INFORMATION REPORT

TO:	Mayor and Members Board of Health
COMMITTEE DATE:	March 20, 2017
SUBJECT/REPORT NO:	Immunization in Hamilton: Immunization of School Pupils Act Compliance (BOH17005) (City Wide)
WARD(S) AFFECTED:	City Wide
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Council Direction: Not applicable

Information:

Background

Public Health Services (PHS) is responsible for the delivery of the Vaccine Program under the *Ontario Public Health Standards* (2008) (OPHS) and associated protocols of *Immunization Management* (2016) and *Vaccine Storage and Handling* (2016). Full details of the requirements and the resource challenges PHS faces in meeting the requirements were provided in report BOH16053 (Vaccine Program Update, November 14, 2016).

At the January 2017 Board of Health (BOH) meeting, questions were raised regarding the data contained in The Spectator series on vaccination rates published in late 2016.

This report will provide further information to the BOH on these data.

Immunization of School Pupils Act

The *Immunization of School Pupils Act* (ISPA) is provincial legislation that describes the immunization requirements for Ontario's elementary and high school students, along with the roles and responsibilities of those involved in the implementation of the ISPA, including parents, physicians, nurses, the Medical Officer of Health and school operators (Table 1).

Table 1: Roles and Responsibilities in the Implementation of the ISPA and Vaccine Program

Role	Responsibility
Parents	• Complete the vaccines required for their child, • Report when their child receives vaccines to PHS, and • If vaccines were not received, provide a valid medical exemption if the child cannot receive the vaccines for medical reasons or a completed statement of conscience or religious belief if the parent does not wish the child to receive the vaccines.
Physicians and nurses	• Provide vaccines according to Ontario's Publicly-Funded Immunization Schedule, and • Provide parents with a signed statement showing the vaccines provided to the child (e.g., Yellow Card).
Medical Officer of Health (MOH)	• Conduct the screening and suspension process to ensure children are up-to-date on the immunizations or have a valid medical exemption on file or have a valid statement of conscience or religious belief on file with PHS, • Enter immunization data into Panorama (provincial vaccine database), and • Provide human papillomavirus (HPV), hepatitis B virus (HBV) and meningococcal vaccine to students in grade 7.
School operator	• Provide school and class lists to PHS, • Allow PHS to attend the school to administer specific vaccines, and • Do not allow students to attend school if the MOH has ordered the student to be suspended for not complying with the ISPA.

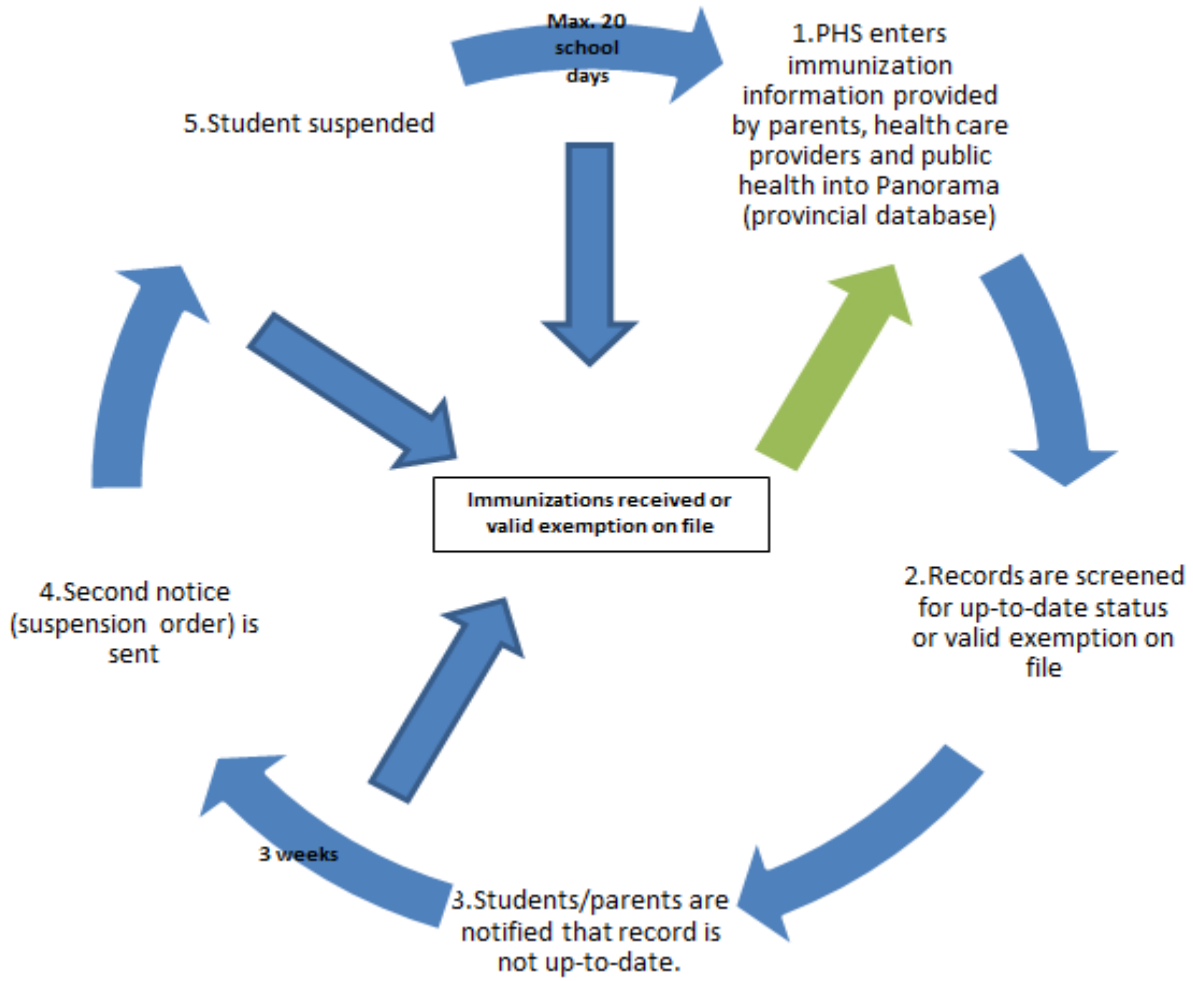
Immunization for the following diseases is required under the ISPA:

- Diphtheria
- Tetanus
- Pertussis (whooping cough)
- Poliomyelitis (polio)

- Measles
- Mumps
- Rubella (German measles)
- Meningococcal disease
- Varicella (chickenpox)

Screening and suspension process (Figure 1).

Figure 1: Summary of the Screening and Suspension Process Under the ISPA



Full details of the screening and suspension process were provided in report BOH16053.

The screening and suspension process is effective in bringing students into compliance with the ISPA. During the current school year (2016-17), 10,704 students have been screened so far with 59% compliant with the ISPA at initial screening, 88% compliant on suspension day and 99.6% compliant by the end of the suspension period (preliminary data).

Compliance with the ISPA

A student is compliant with the ISPA when one of the following is provided to PHS:

- Evidence of immunity or that vaccines are up-to-date for age,
- A valid medical exemption, and/or
- A completed statement of conscientious objection or religious belief (non-medical exemption).

Information on how students/parents can report vaccines to PHS is available on the City of Hamilton website: https://www.hamilton.ca/public-health/health-topics/vaccines-and-immunization. The schools boards in Hamilton have assisted with distributing this information to parents.

Immunization coverage is the percentage of people in a population that are immunized against a disease. In Ontario, two measures have previously been used to estimate immunization coverage: 1) up-to-date for age, and 2) compliance with the ISPA. This was due to limitations in the IRIS database (precursor to Panorama). With the advent of Panorama, Public Health Ontario is developing novel methods to determine more accurate coverage rates for health units across the province. These are expected to be available in the future.

The data are not perfect and both overestimates and underestimates can occur. As compliance with the ISPA includes children with exemptions, slight overestimates can occur. Exemption rates in Hamilton (medical and conscience/religious objection) range from 2-3% which is consistent with the rest of Ontario (Table 2). Additionally, the compliance with ISPA numbers may also underestimate the true vaccine coverage, particularly when performed on students who have not yet undergone the screening and suspension process (as is true of some of the data presented in The Spectator articles). In this case, many students have already received their vaccines, but this was not yet reported to PHS and will only come to light once screening and suspension is completed.

Table 2: ISPA Exemption Rates Among Hamilton Students Born in 2008 and 1998

Year	Measles	Mumps	Rubella	Diphtheria	Tetanus	Pertussis	Polio	Men
2008	2.7%	2.7%	2.8%	2.7%	2.7%	2.7%	2.7%	2.9%
1998	2.7%	2.2%	2.2%	2.1%	2.1%	2.1%	2.1%	2.1%

Men – meningococcal

Data Source: Ontario Ministry of Health and Long-term Care, Panorama, extracted [2016/05/17] to [2016/06/07] and [2016/08/09] to [2016/08/010]

Data Notes: Exemptions include both medical and non-medical exemptions. A recorded exemption does not exclude the possibility that a student was vaccinated (i.e., a student may have both an exemption and a record of vaccination).

Concern is sometimes raised that newcomers to Canada may not be accepting or receiving vaccines. Studies have shown that non-medical exemptions are associated with higher median household income, higher percentage of college graduates, higher proportion of “white” ethnicity, and lower percentage of families in poverty (1-5). A previous study in Ontario showed that immigrant mothers were more likely to have their children up-to-date on vaccines than non-immigrant mothers (6).

Table 3 shows the overall rates of compliance with the ISPA in Hamilton for birth cohorts 2008 and 1998. The complete data shared with The Spectator are included in Appendices A and B. Overall, the 2008 birth cohort (7 year olds) showed high compliance with the ISPA. The 1998 birth cohort (17 year olds) showed high compliance with the ISPA for measles, mumps, rubella, polio and meningococcal. However, compliance with the ISPA was lower for diphtheria, tetanus and pertussis. Adolescents are recommended to receive a booster vaccine for these diseases between 14 and 16 years of age. Some of the challenges with implementing the ISPA in high schools that may impact compliance with the ISPA include students not attending school (skipping, early completion, having dropped out), students having assumed responsibility for their health and health care without parental involvement, as well as when the data were extracted the screening and suspension process was not yet completed at all of the schools.

Table 3: ISPA Compliance Rates Among Hamilton Students Born in 2008 and 1998 Compared to Provincial Up-to-Date for Age Rates in Students Born in 2005 and 1995 (7)

Birth cohort	Measles	Mumps	Rubella	Diphtheria	Tetanus	Pertussis	Polio	Men
2008 (HAM)	97.7%	97.6%	98.7%	95.8%	95.8%	95.8%	95.9%	95.8%
2005 (ON)	88.3%	87.9%	95.2%	74.6%	74.6%	72.6%	74.2%	NA
1998 (HAM)	97.1%	97.0%	97.5%	78.9%	78.9%	77.7%	96.8%	93.6%
1995 (ON)	95.4%	93.7%	97.1%	84.0%	84.0%	69.9%	94.3%	89.4%

HAM – Hamilton; ON – Ontario; NA – not available; Men - meningococcal

Data Source: Ontario Ministry of Health and Long-term Care, Panorama, extracted [2016/05/17] to [2016/06/07] and [2016/08/09] to [2016/08/10]

Data Notes: Parent/student-reported to Public Health. Please note the numbers are subject to change due to system ongoing update.

While some individual schools show lower rates of compliance with the ISPA, the overall compliance in Hamilton is good. The last provincial immunization coverage report was published in 2014 and based on 2012-2013 school year data (7). No further reports have been published due to the transition from IRIS to Panorama, but are expected in future.

To put the Hamilton data into context, it is useful to compare compliance rates in Hamilton with those of the rest of the province. Currently, a direct comparison is not available, but considering the provincial data from 2012-2013 (different birth cohorts and using up-to-date for age), Hamilton compares favourably (Table 3).

Herd Immunity

Herd immunity, also known as community or indirect immunity, has multiple definitions, but the general concept is that when a critical proportion of a population is immunized against a specific infectious disease, those who are not or cannot be immunized (e.g., newborns, pregnant women for some vaccines) will benefit because the disease is unlikely to spread easily in the population (8). The risk of disease in susceptible people in the population is less because most others are immune (8).

While public health always aims for high levels of vaccine coverage in a population, 100% coverage is not possible. Canada has established targets for population coverage of vaccine preventable diseases (Table 4). These targets have yet to be achieved in Canada or Ontario.

Table 4: Canadian Immunization Coverage Targets for Diseases Under the ISPA

Disease	Target (7)
Diphtheria	99%
Tetanus	99%
Polio	99%
Measles	99%
Mumps	99%
Rubella	97%
Pertussis	85-95%
Meningococcal	97%

Critical vaccination levels are more difficult to define than targets. In order to determine the critical vaccination level mathematical modelling must be used and includes concepts such as how many people an infectious person can spread the disease to and how well the vaccine prevents spread of the disease. These are dynamic concepts and may change with different outbreaks and different mathematical models.

Measles, which is very easily spread between people, is estimated to have a critical vaccination level around 95%. In real life, this means that essentially 100% of people in the population need to be immunized because not everyone will mount an immune response when vaccinated. Clearly, it is not prudent to rely on herd immunity to protect yourself or your child from measles.

Tetanus is also a unique case. Tetanus is not passed between people. The bacteria are found commonly in the environment (e.g., soil, rusty nail). It does not matter how many people in the population are immunized against tetanus. If you or your child is not immunized you have no protection against the disease.

Summary

Overall, Hamilton shows good compliance with the ISPA and high levels of protection against vaccine-preventable diseases. While pockets of lower immunization occur in some schools in Hamilton, most Hamiltonians have the ability to protect themselves and their families by staying up-to-date on their immunizations. PHS will continue to promote immunization across the lifespan and deliver vaccines to the community in conjunction with health care providers in the community.

Appendices and Schedules Attached:

Appendix A to Report BOH17005 - ISPA Compliance Rates Among Hamilton Students Born in 2008 by School

Appendix B to Report BOH17005 - ISPA Compliance Rates Among Hamilton Students Born in 1998 by School

References:

(1) Carrel M, Bitterman P. Personal belief exemptions to vaccination in California: a spatial analysis. *Pediatrics*. 2015;136(1):80-88.

(2) McNutt LA, Desemone C, DeNicola E, El Chebib H, Nadeau JA, Bednarczyk RA, et al. Affluence as a predictor of vaccine refusal and underimmunization in California private kindergartens. *Vaccine*. 2016;34(14):1733-8.

(3) Richards JL, Wagenaar BH, Van Otterloo J, et al. Nonmedical exemptions to immunization requirements in California: a 16-year longitudinal analysis of trends and associated community factors. *Vaccine*. 2013;31(29);3009-3013.

(4) Birnbaum MS, Jacobs ET, Ralston-King J, Ernst KC. Correlates of high vaccination exemption rates among kindergartens. *Vaccine*. 2013;31(5):750-6.

(5) Tan L, Anderson C, Tan B, Muhajarine N. Taking a closer look: an examination of measles, mumps, and rubella immunization uptake in Saskatoon. *Can J Public Health*. 2007 Sep-Oct;98(5):417-21.

(6) Guttmann A, Manuel D, Stukel TA, DesMeules M, Cernat G, Glazier RH. Immunization coverage among young children of urban immigrant mothers: findings from a universal health care system. *Amb Ped*. 2008;8:205-9.

(7) Ontario Agency for Health Protection and Promotion (Public Health Ontario). Immunization coverage report for school pupils: 2012-2013 school year. Toronto, ON: Queen's Printer for Ontario; 2014.

(8) Fine P, Eames K, Heymann DL. "Herd immunity": a rough guide. *Clin Infect Dis*. 2011;52(7):911-6.