Enhanced Measles Surveillance in Massachusetts

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Background

- Measles is a highly infectious viral illness characterized by:
  - A maculopapular rash
  - Fever to 103^{O}F or higher
  - Cough
  - Coryza
  - Conjunctivitis
  - Koplik spots on the buccal mucosa
- Incubation period averages 10-12 days
- Transmitted person-to-person via respiratory droplets and is transmissible from 4 days before to 4 days after rash onset
- Measles continues to cause significant morbidity and mortality despite global vaccination efforts
- Considered eliminated in the U.S. since 2000

Objectives

- Response to measles can be resource-intensive and logistically challenging
- The Enhanced Measles Surveillance project aims to:
  - Determine the most efficient and effective use of public health resources
  - Gain a better understanding of transmission scenarios
  - Evaluate the effectiveness of intervention strategies following an exposure

Methods

- The Massachusetts Department of Public Health is one of four health departments participating in this CDC funded project. Other participants include:
  - California Department of Public Health
  - Minnesota Department of Health
  - New York City Department of Health and Mental Hygiene
- In an effort to better understand effective transmission scenarios and to evaluate intervention effectiveness, routine investigation of all Massachusetts residents reporting a confirmed diagnosis of measles will be supplemented with more detailed information on:
  - Duration and distance of exposures
  - Efficacy of post-exposure prophylaxis (PEP) obtained through follow-up interviews with contacts
  - Likelihood of disease transmission given specific characteristics of exposure
- Feasibility of data collection will be assessed by determining barriers to data collection and percent investigation data complete.

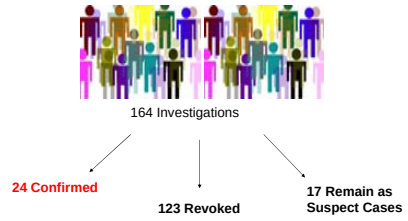
Results

Understanding Transmission

- In order to facilitate gathering of additional information, the variables of interest were consolidated into an electronic set of questions within the Massachusetts Virtual Epidemiologic Network (MAVEN), a web-based disease surveillance system, for ease and consistency of data collection. Additionally, interview worksheets were developed for measles cases and contacts. New variables added include:
  - Further description of rash (e.g. maculopapular, head-to-toe progression)
  - Distance, setting, and duration of exposure
  - Underlying conditions
  - PEP administration date and type given (e.g. MMR, IG)
  - Documented evidence of prior disease or immunity

Retrospective Analysis

- Massachusetts has experienced no incident measles cases since the project's inception, therefore focus has shifted to a retrospective analysis of measles cases from 2011.
  - Twenty-four cases of measles were confirmed in MA in 2011, following a median of two cases per year during the 10 years prior (Figure 1).



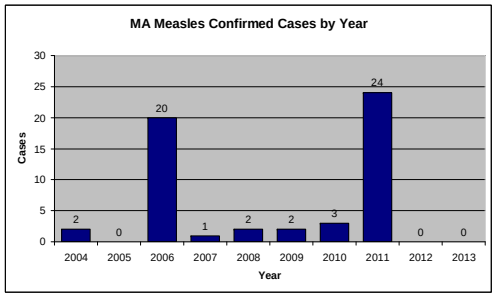


Figure 1: Massachusetts saw an anomalous spike in measles cases in 2011 in the context of a major international outbreak and the largest number of cases in the US in 15 years.

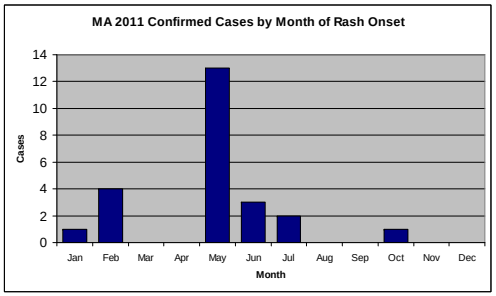


Figure 2: MA saw two clusters of measles outbreaks during 2011.

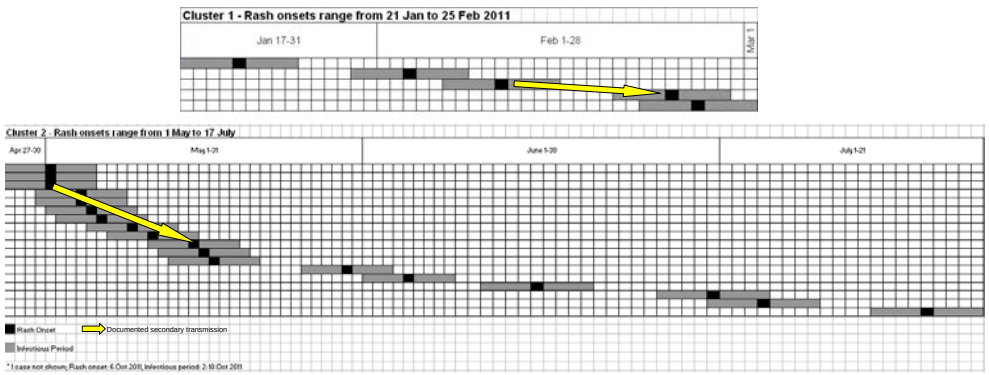


Figure 3: Rash onset dates and infectious periods for the 24 confirmed measles cases in MA in 2011. Secondary transmission was only documented in two instances, as shown by the yellow arrows.

- All 2011 investigations included laboratory testing, contact investigation, and implementation of control measures in conjunction with local partners.
  - Hundreds of contacts were identified to determine susceptibility and provide recommendations for control.
  - Dozens of exposed susceptible individuals were quarantined resulting in lost days of work and school, hundreds contacted providers for immunity testing and vaccination, and dozens received PEP.
  - Supplemental information on contacts continues to be compiled and analyzed, and barriers to data collection are under review.

Descriptive Statistics for 2011 Measles Cases (n=24)	
Age	Avg: 27 years Range: 9 months to 84 years
Gender	Female – 42% Male – 58%
Vaccination status	2 doses – 8% 1 dose – 13% 0 doses – 79%
Reason for unvaccinated status (n=19)	Intentional delay – 16% Born before 1957 – 16% Too young – 16% Missed opportunity – 5% Unknown – 47%
Hospitalization	Hospitalized – 29% Not hospitalized – 71%
Import Status	International importation – 29% Import-linked case – 4% Imported-virus case – 25% Unknown source case – 42%
Genotype	G3 – 25% B3 – 8% D4 – 4% Unknown – 63%
Time to notification of DPH (from rash onset)	Avg: 3.6 days Range: 0 to 17 days

Conclusions

- Investigation of measles cases and their associated contacts remains an important yet resource-intensive activity.
- As evidenced by the 2011 clusters, Massachusetts combats the pressure of imported virus with high immunization and low exemption rates.
  - 93% of children have 1 dose of MMR at 2 yrs, 94% have 2 doses at kindergarten and 98% at 7th grade entry. Exemption rates are < 1.5% for school aged children.
- Results from this project will provide guidance as to which variables collected during the course of case investigation are most pertinent.
- There have been no incident measles cases in MA since the project started, therefore the prospective utilization of new worksheets and collection of additional variables has not yet been tested.
- With the continuing potential for measles importations from endemic regions, public health agencies must remain ready to identify and control disease spread.

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