

Mumps Epidemiology, Outbreaks, and Current Research

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Outline

- Pre Vaccine Era
- Clinical Features
- History of Mumps Vaccine
- Vaccine Era in US
- “Resurgences”
- US Outbreaks 2009-2010
- Diagnostics
- Outbreak Response Strategies
- Discussion



Mumps – Pre Vaccine Era

- **Hippocrates – 5th Century BC**
 - Described clinical picture including orchitis
- **Royal Society of Edinburgh – 1790**
 - 1st description of CNS involvement
- **Disease of Childhood & Military**
 - Leading cause of viral encephalitis in US
 - WWI: Hospitalization rate exceeded only by influenza and gonorrhoea in US Army



Mumps – Clinical Features

- Humans Only Natural Host
- Only Cause of Epidemic Parotitis
- Incubation Period 12-25 Days
- Most Infectious Period 1-2* days Prior & 5 Days After Onset of Parotitis



Mumps – Clinical Features (2)

- **Non-Specific Prodrome**
 - Fever, Headache, Malaise Myalgias, Anorexia
- **Typical Parotitis may be Absent**
 - 40-50% with non-specific or primarily respiratory symptoms
 - Approximately 20% with asymptomatic infection
- **Complications**
 - Orchitis (25-37%); Oophoritis (5%); Mastitis (up to 30%); Pancreatitis (4%)
 - Deafness (4% -most transient); Meningitis (<1-15%)
 - Encephalitis (most serious complication) rare in vaccine era
- **Clinical Illness Modified in Vaccinated?**



History of Mumps Vaccine

- Etiologic Agent of Mumps Identified as a Virus in 1934
- Cultivation of Mumps Virus in 1945
- Inactivated Vaccine Tested in 1951
- Live Attenuated Vaccine Developed in 1960's
- Licensed in the US in 1967



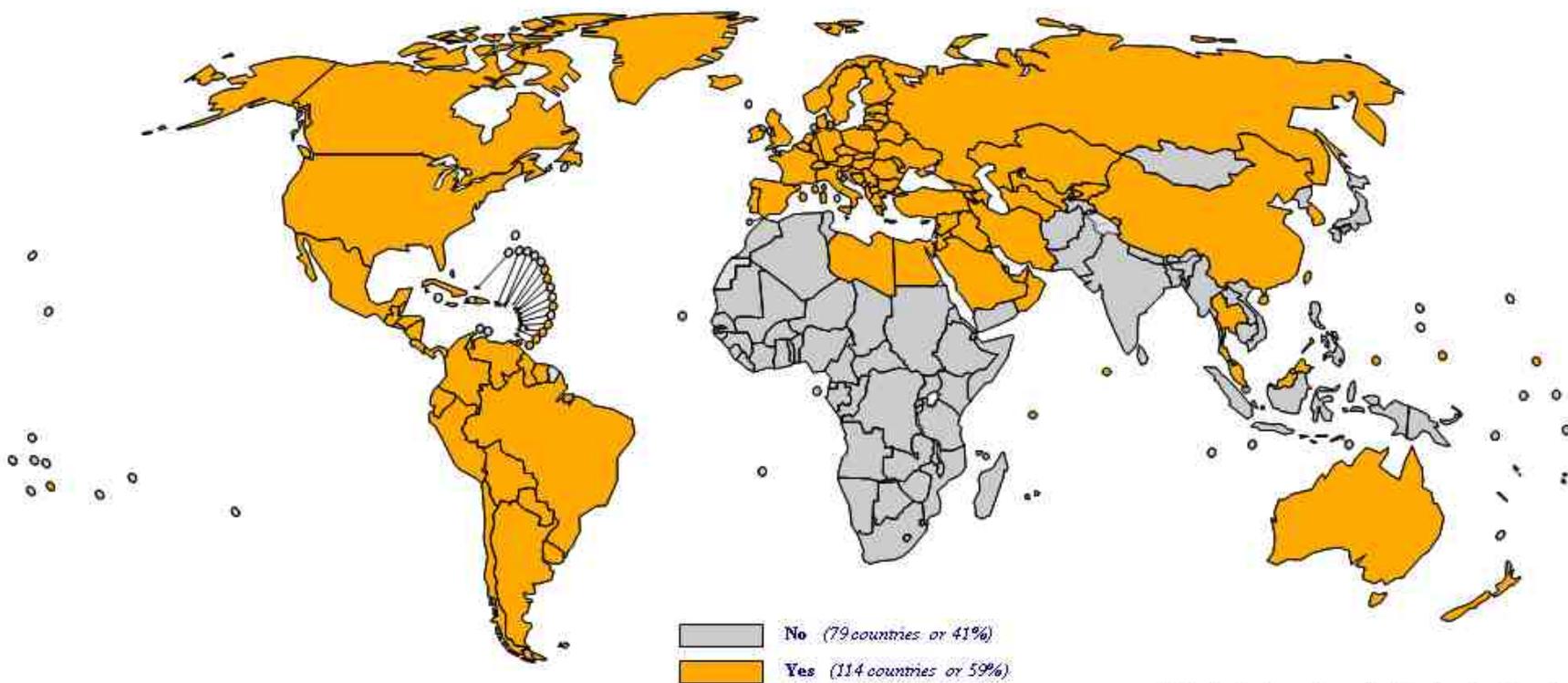
History of Mumps Vaccine (2)

ACIP Recommendations

- **1967: “May be Considered”**
 - Approaching puberty; adolescents; adults (particularly males)
- **1968: Consider “Immunizing All Susceptible Children > 1 year of Age”**
- **1977: “All Children at any Age After 12 months”**
- **1989: 2nd Dose of MMR for Measles Control**
 - “Mumps revaccination is particularly important”



Countries Using Mumps Vaccine in National Immunization Schedule



Source: WHO/IVB database, 193 WHO Member States. Data as of July 2009
Date of slide: 12 August 2009

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2009. All rights reserved.

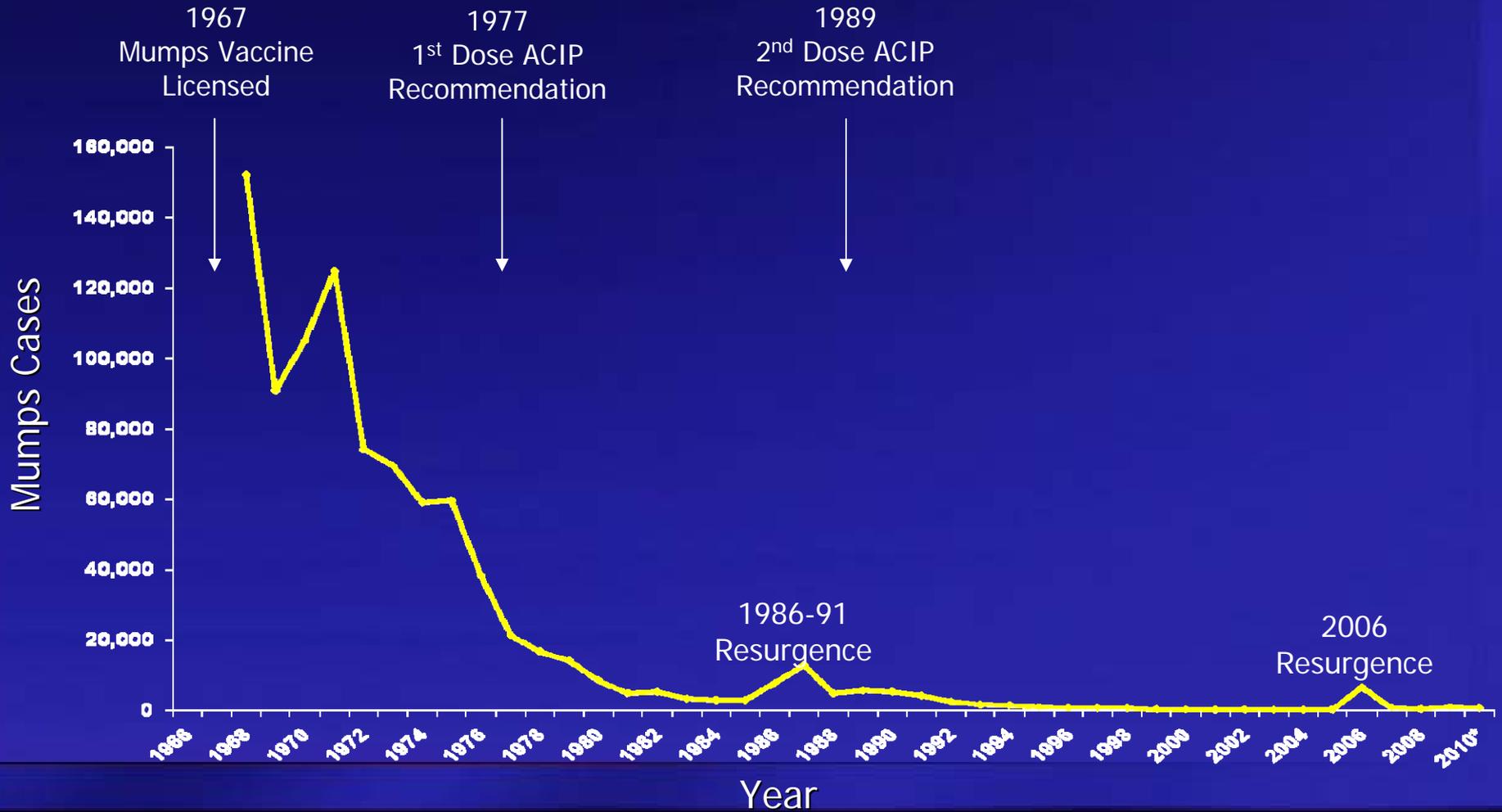


Mumps – Vaccine Era in US

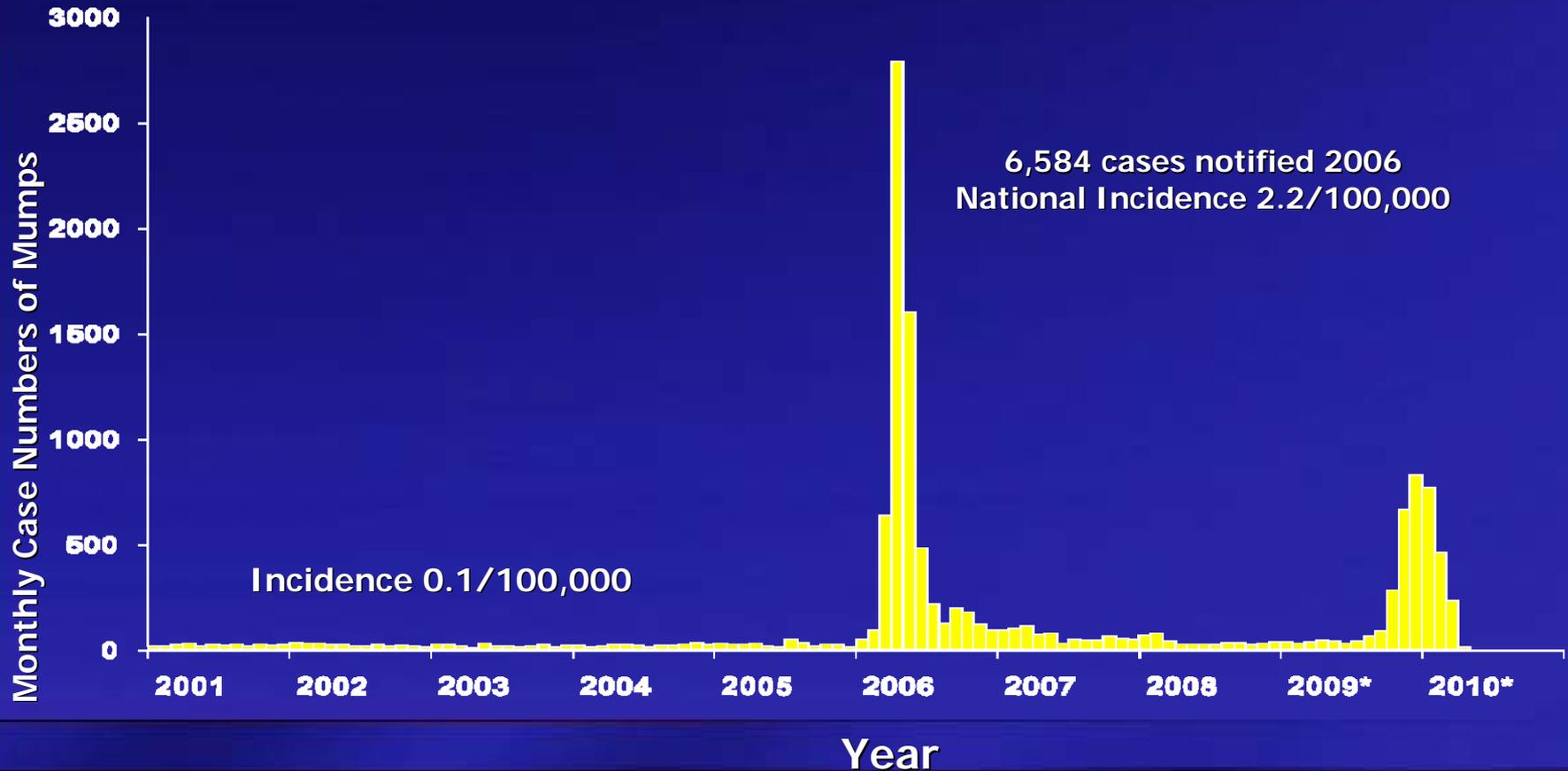
- 97% Decrease in Reported Cases by 1982
- Focal Resurgence 1986-87
- Outbreaks with One-Dose Failures 1988-92
- Continuous Decline in Cases 1993-2001; Followed by Plateau Through 2005



Mumps Notifications, U. S., 1968-2010



Monthly Case Numbers of Mumps United States, 2001 - 2010*



Dayan G et al NEJM 2008; 358:1580-1589

*National Notifiable Disease Surveillance System, Locally collected data
Data provisional through 04/15/2010



Mumps "Resurgences"

- **Brooklyn Outbreak 1997**
 - 119 cases; 92% 1+dose; 62% 2+doses
 - 85% school-aged children attending yeshivas
- **Mid-West Outbreak 2006**
 - 6584 cases; 76% 1+dose; 56% 2+doses
 - Incidence highest in age 18-24 years (80% 2-doses)
 - 83% college students (89-99% 2-doses)
 - 85% of cases in 8 mid-west states



Mumps “Resurgences”

Other High Coverage Outbreaks

- Czech Republic 2005-06
 - Incidence rate highest in age 15-19 yrs
 - 87% of cases age 15-19 yrs with 2 doses
- Naverre, Spain 2006-08
 - 85% of cases age 7-10 yrs with 2 doses
- Kimberly, Western Australia 2007-08
 - Incidence rate highest in age 15-19 yrs
 - 81% of cases age 15-19 yrs with 2 doses
- Jerusalem, Israel 2009 (associated with US outbreak)
 - Incidence rate highest in age 10-14 yrs
 - 78% of cases age-appropriately vaccinated
- Netherlands, 2010
 - 88% of cases (94% of students) with 2+ doses



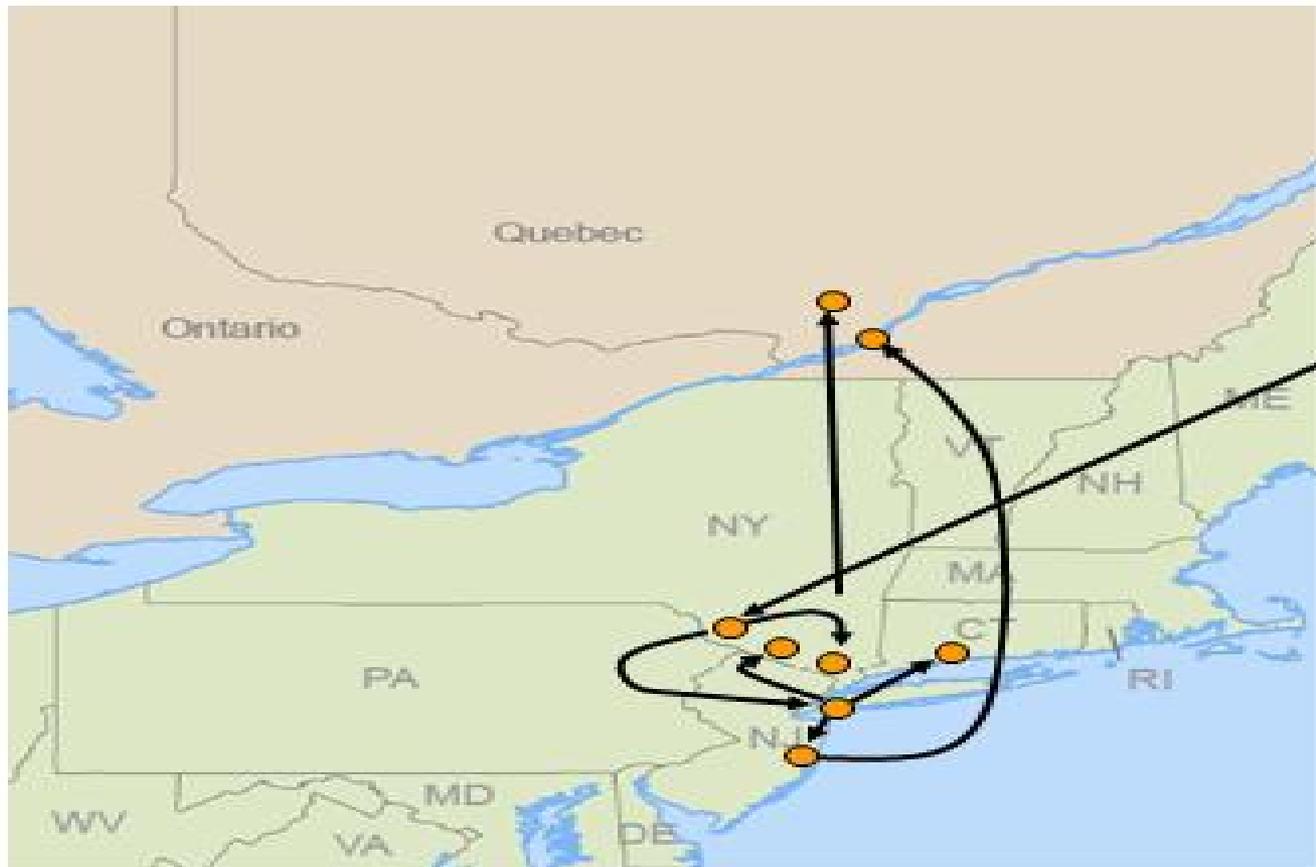
Mumps USA 2009-10

- **Northeast Outbreak 2009-10**
 - ~3400 US cases as of May 21, 2010
- **Guam 2010**
 - >285 cases as of May 21, 2010
- **Iowa College 2010**
 - 8 cases; all with 2 doses (+ 5 more)
- **Nebraska Alumni Basketball Tournament 2010**
 - 20 cases
- **North Carolina/Virginia Rugby Tournament 2010**
 - 5 cases?

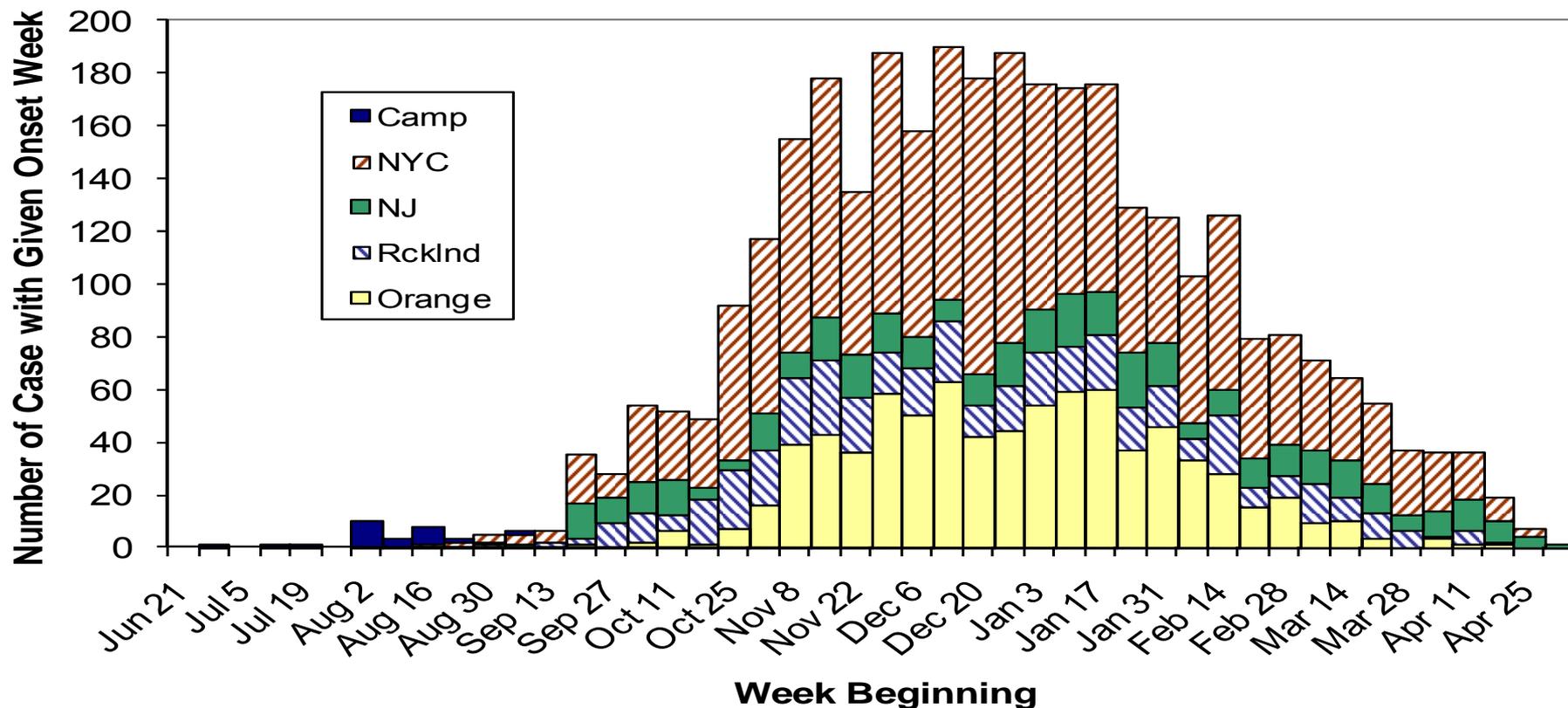


Mumps Outbreak, Northeast US

Geographic Foci of Cases



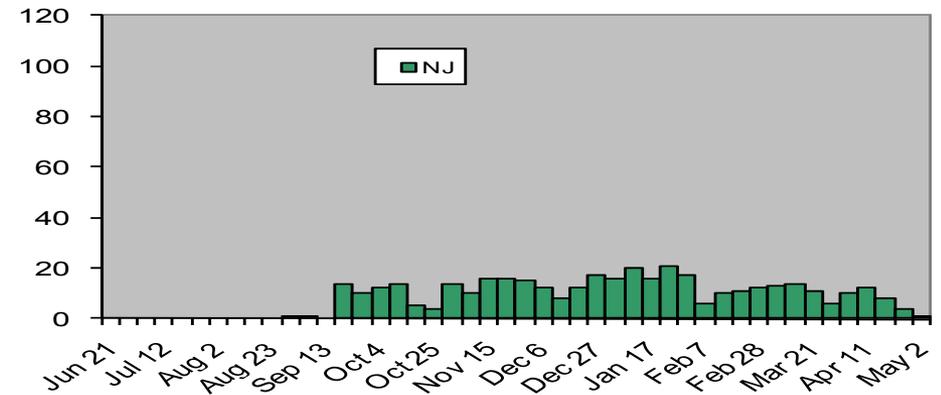
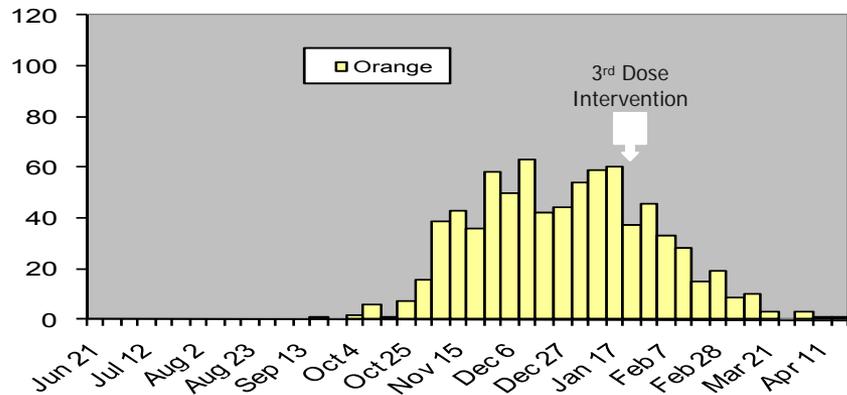
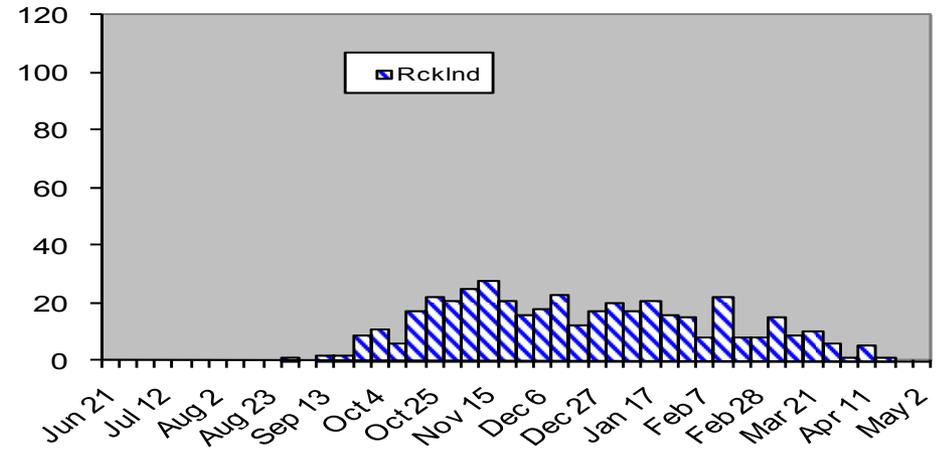
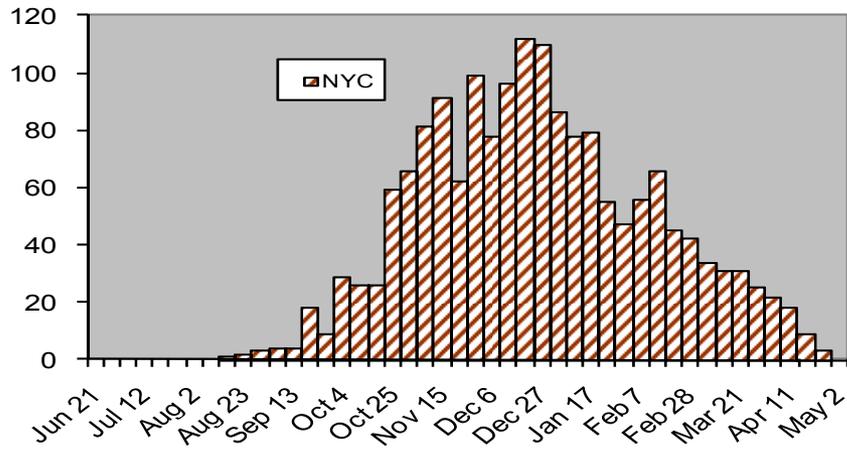
Mumps Outbreak, Northeast US 2010



Reported Cases as of May 14, 2010



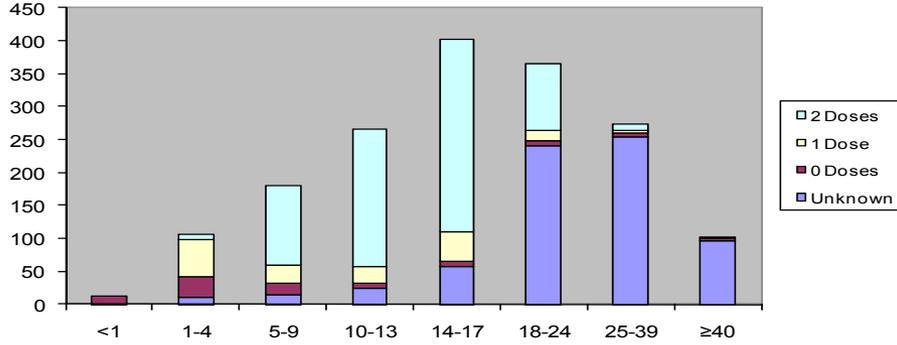
Mumps Outbreak, Northeast US 2010



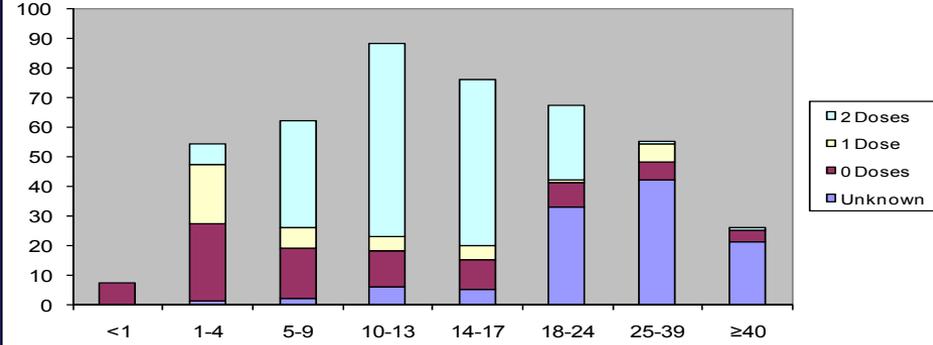
Mumps Outbreak, Northeast US

Age Group and Vaccination Status of Cases

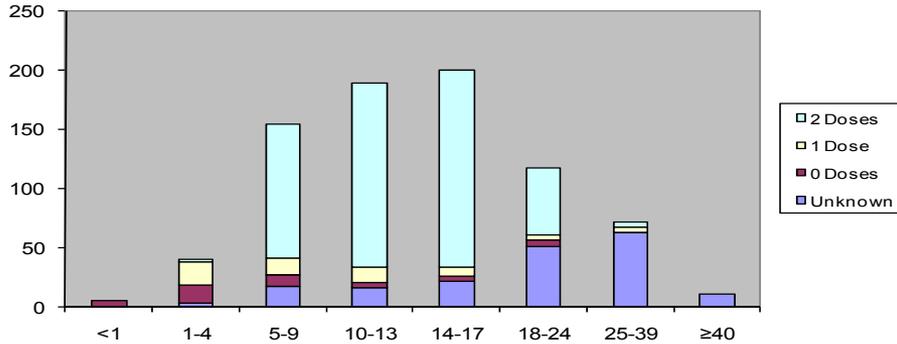
NYC



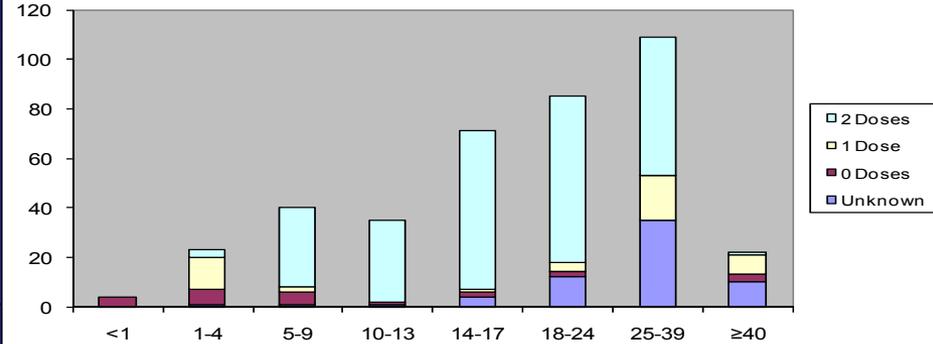
Rockland



Orange



NJ



Mumps Outbreak, Northeast US Characteristics

- Largest US Outbreak Since 2006
- ~3400 Reported US Cases as of May 21, 2010
- Median Age 15yrs (3 mos – 90 yrs)
- 73% Male
- 98% Specific Religious Community

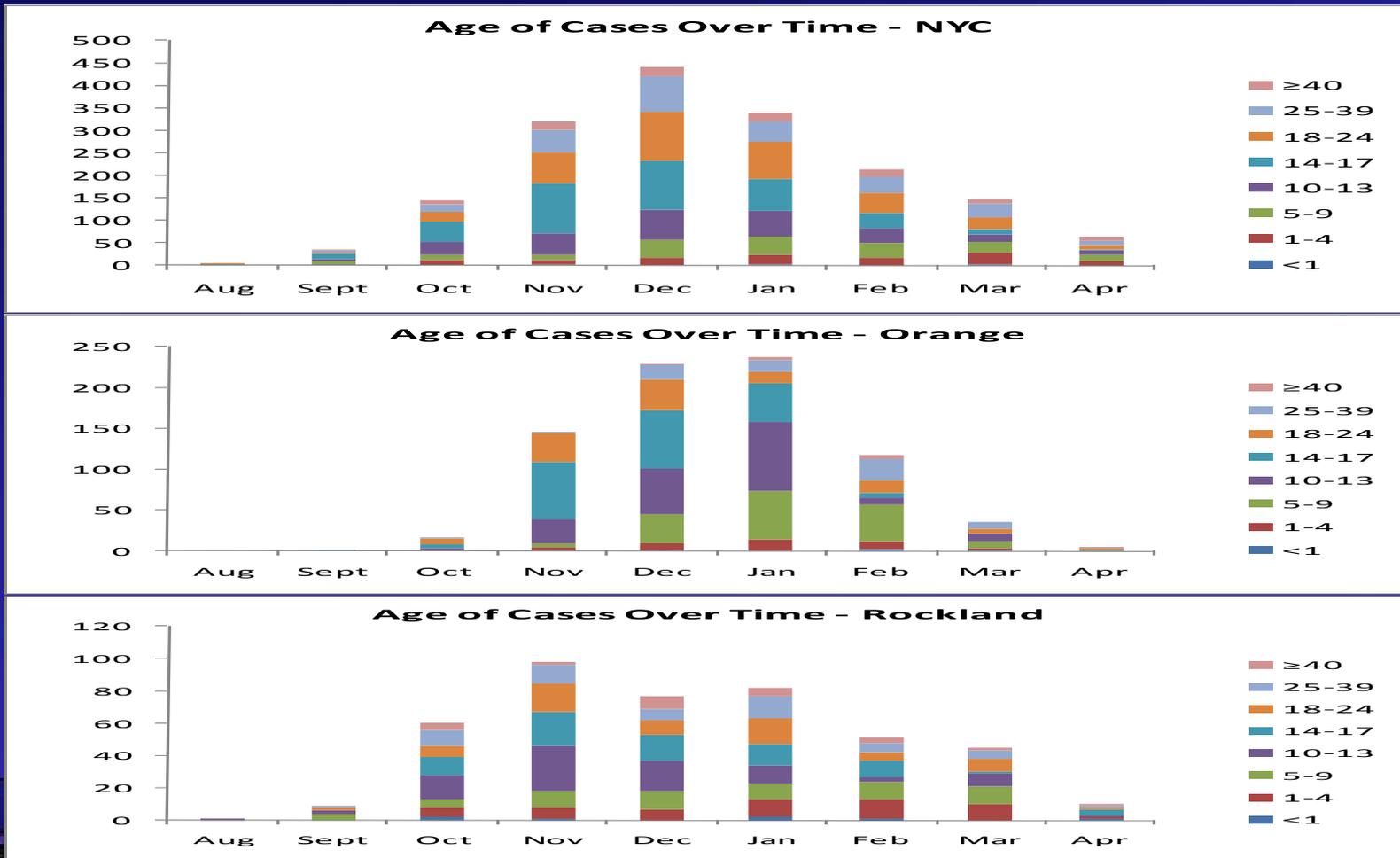


Mumps Outbreak, Northeast US Interventions/Evaluations

- **NYC:**
 - Catch-up vaccine clinics; HH VE study; Environmental risk factors
- **Orange Co:**
 - 3rd dose school-based IRB study: Grades 6-12
 - 3rd dose HH PEP IRB study: 2 community practices
- **Rockland Co:**
 - Community outreach
- **NJ:**
 - College vaccine catch-up & exclusion; Case isolation

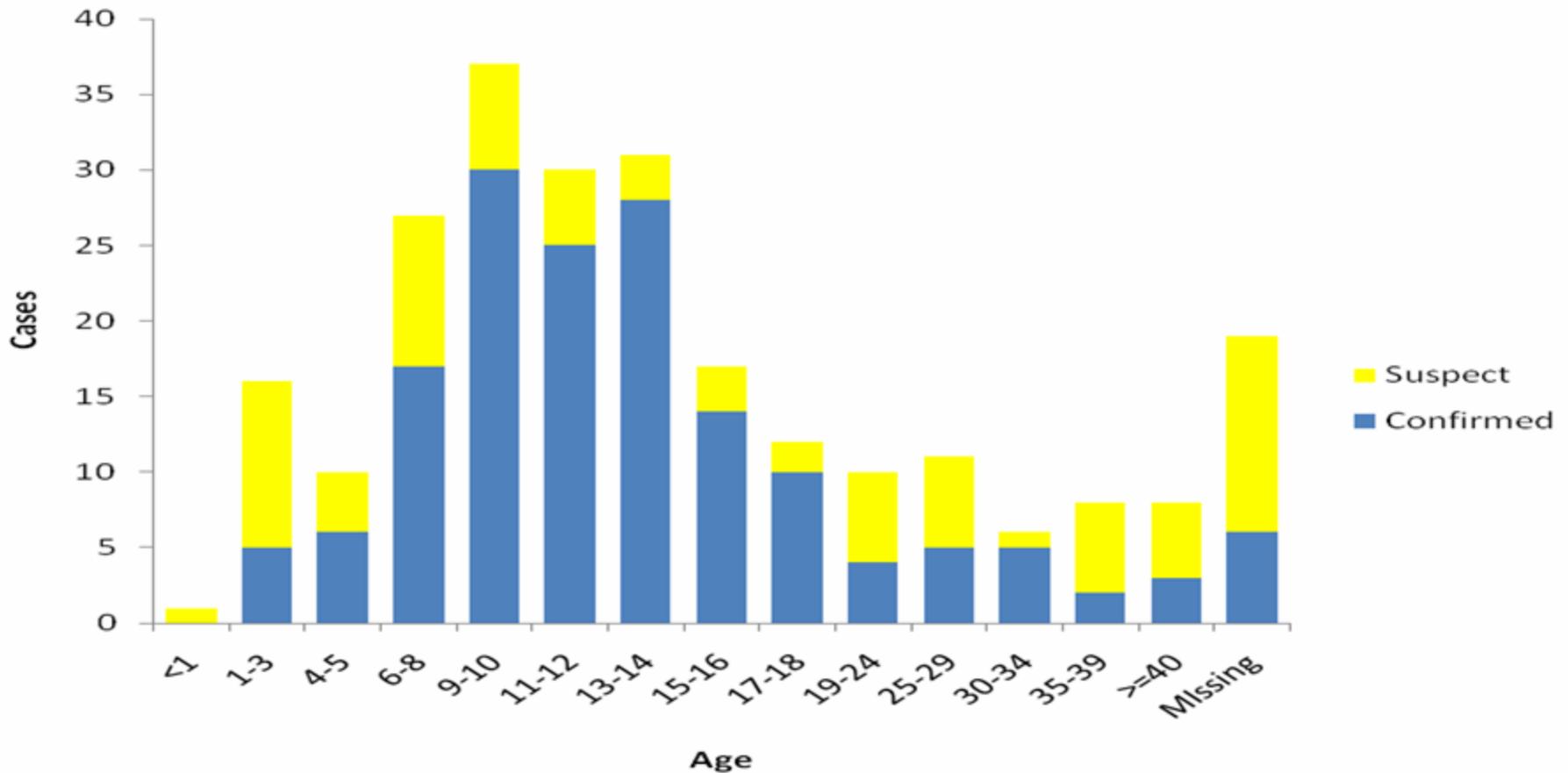


Impact of 3rd Dose Outbreak Intervention Under Evaluation



Mumps Outbreak, Guam

Age Distribution of Cases



Reported Cases as of May 7, 2010



Mumps Outbreak, Guam Characteristics

- Median Age 12 yrs (1-62 yrs)
- Incidence Rate Highest in Ages 9-14 yrs
- Attack Rate Varies by Ethnicity
- 98% 2-dose Coverage Among Cases Age 6-18 yrs



Mumps Diagnostics/Lab Issues

- Correlates of Immunity for Not Established
- Many Cases are not 'Classic' Presentations
- Sensitivity of Lab-Confirmation Decreased in Vaccinated
- Viral Specimens should be Obtained Early (0-3 days ideal)
- New Testing Under Investigation
 - ELISpot
 - Plaque Reduction Neutralization
 - Oracol Swabs



Outbreak Response Strategies

- High 2-Dose MMR Coverage
- Early Detection & Isolation
- Catch-up Vaccination & Exclusion
- ?3rd Dose? – When?; What Conditions?
- ?New Vaccine?



??Factors Contributing to Mumps Outbreaks??

- Vaccine Efficacy
- Waning Immunity
- Vaccine/Strain Mismatch
- “Crowding” (Force of Infection)
- Abundant Sources of Virus
- Missed/Delayed Diagnoses



Discussion

