

# Epidemiology of the 2008 mumps outbreak in Oxford County, Ontario



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## Introduction

Mumps is an acute viral infection. It is a vaccine-preventable disease for which a vaccine has been available in Ontario since the early 1970s. Until recently, mumps was a rare disease in Canada, with an average of 87 cases reported annually. (1) In recent years, however, several major outbreaks have occurred in Canada, including one centred in Oxford County in 2008. *We describe the epidemiology of a mumps outbreak in Oxford County to inform future outbreak investigation and management in communities at increased risk for vaccine-preventable disease outbreaks.*

## Methods

In response to a report of a confirmed case of mumps in an Oxford County student who was visiting Alberta in early January 2008, Oxford County Public Health & Emergency Services heightened surveillance for mumps disease by contacting local physicians, walk-in clinics and hospitals beginning in January 2008. On August 1, 2008, the Ontario Ministry of Health and Long-Term Care (MOHLTC) was notified of six cases of mumps in Southwestern Ontario reported between May 29 and July 31, 2008. All cases were unimmunized and part of an under-immunized community in Oxford County with links to communities in the Netherlands and British Columbia (BC), also with low vaccination coverage. These cases indicated an unusual increase, compared to the average of two cases of mumps reported during the same time of year between 2001 and 2006. On the same day, a mumps outbreak was declared in the Township of Norwich, and later expanded to encompass all of Oxford County.

### Case management and data collection

- An enhanced surveillance directive was issued by MOHLTC on August 1, 2008 to initiate enhanced surveillance throughout Ontario, requiring all health units to report cases of mumps electronically through the web-based integrated Public Health Information System (iPHIS) within one business day.
- During the outbreak, the Oxford County Board of Health implemented 425 Exclusion Orders made under the Immunization of School Pupils Act (2) to students at one private school identified as an exposure site in the outbreak. Exclusion Orders normally remain in place until a) the outbreak is declared over; or b) the student named in the Order demonstrates they have acquired immunity to the disease either by immunization or natural disease.
- As a result of the Exclusion Orders, 370 students and their family members consented to be interviewed and tested for immunity to mumps.
- On August 25 and 26, 2008, serology (blood testing) clinics were held for students that attended a private school identified as an exposure site for the current outbreak.
- Viral isolation samples were acquired from newly identified, active cases and polymerase chain reaction (PCR) testing was performed, where possible.

### Case definitions

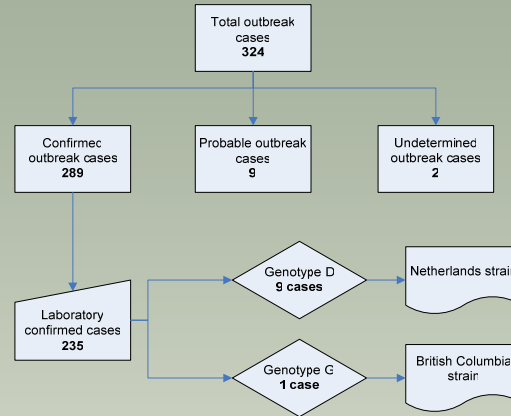
Outbreak-associated cases were classified as follows, where clinical illness was characterized by acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary gland, lasting  $\geq 2$  days, and without any other apparent cause:

- Confirmed outbreak cases were defined by any of the following in the absence of recent mumps vaccination: positive mumps IgM serology, virus detection or isolation, a significant rise in mumps IgG antibody between the acute and convalescent sera or seroconversion, or clinical illness in a person with an epidemiological link to a laboratory-confirmed case.
- Probable outbreak cases were defined as those with clinical illness and an epidemiological link to an exposure site.
- Undetermined outbreak cases were defined as persons with indeterminate IgM and reactive IgG antibody lab results for mumps and general respiratory symptoms without parotitis.

### Data preparation, extraction & analysis

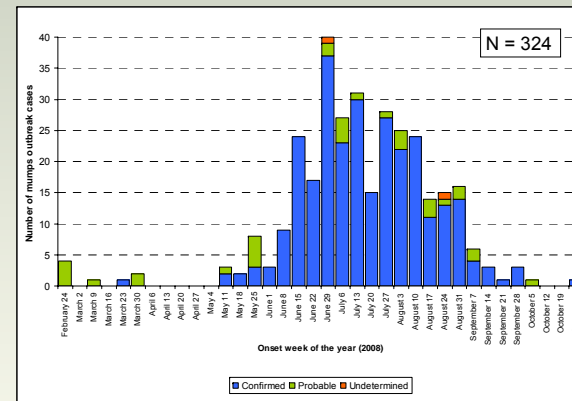
- After the outbreak was declared over, the involved health units completed data cleaning of the cases entered in iPHIS to ensure that all case information was complete and up-to-date.
- Once complete, the data was extracted from iPHIS by the MOHLTC using Cognos ReportNet in April 2009, with some additional updates extracted in September 2009.
- Descriptive epidemiologic analysis was completed using Microsoft Excel.

### Outbreak cases by classification and genotyping results



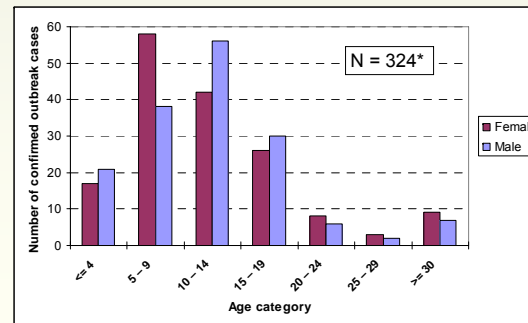
Source: Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (iPHIS) database, extracted [22/04/2009]

### Epidemiologic curve by outbreak case classification and onset week in 2008



Source: Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (iPHIS) database, extracted [22/04/2009]

### Age and gender distribution for all outbreak cases



Source: Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (iPHIS) database, extracted [22/04/2009]  
 \*Note: Age was unknown for 1 case.

## Results

- The onset of illness for the index case was Feb 24, 2008, and the last onset of illness for a case occurred on Oct 26, 2008. The outbreak was declared over on Dec 17, 2008, two incubation periods following the last day of onset of illness.
- 307 of the outbreak cases (94.8%) resided in Oxford, while the remaining 17 cases (5.2%) resided in two surrounding health units.
- The mean age was 12 years and the median age was 11 years, with a range of <1 to 45 years. There was an equal gender distribution with 161 males and 163 females.
- 310 cases (95.7%) were not immunized for mumps. Only one case had received two doses of mumps-containing vaccine, and two cases received one dose of mumps-containing vaccine. The immunization status was unknown for two cases.
- Investigation by public health units found that a number of cases were exposed to the mumps virus at a Township of Norwich school, as well as other exposure settings within Oxford County.
  - 116 cases (35.8%) were exposed at the private school
  - 57 cases (17.6%) were exposed at a community church
  - 67 cases (20.7%) were exposed in the household
- Of the 289 confirmed outbreak cases, 235 (81.3%) were laboratory-confirmed for mumps disease.
- Genotype D was identified in 9 cases (3.8%) and genotype G was identified in 1 case (0.4%).

## Discussion

We have described an outbreak of mumps that was mainly limited to a community with low vaccination rates. Serology clinics held to test for immunity to mumps disease were largely successful, as a number of active cases were identified through these clinics. While they were made available to both students and their family members, few family members who did not attend school were tested for immunity to mumps disease, as only school pupils are required to prove immunity to attend school, according to the Immunization of School Pupils Act (2). The observed age distribution reflects this community response, which is largely skewed towards school-age children and suggests underreporting in all other age groups. Therefore, the true extent of the outbreak was likely to have been underestimated.

There is geographic clustering across Canada of related communities with low vaccination rates. Genotype D was the genotype isolated in a mumps outbreak 2007-2008 in the Netherlands (3), while Genotype G was isolated in a 2008 mumps outbreak in British Columbia (4-6). As genotypes D and G were isolated in the current outbreak, this confirms the circulation of mumps virus between communities in Ontario, British Columbia, and the Netherlands. Given that geographically clustered groups with low vaccination rates are connected and highly mobile, a large pool of susceptible persons remain at increased risk for vaccine-preventable diseases such as mumps disease.

Public health efforts should be focused on ensuring that vaccine-induced (herd) immunity is high in the general population surrounding geographic clusters of low vaccination rates to prevent further circulation of the mumps virus to those who cannot be vaccinated in the general community.

## Conclusions

Frequent contact between unimmunized communities within Canada and Europe creates an opportunity for increased transmission of vaccine-preventable diseases. Enhanced surveillance is required from public health officials and efforts to maintain herd immunity in the surrounding population are warranted.

## Acknowledgements

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