviours. Healthcare system-based interventions seem to be the most comprehensive approach that requires coordinated efforts and partnerships between community-based organizations and vaccination providers to ensure inclusive and integrated service delivery.

## Background

Vaccine hesitancy (VH) is the reluctance or refusal to vaccinate despite vaccine availability and is a leading risk factor resulting in low immunization uptake. Parental concerns regarding adverse effects following immunization (AEFI), especially in the developed world, has increased hesitancy to vaccinate [1]. In 2019, the World Health Organization (WHO) ranked VH as one of the top 10 global health threats [2]. The reasons for VH and/or vaccine refusal are complex and multidimensional. Given the importance of achieving herd immunity [mandated vaccination coverage for attaining adequate disease-specific thresholds] to avoid vaccine preventable disease (VPD) outbreaks, VH is a critical public health issue that threatens to reverse the tremendous progress in combatting VPDs in the past. VPDs, particularly those as serious and highly contagious as measles, are increasing in prevalence across the world [3], and Canada is not immune to this negative trend [4,5]. The 2016 Canada Communicable Disease Report [6] noted that approximately 20% people believed vaccines are directly linked to autism – a link that was officially discredited in 2010 [7], resulting from a 1998

research paper [8] that ignited a global confidence crisis in the measles, mumps, and rubella vaccine.

VH is on the rise in Ontario, Canada. Parental VH, vaccine misconceptions, rising non-medical vaccine exemption rates, and low childhood vaccination coverage has led to a resurgence in VPDs, especially measles. This article critiques current vaccine policy strategies and outlines a policy approach to address parental VH and prevent future VPD outbreaks, specifically in Ontario, and generally in Canada.

## Adverse effects of vaccine hesitancy

Vaccination is considered to be one of the greatest public health achievements, contributing to a substantial decline in infectious disease mortality in Canada [9,10]. However, a growing threat of VH has compromised the herd immunity for VPDs [11], specifically the nation-wide mandated vaccination coverage of 95% for measles [12]. This negative trend has resulted in an upsurge in the prevalence and incidence of measles [5,13] in Ontario [14,15].

VH is a complex public health issue that has resulted in the recent measles outbreak across Canada [16–21], including Ontario [14,15,22]. Particular risk factors for this crisis is misinformation on social media [23,24]; anti-vaccination movements [25,26]; vaccine misconceptions [1,27]; growing public mistrust [11,28–30], among others. Currently, there are approximately 20%-30% VH parents in the country [31].

Albeit scientific and medical fraternity is affirmative on vaccination benefits, negative discourse around vaccine safety and efficacy continues to dominate social media [24]. New generations of Canadians are unaware of the risks of many VPDs and their concerns have shifted to vaccination risks [32]. Given the importance of achieving high vaccination coverage to avoid VPDs and their dire consequences, VH is an important issue that needs to be addressed urgently and expeditiously.

## Vaccination policy landscape

The recent measles crisis has fueled debate regarding childhood under-vaccination and mandatory vaccination of schoolchildren [33]. Although the Immunization of School Pupils Act [34] mandates childhood vaccination for attending public-school system in Ontario [34,35], the province currently permits non-medical vaccine exemptions on the basis of religious and philosophical reasons [34]. Under the Immunization of School Pupils Act, parents requesting non-medical exemption have to undergo a mandatory vaccine education class before such an exemption is granted [34]. In the event of an outbreak, unvaccinated children may also be subject to a temporary exclusion from school [34]. A failure to vaccinate children can further result in a fine of up to \$1,000 [34].

In Ontario, considering the issue of steadily rising non-medical exemption rates [22,36,37] and adiabatic impact of mandatory VH education classes for parents [38], Toronto's Board of Health passed a report in September 2019 [39–41], with request in keeping with the recommendations from The Ontario Ministry of Health and Long-term Care – Premier's Council on Improving Healthcare and Ending Hallway Medicine [42]. The Council's recommendations focused on ensuring robust continuum of care via patient integration, digital innovation, system efficiency, and capacity building measures [42]. Further, The Board of Health made additional policy recommendations to mitigate VH via developing a Vaccine-Injury Compensation (VIC) program, removing non-medical exemptions, empowering the public, regulating search engines and social media, improving electronic immunization record keeping, among other policy options [39–41].

## Vaccination policy strategies and avenues: Critical analysis

This section will analyze the merits and demerits of aforementioned vaccine policy approaches and recommend a feasible and viable vaccine policy option [falling under the purview of provincial jurisdiction] with province-wide applicability in

order to address parental VH in Ontario.

### 1. Vaccine-injury compensation program

VIC program is a "no-fault" publicly funded scheme that compensates individuals experiencing potentially rare AEFI ranging from mild to severe, if at all [43]. VIC programs have strong public health ethical justification and currently exist in 19 jurisdictions across the world, including 17 high-income countries [31]. In Canada, VIC currently exists in only one province, Quebec, with a good track record [44]. Thus, implementation in Ontario could help close this provincial vaccination policy gap [45]. Developing a provincial VIC program could strengthen vaccine acceptance [31] and provide a strong foundation to the current vaccine policy framework in Ontario. However, the financial cost estimation of injury is ambiguous since assessing causal relationship between a vaccine and a specific injury is difficult, with a high likelihood of VIC program being abused [46]. Thus, it is unlikely to curb the root cause of VH, that is, skepticism regarding vaccine safety and efficacy. Contrariwise, VIC programs can increase public mistrust in vaccines [46].

Further, with respect to the policy option of VIC, in lieu of developing a provincially administered financial compensation program, it might be more useful to mitigate vaccine safety concerns through improved public transparency on AEFI via streamlining and strengthening the Ontario AEFI system [47,48] as well as enhancing universal functionality of Canada-wide available and searchable online database of AEFI reports, that is, the Canadian Adverse Events Following Immunization Surveillance System [49].

### 2. Removal of non-medical exemptions

Removing non-medical exemptions based on philosophical and religious grounds, from the Immunization of School Pupils Act could be another way forward. In the United States, jurisdictions such as California, among others, which have removed non-medical exemptions, have shown improved vaccination rates in schools [50] and higher levels of vaccination coverage in comparison to jurisdictions that allow non-medical exemptions [51]. That said, there is a likelihood for abuse [profiteering] by physicians for financial gains and problem of VH parents shopping for vaccine exemptions, as had been reported in California [33]. However, this particular issue might not be of grave concern in Ontario (from the patient' and physician' point of view) due to the publicly-funded healthcare system in Canada, covering only those health services with a prerequisite medical reason in order to receive a health service and/or treatment [52].

Further, vaccine scholars and religious communities have noted that religion-based vaccine objections by parents cannot be traced back to any major religious or academic sources [53,54]. Furthermore, similar to the counterproductive aspects of implementing VIC program, ending non-medical exemptions seems counterintuitive [11,29,30] and con-

tradictory [55,56] to lower VH and attain higher vaccine acceptance levels among parents in Ontario.

### 3. Public empowerment

Public empowerment entails providing support to primary care physicians; empowering parents, families, and communities; engaging collaboratively with healthcare professionals and local public health unit officials to support and enable healthy vaccination behaviours in the province. According to the WHO, VH is a complex and multidimensional issue and the most effective intervention must be multi-component, dialogue-based, and directly targeted towards under-vaccinated and/or unvaccinated population subgroups [57]. Collaborative engagement with healthcare professionals [58], local public health units, and newly formed Ontario Health Teams [59] has the potential to generate holistic insights, develop better healthcare services, and ensure recommended individual and community vaccination behaviours in the province [57,60]. Further, this approach will most likely entail lower financial and/or non-financial investments, relative to other policy options discussed above, with lower negative impact, if any, in implementing this particular vaccine policy and/or program strategy.

Another important facet of public empowerment is home visit interventions [61–63]. Although this strategy might address multiple issues such as parent education, vaccination promotion, among others, it might pose logistical challenges (vaccination scheduling and privacy concerns) and economic challenges (resource intensiveness). On the other hand, school-based interventions [64] could counter some of the above issues and also complement home visit services delivered through healthcare system-based interventions [65]. These interventions could turn out to be relatively less resource-intensive, in terms of both economic costs [lower healthcare costs] and opportunity costs [parental loss of productivity and income associated with child sickness and children's clinic visits]. However, school-based interventions could potentially impede regular channels of communication with primary healthcare provider. Furthermore, healthcare system-based interventions [65] seem to be the most comprehensive approach that requires coordinated efforts and partnerships between community-based organizations and vaccination providers to ensure inclusive and integrated service delivery. That is, public empowerment via formal healthcare system-wide interventions.

### 4. Regulation of search engines and social media

In relation to regulating search engines and policing social media, the Ad Standards Canada needs to revise the Canadian Code of Advertising Standards [66] and limit the spread of vaccine misinformation and disinformation by adopting the Priorities for Action from the Salzburg Statement on Vaccine Acceptance [67]. This policy avenue is critical to address VH in order to regulate nation-wide social media whilst promot-

ing the spread of evidence-based, science-backed, and fact-checked information.

### 5. Improvement of electronic immunization records

The policy option of improving electronic immunization record keeping has the potential to strengthen vaccination programs via enhanced parental vaccine reporting. Although promoting vaccinations and providing financial incentives to only local healthcare providers seems financially prudent [42], financial incentives for target population subgroups with lower socioeconomic status [68] and compensation for parents attending mandatory vaccine education sessions could be more beneficial in the long-run. However, this will require a higher budgetary allocation for provincial healthcare expenditures.

### Conclusion

VH issue is centred around cultural orientation and predispositions involving certain individual and community beliefs and cognitive biases. Given the current provincial vaccine policy architecture and resource allocation, the most efficient and effective policy strategy to implement in Ontario is public empowerment, in an effort to provide voice and agency to all stakeholders impacted by this issue. Providing support to healthcare providers and primary care physicians; and empowering parents, schools, students, families, and communities in Ontario, will slowly, but surely mitigate VH and enable healthy vaccination behaviours. This public-centered and inclusive health policy and programming strategy will ensure societal consensus on vaccine safety, efficacy, and acceptability. Implementing this policy option could set Ontario on the path to achieving higher childhood vaccination rates as well as the mandated vaccination coverage among adolescents, adults, and the elderly. This approach could prove to be a solution to end VH, not only in Ontario, but across Canada.

In closing, Canada could be a leader in vaccination rates for children, adolescents, adults, and the elderly. There is no perfect solution to address VH. Understanding the complex mix of factors that determine individual and collective vaccination behaviour is vital to designing effective vaccination policies, programs, and targeted interventions whilst also providing insights to refine future policy change processes in order to address VH in the country, comprehensively and harmoniously.

## References

- Chen RT, DeStefano F, Pless R, Mootrey G, Kramarz P, Hibbs B. Challenges and Controversies in Immunization Safety. *Infectious Disease Clinics of North America* [Internet]. 2001 Mar 1 [cited 2019 Nov 5];15(1):21–39. Available from: <http://www.sciencedirect.com/science/article/pii/S089155200570266X>
- Ten health issues WHO will tackle this year [Internet]. [cited 2019 Nov 5]. Available from: <https://www.who.int/emergencies/ten-threats-to-global-health-in-2019>
- WHO | New measles surveillance data for 2019 [Internet]. WHO. [cited 2019 Nov 5]. Available from: <http://www.who.int/immunization/newsroom/measles-data-2019/en/>
- Canada PHA of. Measles and Rubella Weekly Monitoring Report – Week 42: October 13 to October 19, 2019 [Internet]. aem. 2019 [cited 2019 Nov 5]. Available from: <https://www.canada.ca/en/public-health/services/publications/diseases-conditions/measles-rubella-surveillance/2019/week-42.html>
- Canada PHA of. Statement from the Chief Public Health Officer of Canada, Dr. Theresa Tam, on the current measles outbreak and vaccine hesitancy [Internet]. gcnews. 2019 [cited 2019 Nov 5]. Available from: <https://www.canada.ca/en/public-health/news/2019/03/statement-from-the-chief-public-health-officer-of-canada-dr-theresa-tam-on-the-current-measles-outbreak-and-vaccine-hesitancy.html>
- Greenberg J, Dubé E, Driedger M. Vaccine Hesitancy: In Search of the Risk Communication Comfort Zone. *PLoS Curr* [Internet]. 2017 Mar 3 [cited 2019 Nov 5];9. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5346025/>
- Dyer C. Lancet retracts Wakefield's MMR paper. *BMJ* [Internet]. 2010 Feb 2 [cited 2019 Nov 5];340:c696. Available from: <https://www.bmj.com/content/340/bmj.c696>
- Wakefield A, Murch S, Anthony A, Linnell J, Casson D, Malik M, et al. Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children [Internet]. 1998 [cited 2019 Nov 5]. Available from: <https://www.thelancet.com/action/showPdf?pii=S0140-6736%2897%2911096-0>
- Ten Great Public Health Achievements --- Worldwide, 2001--2010 [Internet]. [cited 2019 Nov 5]. Available from: <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6024a4.htm>
- Vaccination | Canadian Public Health Association [Internet]. [cited 2019 Nov 5]. Available from: <https://www.cpha.ca/vaccination>
- Vaccine Coverage in Canadian Children - Results From The 2013 Childhood National Immunization Coverage Survey (CNICS) [Internet]. Public Health Agency of Canada; 2017 [cited 2019 Nov 5]. Available from: [http://publications.gc.ca/collections/collection\\_2017/aspc-phac/HP40-156-2017-eng.pdf](http://publications.gc.ca/collections/collection_2017/aspc-phac/HP40-156-2017-eng.pdf)
- Canada PHA of. Vaccination Coverage Goals and Vaccine Preventable Disease Reduction Targets by 2025 [Internet]. aem. 2017 [cited 2019 Nov 5]. Available from: <https://www.canada.ca/en/public-health/services/immunization-vaccine-priorities/national-immunization-strategy/vaccination-coverage-goals-vaccine-preventable-diseases-reduction-targets-2025.html>
- Canada PHA of. Measles & Rubella Weekly Monitoring Report – Week 48: November 24 to November 30, 2019 [Internet]. aem. 2019 [cited 2019 Dec 17]. Available from: <https://www.canada.ca/en/public-health/services/publications/diseases-conditions/measles-rubella-surveillance/2019/week-48.html>
- Weeks C. Patchy vaccination rates raise measles outbreak concerns in Ontario as U.S. battles emergency. [cited 2019 Nov 5]; Available from: <https://www.theglobeandmail.com/canada/article-as-us-battles-measles-emergency-patchy-vaccination-rates-raise/>
- Toronto Public Health investigating confirmed case of measles | CTV News [Internet]. 2019 [cited 2019 Nov 5]. Available from: <https://www.ctvnews.ca/health/toronto-public-health-investigating-confirmed-case-of-measles-1.4323293>
- Lindsay B. B.C. is in the middle of a measles outbreak. Here's how to figure out if you need to get the vaccine | CBC News [Internet]. CBC. 2019 [cited 2019 Nov 5]. Available from: <https://www.cbc.ca/news/canada/british-columbia/measles-outbreak-who-needs-vaccine-1.5034726>
- Ip S. Measles: Latest case located in Fraser Valley, linked to outbreak | Vancouver Sun [Internet]. 2019 [cited 2019 Nov 5]. Available from: <https://vancouver.sun.com/news/local-news/b-c-s-17th-case-of-measles-confirmed-in-fraser-valley-linked-to-vancouver-outbreak>
- MacKinnon B-J. Saint John measles outbreak grows to 12 confirmed cases, spreads to 2nd high school | CBC News [Internet]. CBC. 2019 [cited 2019 Nov 5]. Available from: <https://www.cbc.ca/news/canada/new-brunswick/measles-outbreak-saint-john-hampton-high-school-1.5158687>
- MacDonald M. Measles outbreak in New Brunswick continues to grow, medical officer says | The Star [Internet]. thestar.com. 2019 [cited 2019 Nov 5]. Available from: <https://www.thestar.com/news/canada/2019/06/01/measles-outbreak-in-new-brunswick-continues-to-grow-medical-officer-says.html>
- Manitoba public health officer confirms case of measles, but risk to others low | The Star [Internet]. thestar.com. [cited 2019 Nov 5]. Available from: <https://www.thestar.com/news/canada/2019/06/28/manitoba-public-health-officer-confirms-case-of-measles-but-risk-to-others-low.html>
- Small K. 'An extremely contagious disease': Confirmed measles case is Calgary's second in a month, AHS says | Globalnews.ca [Internet]. 2019 [cited 2019 Nov 5]. Available from: <https://globalnews.ca/news/5114454/measles-calgary-alberta-health-services/>
- Payne E. Vaccine hesitancy on the rise in Ontario, says head of the Ontario Medical Association | Ottawa Citizen [Internet]. 2019 [cited 2019 Nov 5]. Available from: <https://ottawacitizen.com/news/local-news/vaccine-hesitancy-on-the-rise-in-ontario-says-head-of-the-ontario-medical-association>
- Song MY-J, Abelson J. Public Engagement and Policy Entrepreneurship on Social Media in the Time of Anti-Vaccination Movements. In 2017.
- Broniatowski DA, Jamison AM, Qi S, AlKulaib L, Chen T, Benton A, et al. Weaponized Health Communication: Twitter Bots and Russian Trolls Amplify the Vaccine Debate. *Am J Public Health* [Internet]. 2018 Oct [cited 2019 Nov 6];108(10):1378–84. Available from: <https://ajph.aphapublications.org/doi/10.2105/AJPH.2018.304567>
- Perry DM. Destabilizing the Jenny McCarthy Public-Health Industrial Complex [Internet]. The Atlantic. 2013 [cited 2019 Nov 5]. Available from: <https://www.theatlantic.com/health/archive/2013/07/destabilizing-the-jenny-mccarthy-public-health-industrial-complex/277695/>
- Sun LH. Majority of anti-vaccine ads on Facebook were funded by two groups [Internet]. Washington Post. 2019 [cited 2019 Nov 30]. Available from: <https://www.washingtonpost.com/health/2019/11/15/majority-anti-vaccine-ads-facebook-were-funded-by-two-groups/>
- Nyhan B, Reifler J, Richey S, Freed GL. Effective Messages in Vaccine Promotion: A Randomized Trial. *Pediatrics* [Internet]. 2014 Apr 1 [cited 2019 Nov 30];133(4):e835–42. Available from: <https://pediatrics.aappublications.org/content/133/4/e835>
- Kupferschmidt K. Can skeptical parents be persuaded to vaccinate? [Internet]. Science | AAAS. 2017 [cited 2019 Nov 30]. Available from: <https://www.sciencemag.org/news/2017/04/can-skeptical-parents-be-persuaded-to-vaccinate>
- Galley S. Survey for the Development of the Childhood Vaccination Campaign [Internet]. Ekos Research Associates; 2018 [cited 2019 Nov 5]. Available from: <http://epe.lac-bac.gc.ca/100/200/301/pwsgc-tpsgc/por-ef/health/2018/022-17-e/report.pdf>
- Wilson K, Barakat M, Vohra S, Ritvo P, Boon H. Parental views on pediatric vaccination: the impact of competing advocacy coalitions. *Public Underst Sci* [Internet]. 2008 Apr [cited 2019 Nov 7];17(2):231–43. Available from: <http://journals.sagepub.com/doi/10.1177/0963662506067662>
- Dubé E, Bettinger J, Fisher W, Naus M, Mahmud S, Hilderman T. Vaccine acceptance, hesitancy and refusal in Canada: Challenges and potential approaches. *Can Commun Dis Rep* [Internet]. 2016 Dec 1 [cited 2019 Nov 5];42(12):246–51. Available from: [https://www.canada.ca/content/dam/phac-aspc/migration/phac-aspc/publicat/ccdr-rmtc/16vol42/dr-rm42-12/assets/pdf/16vol42\\_12-ar-02-eng.pdf](https://www.canada.ca/content/dam/phac-aspc/migration/phac-aspc/publicat/ccdr-rmtc/16vol42/dr-rm42-12/assets/pdf/16vol42_12-ar-02-eng.pdf)
- Larson HJ, Schulz WS, Tucker JD, Smith DMD. Measuring Vaccine Confidence: Introducing a Global Vaccine Confidence Index. *PLoS Curr* [Internet]. 2015 Feb 25 [cited 2020 Feb 9];7. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4353663/>
- Grégoire M-C. Measles resurgence prompts debate over mandatory vaccination. *CMAJ* [Internet]. 2019 Jun 17 [cited 2019 Nov 30];191(24):E676–7. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6581531/>
- Immunization of School Pupils Act, R.S.O. 1990, c. I.1 [Internet]. Ontario.ca. 2014 [cited 2019 Nov 5]. Available from: <https://www.>

- ontario.ca/laws/statute/90i01
35. R.R.O. 1990, Reg. 645: GENERAL [Internet]. Ontario.ca. 2014 [cited 2019 Nov 5]. Available from: <https://www.ontario.ca/laws/regulation/900645>
  36. Mah CL, Guttman A, McGeer A, Krahn M, Deber RB. Compulsory School-Entry Vaccination Laws and Exemptions: Who Is Opting Out in Ontario and Why Does It Matter? *Healthc Policy* [Internet]. 2010 May [cited 2019 Nov 5];5(4):37–46. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2875891/>
  37. Wilson SE, Seo CY, Lim GH, Fediurek J, Crowcroft NS, Deeks SL. Trends in medical and nonmedical immunization exemptions to measles-containing vaccine in Ontario: an annual cross-sectional assessment of students from school years 2002/03 to 2012/13. *cmaj* [Internet]. 2015 Jul 17 [cited 2019 Nov 30];137(3):E317–23. Available from: <http://www.cmajopen.ca/content/3/3/E317>
  38. Kirkey S. Ontario's mandatory class for parents seeking vaccine exemptions has 'zero conversions' | National Post [Internet]. [cited 2019 Nov 5]. Available from: <https://nationalpost.com/news/ontarios-mandatory-class-for-parents-seeking-vaccine-exemptions-has-zero-conversions>
  39. Moving to Acceptance: Toronto Public Health's Strategy to Address Vaccine Hesitancy. 2019 Sep 9;12. Available from: <https://www.toronto.ca/legdocs/mmis/2019/hl/bgrd/backgroundfile-137355.pdf>
  40. Agenda Item History [Internet]. 2019 [cited 2019 Nov 23]. Available from: <http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2019.HL9.2>
  41. Dubey DV. Moving to Acceptance: Toronto Public Health's Strategy to Address Vaccine Hesitancy. :5.
  42. A Healthy Ontario: Building a Sustainable Health Care System. 2019 Jun [cited 2019 Nov 30];57. Available from: <https://files.ontario.ca/moh-healthy-ontario-building-sustainable-health-care-en-2019-06-25.pdf>
  43. Information Sheet - Observed Rate of Vaccine Reactions Measles, Mumps, and Rubella Vaccines [Internet]. 2014 [cited 2019 Nov 30]. Available from: [https://www.who.int/vaccine\\_safety/initiative/tools/MMR\\_vaccine\\_rates\\_information\\_sheet.pdf](https://www.who.int/vaccine_safety/initiative/tools/MMR_vaccine_rates_information_sheet.pdf)
  44. Vaccine Injury Compensation Program [Internet]. [cited 2019 Nov 30]. Available from: <https://www.quebec.ca/en/health/advance-and-prevention/vaccination/vaccine-injury-compensation-program/>
  45. Gardner DC. Moving to Acceptance: Toronto Public Health's Strategy to Address Vaccine Hesitancy. 2019 Sep 20;43. Available from: <https://www.toronto.ca/legdocs/mmis/2019/hl/comm/communicationfile-97169.pdf>
  46. Attwell K, Drislane S, Leask J. Mandatory vaccination and no fault vaccine injury compensation schemes: An identification of country-level policies | Elsevier Enhanced Reader [Internet]. 2019 [cited 2019 Nov 30]. Available from: <https://reader.elsevier.com/reader/sd/pii/S0264410X19304141?token=7666CBDD51BA7D45B6B-21F4181424A3013DBE14AC1F142E8EA4B545C6856FDF-6F9A573CB4B4AD0FFB24C9B6C3A330D5E>
  47. Adverse Event Following Immunization Reporting For Health Care Providers in Ontario [Internet]. [cited 2019 Nov 30]. Available from: <https://www.publichealthontario.ca/-/media/documents/aeifi-reporting-overview.pdf?la=en>
  48. Health Protection and Promotion Act, R.S.O. 1990, c. H.7 [Internet]. Ontario.ca. 2014 [cited 2019 Nov 30]. Available from: <https://www.ontario.ca/laws/view>
  49. Canada PHA of. Canadian Adverse Events Following Immunization Surveillance System (CAEFISS) [Internet]. *aem*. 2006 [cited 2019 Nov 30]. Available from: <https://www.canada.ca/en/public-health/services/immunization/canadian-adverse-events-following-immunization-surveillance-system-caefiss.html>
  50. Pingali SC, Delamater PL, Bутtenheim AM, Salmon DA, Klein NP, Omer SB. Associations of Statewide Legislative and Administrative Interventions With Vaccination Status Among Kindergartners in California. *JAMA* [Internet]. 2019 Jul 2 [cited 2019 Nov 30];322(1):49–56. Available from: <https://jamanetwork.com/journals/jama/fullarticle/2737172>
  51. Shaw J, Mader EM, Bennett BE, Vernyi-Kellogg OK, Yang YT, Morley CP. Immunization Mandates, Vaccination Coverage, and Exemption Rates in the United States. *Open Forum Infect Dis* [Internet]. 2018 Jun 2 [cited 2019 Nov 30];5(6). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6016709/>
  52. Health Insurance Act, R.S.O. 1990, c. H.6 [Internet]. Ontario.ca. 2014 [cited 2020 Jun 2]. Available from: <https://www.ontario.ca/laws/view>
  53. Szklarski C. Scholars say religious vaccine objections can't be traced to Biblical sources | CTV News [Internet]. 2019 [cited 2019 Nov 5]. Available from: <https://www.ctvnews.ca/health/scholars-say-religious-vaccine-objections-can-t-be-traced-to-biblical-sources-1.4643508>
  54. Peličić G, Karačić S, Mikirtichan GL, Kubar OI, Leavitt FJ, Cheng-tek Tai M, et al. Religious exception for vaccination or religious excuses for avoiding vaccination. *Croat Med J* [Internet]. 2016 Oct [cited 2019 Dec 2];57(5):516–21. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5141457/>
  55. Wilson K, J. Mills E, Norman G, Tomlinson G. Changing attitudes towards polio vaccination: a randomized trial of an evidence-based presentation versus a presentation from a polio survivor. *ScienceDirect*. 2005 [cited 2019 Nov 5].
  56. Lord CG, Ross L, Lepper MR. Biased Assimilation and Attitude Polarization: The Effects of Prior Theories on Subsequently Considered Evidence. :12.
  57. WHO | Improving vaccination demand and addressing hesitancy [Internet]. WHO. 2019 [cited 2019 Nov 30]. Available from: [http://www.who.int/immunization/programmes\\_systems/vaccine\\_hesitancy/en/](http://www.who.int/immunization/programmes_systems/vaccine_hesitancy/en/)
  58. Shen S (Cindy), Dubey V. Addressing vaccine hesitancy. *Canadian Family Physician* [Internet]. 2019 Mar [cited 2019 Nov 30];65:7. Available from: <https://www.cfp.ca/content/cfp/65/3/175.full.pdf>
  59. Government of Ontario M of H and L-TC. Become an Ontario Health Team - Health Care Professionals - MOHLTC [Internet]. 2019 [cited 2019 Nov 30]. Available from: <http://health.gov.on.ca/en/pro/programs/connectedcare/oht/default.aspx>
  60. Ames HM, Glenton C, Lewin S. Parents' and informal caregivers' views and experiences of communication about routine childhood vaccination: a synthesis of qualitative evidence. *Cochrane Database Syst Rev* [Internet]. 2017 Feb 7 [cited 2019 Nov 30];2017(2). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5461870/>
  61. Increasing Appropriate Vaccination: Home Visits to Increase Vaccination Rates Task Force Finding and Rationale Statement. :2.
  62. Kaufman J, Ryan R, Walsh L, Horey D, Leask J, Robinson P, et al. Face-to-face interventions for informing or educating parents about early childhood vaccination. *Cochrane Database of Systematic Reviews* [Internet]. 2018 [cited 2020 Feb 9];(5). Available from: <https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010038.pub3/full?cookiesEnabled>
  63. Sadaf A, Richards JL, Glanz J, Salmon DA, Omer SB. A systematic review of interventions for reducing parental vaccine refusal and vaccine hesitancy. *Vaccine* [Internet]. 2013 Sep 13 [cited 2020 Feb 9];31(40):4293–304. Available from: <http://www.sciencedirect.com/science/article/pii/S0264410X13009353>
  64. Increasing Appropriate Vaccination: Vaccination Programs in Schools and Organized Child Care Centers Task Force Finding and Rationale Statement. :3.
  65. Vaccination-Health-Care-System-Based-Interventions-Implemented-in-Combination-Archive.pdf [Internet]. [cited 2020 Feb 9]. Available from: <https://www.thecommunityguide.org/sites/default/files/Vaccination-Health-Care-System-Based-Interventions-Implemented-in-Combination-Archive.pdf>
  66. The Canadian Code of Advertising Standards [Internet]. 2019 [cited 2019 Nov 30]. Available from: <https://adstandards.ca/code/the-code-online/>
  67. Salzburg Statement on Vaccination Acceptance [Internet]. 2019 [cited 2019 Nov 30]. Available from: [https://www.salzburgglobal.org/fileadmin/user\\_upload/Documents/2010-2019/2019/Session\\_616/Salzburg\\_Statement\\_on\\_Vaccination\\_Acceptance.pdf](https://www.salzburgglobal.org/fileadmin/user_upload/Documents/2010-2019/2019/Session_616/Salzburg_Statement_on_Vaccination_Acceptance.pdf)
  68. Busby C, Chesterley N. A Shot in the Arm: How to Improve Vaccination Policy in Canada. *SSRN Journal* [Internet]. 2015 [cited 2019 Nov 30]; Available from: <http://www.ssrn.com/abstract=2578035>

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