

Mumps outbreaks in post-secondary settings: time for another dose of vaccine?

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Disclosure Statement

- I have no affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization.

Mumps history in Nova Scotia

2005:

- Two small outbreaks in Halifax associated with a high-school and a university
- “The lost cohort” hypothesis

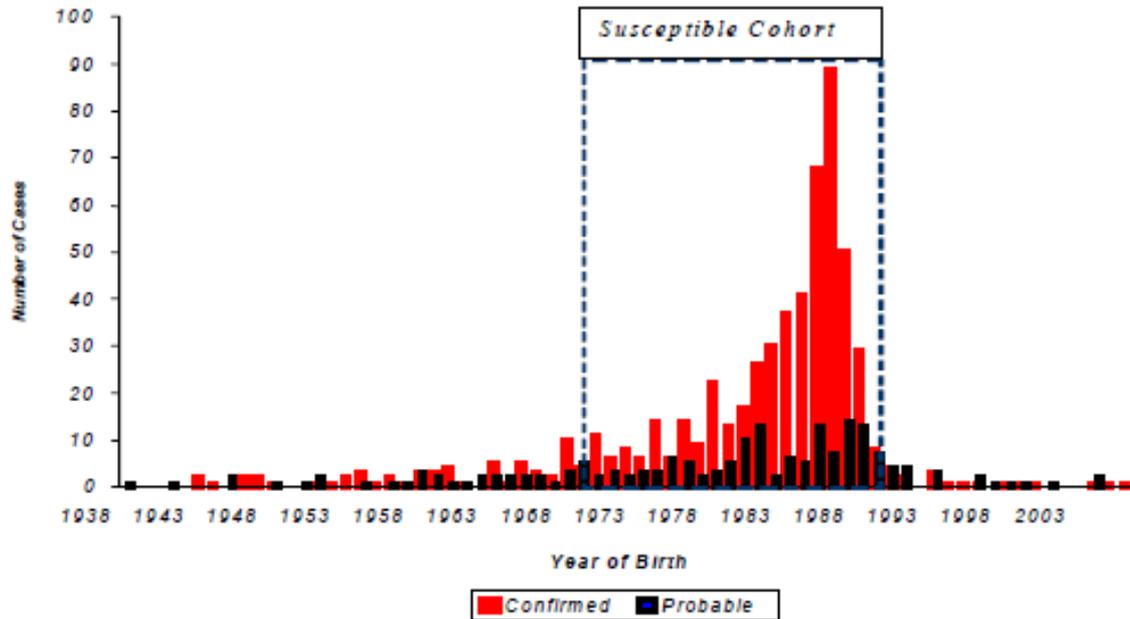
2007:

- Largest outbreak in Canada since 1996 associated with a Halifax university
- 595 cases; median age of 23yrs
- Logistical challenges; serology problematic



The “lost” cohort is found

Figure 49: Mumps Cases in Nova Scotia February 22 – December 31, 2007 by year of birth and case definition. (n=775)



Not Sid too...



Mumps returns to Nova Scotia!

- **2008-2016:**
 - 0-6 cases reported each year
- **2017-18:**
 - Mumps is back! – outbreak affecting young adults in schools and post-secondary settings



Remind me...what is mumps again?

- Highly infectious, vaccine-preventable disease caused by a paramyxovirus spread by respiratory droplets.
- Typically causes acute parotitis (Sid's swollen cheek).
- 15-20% asymptomatic and >50% can be associated with nonspecific respiratory symptoms.
- Prior to vaccination, it was the most common cause of viral meningitis.

Mumps outbreak in 2017/18

- First case reported in a university student in Halifax on October 23, 2017.
- A total of 94 laboratory-confirmed and epi-linked cases of mumps were reported by May 28, 2018 when declared over.
- Cases focused around two universities in the province.
- Parotitis was most common presenting symptom.

What is known about giving 3rd doses in mumps outbreaks?

- Three epidemiologic studies provide evidence for use of a 3rd dose of MMR vaccine for prevention of mumps (ACIP review, 2018).
- Incremental vaccine effectiveness of 3rd versus 2nd MMR dose in these studies ranged from 61% to 88%.
- All report lower attack rates among persons who received the 3rd dose during the outbreak compared with persons who had received 2 doses before the outbreak.

Post-secondary setting – Cardemil et al. 2017

- Risk ratio 6.7 vs. 14.5/1,000 person-years ($p < 0.001$).
- At 28 days after vaccination, receipt of 3rd vaccine dose was associated with a 78.1% lower risk of mumps than receipt of a 2nd dose (adjusted hazard ratio, 0.22; 95% CI 0.12 to 0.39).

Cardemil CV, Dahl RM, James L, Wannemuehler K, Gary HE, Shah M, Marin M, Riley J, Feikin DR, Patel M, Quinlisk P. Effectiveness of a third dose of MMR vaccine for mumps outbreak control. *New England Journal of Medicine*. 2017 Sep 7;377(10):947-56.

Waning immunity?

- Students who received 2 doses of MMR vaccine ≥ 13 years before the outbreak had >9 times the risk for contracting mumps vs. those who had received the 2nd dose in the 2 years prior to the outbreak.

No. of years since receipt of MMR2§	Attack Rate no./1000 population
0-2	1.6
3-12	3.9
13-15	11.3
16-23	17.6



Recommendation of the US CDC, Advisory Committee on Immunization Practices (ACIP)

“Persons previously vaccinated with 2 doses of a mumps virus–containing vaccine who are identified by public health authorities as being part of a group or population at increased risk for acquiring mumps because of an outbreak should receive a third dose of a mumps virus–containing vaccine to improve protection against mumps disease and related complications.”

“Because of the complexity of mumps outbreaks, including the setting, the group or population affected, and risk factors for transmission, public health authorities are uniquely positioned to advise parents, students, clinicians, and universities regarding when and for which groups a third dose of MMR vaccine is appropriate.”

Would the 3rd dose intervention work in Nova Scotia's outbreak?

- Compare:
 - Setting: proportion of post-secondary students
 - Median age of cases
 - Proportion of cases with 2-dose vaccination
 - Average length of time from 2nd dose of measles containing vaccine to outbreak



	Nova Scotia 2017/18	Cardemil et al. 2017	ACIP (3 studies)
Setting	82.6% post-secondary students 72.3% at two universities	91% post-secondary students at University of Iowa	Post-secondary and secondary school settings
Median age of cases (years)	21	21	N/A
Proportion of cases 2+ dose vaccinated	82% (62/76)	98% (255/ 259)	70% (7,187/9,200)
Average length of time from last dose of MMR (years)	15.5	14.5	N/A

What would this intervention look like in the “real-world” setting?

- Mass immunization clinics for third dose vaccination in university settings showing evidence of transmission.
- Would have applied to two universities:
 - Dalhousie University in Halifax in November (23 cases)
 - St. FX in Antigonish early February (45 cases)



The approach to the NS outbreak

- Three doses would likely help, but not recommended in the *Canadian Immunization Guide*.
- Vaccine records difficult to find and risks of additional vaccine low - just “go ahead” and recommend dose if could not confirm 2-dose history.
- No mass immunization clinics - referred contacts for updated dose if missing record of 2-doses.
- Started to ask ourselves: is this mumps or is this sMumps?

sMumps: “sort of mumps”

- Completely unscientific term devised by me to describe a non-severe, vaccine-attenuated mumps that is being readily identified in 2-dose vaccinated persons due to improved detection and increased communication among those affected.
- Orchitis only significant complication reported in Nova Scotia 4/94 (4.3%); no hospitalizations.



sMumps in the ACIP review?

- The overall proportion of outbreak-associated mumps patients with complications was <3% (270 of 9,200).
- Significantly lower prevalence of complications among mumps patients who had received 2 vaccine doses than among unvaccinated patients
- Orchitis accounted for 75% (203 of 270) of reported complications.
- Cardemil et al. 2017 – 14 orchitis (5%), 1 meningitis.

Conclusions

- National Advisory Committee on Immunization recommendations on 3rd dose mumps vaccine needed – currently not recommended in any circumstances.
- Need to collect better outcome information (ie: rate of complications) for our future outbreaks to better understand mild vaccine-attenuated disease.
- Cost-effectiveness considerations of a 3rd dose vaccine approach important.

Final note on Cost-effectiveness



- Cardemil et al. outbreak 2015-16 at University of Iowa:
 - ~6300 hours of personnel time from state/local public health and the university, including vaccination and lab work
 - 4736 MMR doses administered
 - Total cost >\$649 000, roughly equally distributed between standard outbreak control activities and 3rd MMR vaccination
- Consider opportunity costs of outbreak control activities vs vaccine delivery – targeting of mass immunization likely important + measles protection as secondary benefit.

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