



**STAFF REPORT
ACTION REQUIRED**

**Toronto Unvaccinated:
The Impact of Vaccination on the City's Health**

Date:	April 15, 2013
To:	Board of Health
From:	Medical Officer of Health
Wards:	All
Reference Number:	

SUMMARY

The success of vaccination programs depend on public acceptance of vaccinations and the successful maintenance of high vaccination rates. The first vaccines offered in North America were for contagious and life-threatening diseases like smallpox, polio and diphtheria. These early childhood vaccination programs were successful despite public hesitancy because most parents had actually lived through disease epidemics and seen children suffer and die from these diseases. Broad public acceptance of vaccinations over time has eliminated or significantly reduced most infectious diseases prevented by vaccines. Now that vaccine preventable diseases are rarer, parents have become less fearful of them, and some are choosing to delay or refuse vaccination for their children¹.

A technical report titled *Toronto Unvaccinated: the Impact of Vaccination on the City's Health* (Appendix 1) models the risk for infection, harm and death if more children in Toronto stopped getting routine childhood immunizations. Three diseases polio, measles, and whooping cough (pertussis) were chosen to illustrate this risk.

Even though wild polio has been eradicated in North America, it still circulates in a number of countries and can be re-introduced in Toronto through travel. Measles is highly contagious and requires very high vaccination rates to stop the disease from spreading; if Toronto's vaccination rates drop by as little as 10%, outbreaks will occur, similar to what Europe is experiencing. Whooping cough continues to circulate in Toronto, with severity and rates much lower compared to the pre-vaccine era; if whooping cough vaccination rates were to drop by just 25%, whooping cough cases could rise by 400% among children two years of age and younger, resulting in severe disease and death. In summary, if children in Toronto are not vaccinated against previously common childhood diseases, Toronto will see a large increase in these

diseases, with associated complications and deaths. This report highlights key findings from the technical report, and current barriers to vaccination, including vaccine hesitancy, vaccine misinformation, and concerns about vaccine safety. Suggested strategies to maintain and improve vaccination rates are offered with the aim of informing Ontario's Immunization System Review.

RECOMMENDATIONS

The Medical Officer of Health recommends that:

1. The Board of Health reaffirm its request to the Ministry of Health and Long-Term Care to:
 - a. Update the Immunization of School Pupils Act to be consistent with vaccines currently recommended in Ontario's Publicly Funded Immunization Schedule (*R.R.O. 1990, Ontario Regulation 645 in the Immunization of School Pupils Act*).
 - b. Strengthen the reporting of immunization information to public health by amending the *Health Protection and Promotion Act* to require mandatory reporting by health care providers to the Medical Officer of Health of the administration of an immunization to anyone below the age of 18 years.
 - c. Ensure that Panorama, the electronic immunization system that will replace the Immunization Recording Immunization System (IRIS) to capture vaccine records for Ontario children, is designed to easily accept electronic information directly from health care provider electronic medical records for the efficient capture and sharing of immunizations records, and to act as an immunization registry for Ontario.
2. The Board of Health urge the Ministry of Health and Long-Term Care and Public Health Ontario to:
 - a. Support both health care providers and parents by developing comprehensive and innovative communication tools to ensure access to accurate vaccine and disease risk-benefit information.
 - b. Develop a comprehensive provincial vaccine safety communication strategy promoting plain language, evidence-informed advice to parents.
 - c. Develop a provincial vaccine injury compensation program to compensate families in the rare circumstance a serious true vaccine injury occurs.
 - d. Promote evidence-informed methods to improve immunization coverage to local public health agencies and health care providers.
3. This report be forwarded to the Chief Medical Officer of Health and the Ontario Provincial Immunization Review Task Group and its sub-committees for consideration in the Task Group's final report.
4. This report be forwarded to Public Health Ontario, the Provincial Infectious Diseases Advisory Committee on Immunization, the Association of Local Public Health

Agencies, the Ontario Public Health Association, the Council of Medical Officers of Health of Ontario, the Public Health Agency of Canada and the Canadian Paediatric Society.

Financial Impact

There are no direct financial impacts flowing from this report.

DECISION HISTORY

The Board of Health has received two reports from the Medical Officer of Health on immunization coverage in Toronto:

1. At its February 10, 2009 meeting, the Board of Health received a report titled *Childhood Immunization Coverage in Toronto*. This report described the importance of immunization to improve the health of Toronto residents.
<http://www.toronto.ca/legdocs/mmis/2009/hl/bgrd/backgroundfile-18659.pdf>
2. At the January 20, 2012 meeting, the Board of Health received a follow-up report titled *Inequalities and Immunization Rates in Toronto School Children*. This report identified the importance of Toronto Public Health's work in achieving equitable levels of immunization coverage of Toronto students.
<http://www.toronto.ca/legdocs/mmis/2012/hl/bgrd/backgroundfile-44266.pdf>

COMMENTS

Toronto Unvaccinated

The *Toronto Unvaccinated* technical report estimates based on technical modelling, how quickly infectious diseases would re-emerge in Toronto if children stopped being vaccinated for polio, measles and whooping cough (pertussis) - three diseases that have been greatly reduced by vaccination. The models incorporated the following: the contagiousness of each disease; the likelihood of importation due to travel; the effectiveness of the vaccine; and vaccination rates.

The key findings from this report show that if children in Toronto stopped receiving routine childhood vaccinations, infectious diseases would rise dramatically resulting in catastrophic outbreaks with complications such as death. In particular, the models show the following for each disease:

Polio

Polio is a potentially deadly infectious disease caused by a virus that spreads from person to person, invading the brain and spinal cord and causing paralysis. Polio has no cure, so vaccination is the best form of protection. Canada has been free of polio since 1996.

However, polio can re-emerge in Canada from persons travelling to areas where polio is still spreading. Given current global patterns of disease and travel, there is approximately a 15% chance that a person infected with the poliovirus will arrive in Toronto in any given year. Most people with polio infections have no symptoms or very mild symptoms, but are still contagious. If Toronto maintains current high vaccination rates, there is little risk of polio being spread here. However, if vaccination rates decline to below 75%, in five to ten years, cases of polio including paralysis and possible death could emerge. Even one case of paralytic polio in Toronto would generate tremendous international concern.

Measles

Measles is a very contagious viral infection that spreads through air droplets. It causes a fever, rash, cough, red watery eyes and a runny nose. Most people with measles are sick for up to 10 days and then recover completely. Symptoms however are more severe for infants than adults. Measles can lead to ear infections, lung infection (pneumonia), an infection of the brain (encephalitis), and death. Since measles is so contagious, high vaccination rates are required to stop measles from spreading in the community. The measles vaccine is very safe; the risks of getting the disease are far greater than the risk of vaccination (Table 1). If vaccination rates for measles drop by just 10%, Toronto can expect large outbreaks of measles with 50 to 10,000 cases estimated in as few as five years. Over the long-term, very large outbreaks are expected in the range of 10,000 to 100,000 cases, as has recently occurred in Europe.

Table 1. Risk of complications from measles infection compared to known risks of vaccination in immuno-competent individuals².

Complication	Risk after infection (per case)	Risk after vaccination (per vaccine dose)
Otitis media	7-9%	0
Pneumonia	1-6%	0
Diarrhea	6%	0
Post-infectious encephalomyelitis	0.5-1 per 1000	1 per 1,000,000
Subacute sclerosing panencephalitis	1 per 100,000	0
Anaphylaxis	0	1 per 100,000-1,000,000
Thrombocytopenia	— ^a	1 per 30,000 ^b
Death	0.1-1 per 1000	0

^aCases reported after measles infection, but risk has not been properly quantified

^bRisk reported after MMR vaccination and cannot be only attributed to the measles component

Whooping cough (Pertussis)

Whooping cough is caused by infection with a bacteria called *Bordetella pertussis*. It gets its name from the high pitched gasp or whooping sound a person makes when trying to breathe after a coughing attack. It is highly contagious and spreads through respiratory droplets. Although it can resemble a common cold, whooping cough may become more serious, especially in infants under one year of age and pregnant women. Whooping

cough rates have declined since vaccinations were introduced. The mathematical model for whooping cough estimates that, if whooping cough vaccination rates drop by 25%, whooping cough cases will rise by 400% among children two years of age and younger, resulting in large outbreaks, neurological complications and even death in infants and toddlers.

Current Disease and Vaccination Trends in Toronto

Toronto's Vaccination Rates

Canada's benchmarks for vaccinations of school children are 99% for most vaccines. In Ontario, the Immunization of School Pupils Act (ISPA) mandates vaccinations for diphtheria, tetanus, polio, measles, mumps and rubella for children attending school in Ontario under 18 years of age. Such laws and their enforcement have helped to improve vaccination rates and reduce vaccine-preventable diseases^{3 4 5}. Ontario and New Brunswick are the only provinces in Canada with legislation mandating vaccinations for school entry.

Toronto Public Health's (TPH) School Immunization Assessment Program which enforces the ISPA produces high vaccination rates. Toronto Public Health data for the 2011-12 school year show the overall vaccination rate for mandatory vaccinations for Toronto students was 90%. Exemptions for mandatory vaccinations were received from 1.7% of students, similar to the past six years⁶; by comparison some communities in the United States report vaccine exemption rates have reached as high as 7%⁷.

Vaccination rates among Toronto students for many non-mandatory vaccines are not routinely available due to the lack of an immunization registry. Current coverage rates for non-mandatory vaccines for school-aged children range from 97% for *Haemophilus influenzae type b* (Hib) to 69% for pertussis. The high rate for the Hib vaccine reflects its use as a combination vaccine with mandatory vaccinations. The lower rate for pertussis vaccination is due in part to the delay in adolescents receiving their booster.

TPH administers hepatitis B and meningitis vaccines to grade seven students annually through school-based vaccination programs. In 2011-12, 84% and 76% of grade seven students in Toronto were up-to date for the first and second dose respectively of the hepatitis B vaccine and 77% were up-to-date for the meningitis vaccine. Since there is no immunization registry that shows reports of hepatitis B and meningitis vaccinations that were provided by the child's health care provider, the actual vaccination rates for these vaccines may be higher. Since September 2007, the human papillomavirus (HPV) vaccine was provided to grade 8 female students at school-based clinics and since 2012 through a catch-up program for high school females. HPV vaccination rates for grade 8 females in 2011-12 were 76% for dose one, 74% for dose two and 65% for the third dose.

Toronto's Rates of Infectious Diseases Prevented by Vaccines

Reports of vaccine preventable diseases in Toronto are at or near record low numbers. However, since Toronto is a globally connected city with extensive travel to and from

countries with high rates of these diseases, there is an on-going risk for reintroduction of many preventable diseases and the potential for outbreaks of these diseases⁸.

Despite achieving high vaccination rates against mumps and measles, pockets of unimmunized and under-immunized children and adults in Toronto have led to recent outbreaks of mumps (in 2009, 2010 and 2011) and measles (in 2008 and 2013)⁹.

There has been a significant increase in mumps in Toronto over the past five years. From 2007 to 2011, 75% (81 of 105) of all mumps cases reported in Toronto were outbreak-related, with links to provincial and international outbreaks. Most cases occurred in young adults who had received only one or no doses of mumps vaccine instead of the required two doses.

Toronto has also seen measles cases over the past five years, due to locally spread outbreaks and travel-acquired cases. During the period from 2007 to 2011, there were 35 reported cases of measles: 71% (25 of 35) were related to an outbreak in 2008 and 17% (6 of 35) were travel-acquired. Toronto is currently experiencing an outbreak of measles with five cases in young children who were unvaccinated or under-vaccinated and had no travel history.

Rates of pertussis in Toronto have been consistent with the three to five year cyclical nature of the disease. The last large outbreak in Toronto began in 2005 and transmission among Toronto residents continued at higher than expected levels until 2009. During that five-year period, an average of 386 cases were reported to TPH each year. Since 2009, the number of reported cases has decreased, with a range of 40 to 100 cases each year. The majority of pertussis cases in Toronto are reported for infants less than one year of age.

Barriers to Vaccination

In Toronto, vaccination rates for vaccines required for school have been high and the rates of infectious diseases prevented by vaccines are still quite low compared to when vaccines were first introduced. However, there are pockets of unvaccinated and under-vaccinated children and adults in Toronto. Studies indicate that children who are unvaccinated are more likely to be white, have parents with higher levels of education and higher salaries, and have a mother who is married¹⁰. The reasons why children's vaccinations are not up-to-date are related to parents not knowing their child's vaccines were due, or social and economic barriers to accessing health care services^{11 12 13 14}. Growing trends worldwide also reveal increasing concerns about vaccination among parents resulting in a hesitancy to vaccinate, growth of vaccine misinformation, and increasing concerns about vaccine safety.

Vaccine Hesitancy

Vaccine hesitancy is a term used to describe parental concerns and misperceptions of vaccines which cause them to delay or question vaccination^{15 16 17}. This phenomenon of

vaccine hesitancy has grown in the past 10 years^{18 19}, so much so that in 2011, the World Health Organization's Director-General Margaret Chan expressed concerns over what she called a "worrisome" public mistrust of vaccines²⁰.

Studies show that parents who delay or refuse vaccines are more likely to have vaccine safety concerns and to perceive fewer benefits associated with vaccination. The results of a 2010 Ontario College of Family Physicians online (not representative) survey of 852 Ontario parents showed that 33% of parents were nervous to immunize their children; 23% felt it was a difficult decision; 24% did not want to give their child a medication that was not needed; and 18% said they will delay some or all of their children's immunizations until they are a bit older. More than half (63%) of parents agreed there is a lot of conflicting information on immunization safety. Three percent said they will not immunize their children at all²¹.

A 2011 survey of 1,745 Canadian parents' key issues related to immunization²² showed a high level of concern about the safety of vaccines, especially newer vaccines, and felt that children now receive too many vaccines. Approximately 10% of surveyed parents declined one or more vaccines for their children. The most commonly missed vaccines cited by parents in the study were seasonal influenza (43%), human papillomavirus (43%), chickenpox (42%), hepatitis B (31%), measles, mumps, rubella (MMR) (30%) and the combined tetanus/diphtheria/Hib/pertussis/polio vaccine (21%).

Parents weigh the benefits and risks of vaccination based on the information they receive²³. More and more parents are getting information about health topics from a variety of sources and increasingly from social media²⁴. A large study of U.S. parents with 19 to 35 month old children showed that parents who intentionally delayed vaccination for their children because of vaccine safety or efficacy concerns were significantly more likely to seek additional information for their decision from the Internet and significantly less likely to seek information from a doctor²⁵.

In the above 2011 Canadian study²⁶, 63% of parents sought vaccine information from the Internet, primarily through a Google search, 54% sought vaccine information from physicians, 21% from a health care worker other than a physician, and only 7% from a local public health authority. The use of the Internet as a source of vaccine information among Canadian parents is shown to be related to income levels, with the wealthiest parents (+\$120,000) being more likely to use the Web than less affluent parents. Parents want to see a summary of the risks of disease versus vaccination, including information about side effects.

Most parents trust health care professionals for information about immunizations. Even parents who have refused vaccines cite health care providers as an influential source of vaccine information, playing a crucial role in parents' decision-making²⁷. However, parents may not have enough time or opportunity to discuss their immunization concerns in detail with their healthcare provider during regularly scheduled clinic visits²⁸.

Since February 2013, Toronto has been experiencing an outbreak of measles among children who were primarily unvaccinated. The first two cases occurred in a family with two children who were both unvaccinated and had no travel history or known contact with anyone who travelled outside of Toronto. When asked, the parents indicated that they had delayed the vaccination of their children with the MMR vaccine (and therefore were illustrating what is now termed "vaccine hesitancy") because of a fear of the link between this vaccine and autism, an inaccuracy that has been disproven by many studies across a number of large populations.

Measles then spread to three of the four other unvaccinated children (all under the age of 3 years) attending the same day nursery with one of these two children. The rest of the 84 children attending the day nursery were vaccinated and fully protected from measles.

This recent outbreak of measles infection in five unvaccinated young children was fully preventable, and illustrates the real impact of vaccine hesitancy and a growing trend to delay or refuse routine childhood vaccinations. This outbreak also demonstrates the risk of the re-introduction of infectious diseases that remain rare in Toronto.

Source: Toronto Public Health

Vaccine Misinformation

In the past decade vaccine hesitancy has been fueled by misinformation about vaccines. Vaccine misinformation is incorrect information about vaccinations that has been aggressively disseminated and presented as fact, often by prominent individuals²⁹. Stories about bad things happening to children after vaccination now circulate widely on the Internet, radio, TV and print media, and through celebrities. Medical experts often counter anti-vaccine concerns with scientific information, which can fail to persuade parents since many people misunderstand quantitative information and misinterpret risk³⁰. A study of parents who intentionally delayed their child's vaccination because of safety concerns found that these parents were significantly more likely to have heard or read unfavourable information about vaccines than parents who did not intentionally delay³¹.

Often vaccine misinformation can come from parents who believe that their child has been injured by a vaccine^{32 33}. It is now much easier for those who claim to be injured by immunization to connect with and align themselves with groups that are highly critical of public health via web 2.0 platforms (social media, mobile phone networks and the internet). Groups that are critical of vaccines, called anti-vaccinationists, have a large and influential online presence. A recent study showed negative vaccine messages on Twitter propagated more negative messages. Positive messages about vaccines however did not lead to additional messaging of positive messages, and overall favoured the spread of negative vaccine sentiments³⁴.

Most print and broadcast media do not set out to promote an anti-vaccine agenda when reporting on controversial vaccine stories³⁵, such as in Great Britain in 1999, when the major press carried headlines stating "vaccines linked to autism" following Andrew Wakefield's study into the links between autism and the MMR vaccine which turned out to be untrue and was later retracted by the Journal. The intensive media coverage surrounding this story emphasized this inaccurate message in the minds of many families, and caused them to be fearful of the MMR vaccine. Some media reports, in an effort to be unbiased, cite both pro and anti-vaccine opinions with equal credibility which can help generate uncertainty among parents. This style of "falsely balanced reporting" has been shown to heighten readers' uncertainty regarding vaccine safety and lower their intentions to vaccinate their future children³⁶.

Measles Resurgence in the United Kingdom and Europe^{37 38 39}

In February 2013, an adult male from Toronto and an individual from New Brunswick travelled to a resort in Mexico where they contracted measles from a traveller who was also at the same resort at the same time. The traveller came from an area of the United Kingdom (UK) where measles is known to be circulating. The virus strains of the Canadian cases matched that circulating in the UK.

Outbreaks of measles across the UK are at the highest levels in 18 years. In 2012, England and Wales reported 2030 cases of measles compared to 56 cases in 1998 and the highest annual total since 1994. About 20% of cases are hospitalized, mostly in younger children and adults. Since 1994 there have been 2 measles-related deaths.

From 2001 to 2009, a 10% drop in vaccine coverage for one dose of MMR vaccine among UK children aged two years was observed, due to parents' fears that the MMR vaccine would harm their children. This fear was instigated by Andrew Wakefield's 1998 published case series in the British Medical Journal that falsely linked the MMR vaccine to autism and bowel symptoms. Even after the journal retracted the study in 2010, indicating it was based on false data, public fears persist. This 10% drop in MMR vaccination rates is believed to be the cause for the rising rates of measles in those who are not protected.

In other parts of Europe, measles cases are also high. In 2011, epidemic rates in the European Union resulted in over 30,000 cases of measles, occurring mainly in France, Italy, Romania, Spain and the UK. In 2012 over 8000 cases occurred in the European Union.

Public health vaccination campaigns are now being run in the UK to encourage those who did not get the vaccine as a child in the 1990's, namely teenagers, university students and young adults. All of these groups are at risk for measles, and also pose a risk to young children, especially infants who cannot receive the vaccine until one year of age.

Vaccine Safety

Public tolerance for vaccine safety risks is low because vaccines are given to healthy people, mainly children. Many of those with vaccine concerns believe in the concept of vaccination, but need to be convinced that everything possible is being done to ensure the safety of vaccines⁴⁰.

Systems are in place to track the safety of vaccines. In Canada, vaccines for humans are regulated by the Biologics and Genetic Therapeutics Directorate of Health Canada. Like all medicines, vaccines must undergo several stages of rigorous testing and safety standards before they are approved for use. Once vaccines are approved, several systems are in place to ensure that they are used effectively and safely.

Any unwanted or unexpected event following the administration of a vaccine is called an adverse event following immunization. These events may be caused by a vaccine, or they may have occurred regardless of vaccination. To determine if an adverse event is caused by a vaccine, information is collected world-wide, even after licensure of the vaccine, to track and evaluate if the rates of adverse events are similar among vaccinated and unvaccinated individuals.

The Ontario Health Protection and Promotion Act requires all health care professionals who administer vaccines and/or care for patients who may have had an adverse event following immunization, to report the event to local public health authorities within seven days of recognizing the event. TPH investigates these reports and forwards them to Public Health Ontario and the Public Health Agency of Canada. The data are monitored in the Canadian Adverse Events Following Immunization Surveillance System to ensure the safety of vaccines on the Canadian market and to respond to unusual occurrences. Adverse events are also compared internationally.

The Immunization Monitoring Program ACTive (IMPACT) is a pediatric hospital-based network that includes 12 hospitals across Canada (encompassing approximately 90% of the tertiary care pediatric beds in Canada). IMPACT reports the more serious hospitalized cases of adverse vaccine events⁴¹.

The rise of whooping cough in the United States associated with deaths in infants^{42 43 44}

In 2012, the United States had more than 41,000 cases of whooping cough or pertussis, the largest outbreak since before the 1960's. Most of the 41,000 cases occurred in infants less than one year of age and children aged 10-14 years. Eighteen children died, mainly infants younger than 3 months of age who were too young to benefit from protection from the vaccine.

The higher rates among children 10-14 year olds is likely a result of waning immunity from the acellular pertussis vaccine. The acellular vaccine replaced the whole cell vaccine in the 1990's. The whole cell vaccine induced a good immune response. However, there were concerns about the side effects associated with the

vaccine, such as febrile seizures in young children. As such, the vaccine was replaced with the acellular vaccine, which has less side effects, but is less effective and immunity does not last as long.

Despite an acellular pertussis vaccine that is not as effective as the older whole-cell vaccine, vaccination continues to be the single most effective strategy to lessen the burden of whooping cough. Today, unvaccinated children have an eightfold greater risk for whooping cough than children fully vaccinated with acellular pertussis vaccine. As well, vaccinated children are less contagious, have milder symptoms, are not sick for as long, and are less likely to get a severe complication from whooping cough. In particular, vaccination of adults and children who spend time with newborn infants is key to prevent the spread to the most vulnerable who cannot receive the vaccine and are at the highest risk for complications.

Strategies to Maintain and Improve Immunization Coverage

Vaccination rates among school-children in Toronto are high for mandatory vaccinations and vary for non-mandatory vaccines. Active efforts are needed to maintain and improve these rates, especially for non-mandatory vaccines, to avoid a decline in rates similar to that observed in other parts of Europe and the U.S.

Legislation

School immunization requirement laws such as Ontario's Immunization of School Pupils Act (ISPA), keep immunization coverage high in Toronto⁴⁵ and elsewhere where these laws are implemented and enforced^{46 47 48}. Such immunization laws reduce the disparity found in vaccine coverage among student populations regardless of where students live, their socioeconomic status, race and ethnicity⁴⁹. In the U.S., newer vaccines such as varicella (chicken pox) or hepatitis B have been added to immunization laws in some states to both increase coverage and reduce disparities related to immunization^{50 51 52}. In 2012, the Toronto Board of Health requested the Ministry of Health and Long-term Care (MOHLTC) to update the immunization requirements in the ISPA, so that they are more closely aligned with the vaccines in the current Ontario publicly funded immunization schedule. Additionally, the Board requested the MOHLTC to strengthen the reporting of immunization information to public health by amending the *Health Protection and Promotion Act* to require mandatory reporting by health care providers to the Medical Officer of Health of the administration of an immunization to anyone below the age of 18.

Immunization Information Systems

One of the best methods to improve and maintain vaccination rates is through investments in information technology, such as an immunization registry and electronic health records^{53 54}. Many studies have found that reminding people to get vaccinated through automated reminder and recall systems increases vaccination rates^{55 56}. The

MOHLTC is planning to implement Panorama, a web-based, menu-driven, multi-module, public health information system. The Board requested that the MOHLTC ensure that Panorama is designed to easily accept electronic information directly from health care provider electronic medical records to allow for the efficient capture and sharing of immunizations provided in the community and act as an immunization registry for Ontario.

Vaccine Injury Compensation Program

In Ontario, there is no program to compensate victims of a serious true vaccine injury. Vaccines are very safe, but not 100% risk-free. Every year in Canada a few individuals will sustain a serious injury from vaccination. Given that vaccines are offered for the benefit of individuals and society at large, it is recommended that those who develop a true vaccine injury be adequately compensated. Most severe vaccine side effects are very rare, occurring in less than one in a million doses, such as the risk of an anaphylactic allergic reaction or Guillian-Barre syndrome following influenza vaccination. While these adverse events are very rare, they can have serious impacts on individuals. Canada's publicly funded health care system currently covers medical costs. Other costs such as lost income, long-term disability, pharmaceutical and outpatient allied health professional services may not be covered by an individual's private insurance⁵⁷.

A no-fault compensation program is proposed to resolve injury claims as true vaccine injuries may occur despite best practices in both manufacturing and delivery. A no-fault system provides compensation based on the needs of the injured individual. These programs have been found to be both relatively modest and proportionate to the injury. The system can be funded through a tax on each dose of vaccine, which goes into a trust fund⁵⁸. Quebec is the only province in Canada which has a vaccine injury compensation program⁵⁹. The US has a vaccine injury compensation program⁶⁰.

Communication to the Public about Vaccine Safety

Many of those with vaccine concerns believe in the concept of vaccination, but need to be convinced that everything possible is being done to ensure the safety of vaccines⁶¹. Much more needs to be done to communicate and reassure the public that vaccine safety is a high priority. Public Health Ontario is currently tracking adverse events following immunization provincially; and is encouraged to provide information to the public about processes to monitor vaccine safety and injuries that occur on an annual basis.

The more vaccine misinformation is repeated, the more likely it is to appear real. For this reason, public health units, governments and health care providers need to emphasize the evidence-based facts and truths, rather than trying to counter the myths and misinformation⁶². To combat vaccine misinformation and to address parents' vaccine safety concerns it is recommended that comprehensive and innovative communication strategies are developed provincially^{63 64}. This strategy could include: mass media campaigns that focus on physician recommendations for vaccination, internet-based communication tools that profile the risks of vaccines compared to the risks of diseases,

and resources that help parents learn to discern between reliable and unreliable vaccine information on the Internet. This plan should also consider community development processes that enable community discussion and dialogue regarding vaccination among parents.

Ontario's Immunization System Review

The MOHLTC is currently undertaking a review of Ontario's publicly funded immunization system. The review will inform the Ministry's development of a five-year immunization plan for the province.

An advisory committee has been established by the Chief Medical Officer of Health to identify opportunities to improve the overall effectiveness and efficiency of Ontario's immunization system to prevent morbidity and mortality from vaccine preventable diseases.

Task groups reporting to the advisory committee have been established to focus on priority theme areas related to the immunization system including: system integration, immunization decision-making and program delivery, vaccine acceptance and uptake and scientific evidence.

The review began in the fall 2012. A final report is expected to go to the Chief Medical Officer of Health in the summer/fall of 2013.

As well, Ontario's Public Health Sector Strategic Plan, launched April 2013, has as its second strategic goal to improve the prevention and control of infectious diseases, with a focus on immunization.

Vaccines can protect against diseases, but only if almost all children are vaccinated on time. These high vaccination rates offer a protective "herd immunity" that stops person-to-person transmission of disease at the community level. As the technical report *Toronto Unvaccinated* demonstrates, if more Toronto residents choose not to vaccinate against these diseases, they will return and cause significant illness, disability and deaths. The issues of vaccine hesitancy, safety concerns and misinformation are not unique to Toronto. It will be critically important for these issues to be addressed in a coordinated and province-wide manner.

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SIGNATURE

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Medical Officer of Health

Appendix 1: Toronto Unvaccinated: The Impact of Vaccination on the City's Health,
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