Epidemiology of a Pertussis Outbreak in Central Saskatchewan First Nations Communities

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Disclosure Statement

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

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Definitions

An individual's vaccine coverage measure is defined as

- "on-time ": receipt of the full number of pertussis vaccine doses by a certain age when they are suppose to be, as per the Saskatchewan provincial guidelines.
- "up-to-date": receipt of the full number of valid and required pertussis vaccine doses by a certain age, given they are not "on-time".
- "behind": not received at least one or more of the required pertussis vaccines by a certain age.

Purpose

The purpose of this analysis is to:

1. Determine whether the pertussis vaccine coverage measure of an individual by the age of 18 months is associated with the odds of being diagnosed as a pertussis case in this outbreak.

2. Determine whether the number of years passed since the last pertussis vaccine (among 4 years olds to 13 years olds) is associated with the odds of being diagnosed as a pertussis case in this outbreak.

Methods

- Data compiled by the communities and FNIHB using paper chart reviews.
- Analysis included descriptive statistics and multivariable binary logistics regression models:
  - Variables of interest are pertussis vaccine coverage measure, time since last pertussis vaccine received, age, gender and community of residence.
  - Only variables unconditionally associated with the outcomes ($p<0.2$) were included in the manual model building process.
  - Manual backwards elimination procedure was used to build the final multivariable models.
  - Only significant variables ($p<0.05$) and confounders were retained (adjusted odds ratio changing >20%).
  - All possible two-way interactions among main-effects variables were tested.
  - Model diagnostics conducted the using receiver operating curve and plots of standardized residuals.
    - no evidence of any issues with model fitness
  - Analysis conducted using Microsoft Excel 2010 and Stata™ IC 14.1.

Results – Descriptive statistics

Variable	Case	Contact
Gender		
Female	15	121
Male	7	109
Unknown	0	9
Age Groups		
2 to 9 years old	12	82
10 to 17 years old	7	64
18+	3	83
Unknown	0	10
Total	**22**	**239**

Results – Model 1

Odds of being diagnosed as a pertussis case based on the pertussis vaccine coverage measure at 18 months of age

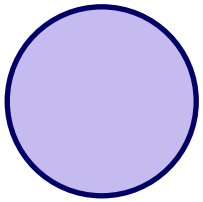
Individuals had nearly five times higher odds of being diagnosed with pertussis in this outbreak if they were "behind" in their pertussis vaccine coverage measure at 18 months of age compared to the individuals who were either "on-time" or "up-to-date".

On-time or Up-to-date

Behind*

O.R. = 4.7

(p= 0.025; CI: 1.21 to 18.1)



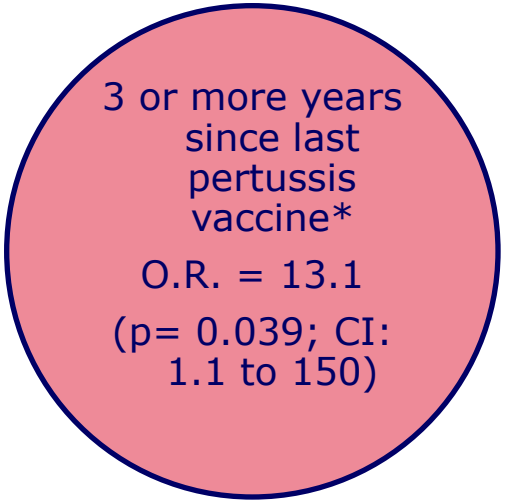
*other variables were not significant or confounding.

Results – Model 2

Odds of being diagnosed as a pertussis case among those children 4 to 13 years old in this outbreak

Children (age 4 to 13 yo) had several times higher odds of being diagnosed with pertussis in this outbreak if they received their last pertussis dose more than 3 years ago compared to the same age group of children who were vaccinated within the past 3 years.

Less than 3 years since last pertussis vaccine



*after controlling for confounders

- gender
- pertussis vaccine coverage measure at 4-6 years of age

The above two variables were not statistically significant but were included in the final model because they were identified as confounders.

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Key Take-Aways and Important Implementations regarding a pertussis outbreak response:

- Vulnerable people are the priority for clinical and public health response (children under 1 year and pregnant women last trimester)
- Immunization is the most effective means of control
- Enhanced immunization in last trimester pregnant women
- Communication is key!
  - Health Directors/Chief and Council
  - Nurses in the “field”
  - Team members (CD and Immunization coordinators, administrative staff, others)
  - Family Physicians/Primary Care
- Awareness of “Outbreak fatigue” in staff on the ground during ongoing outbreaks

In Saskatchewan:

- Current Pertussis vaccine schedule:
  - 2, 4 and 6 months
  - 18 months
  - 4-6 years
  - Grade 8
  - 1 dose in adulthood (18 years of age and older)
  - As of October 1, 2017, all pregnant women are to be offered a dose of Pertussis containing vaccine (Tdap) in the third trimester of every pregnancy (on or after 27 weeks gestation).

Points to Ponder

Timeliness and Effectiveness of the Pertussis Vaccine

- Waning immunity of pertussis vaccine
  - Increase in Pertussis disease among vaccinated populations
  - Additional doses of Pertussis containing vaccines in early school years
- The effect of delayed pertussis vaccination
  - Under vaccinated children are more at risk
  - Timeliness of vaccination also contributes to risk
- Additional doses of Tetanus and Diptheria antigens
  - unnecessary

Take forward

- Increasing Pertussis Vaccine effectiveness
  - Countries using aP vaccines (additional boosters)

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- Question?

- Thanks!