Alberta Health Services

Immunization and Vaccines

A parental choice

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Overview

- Facts about vaccines and immunizing
- Immunization in southern Alberta
- Examples of recent outbreaks:
  - Pertussis
  - Measles

What is a vaccine and how does it work?

- Vaccines protect you from diseases!
- Contain bits of disease germ (weakened or dead) that triggers your body to create antibodies and lifelong immune memory
- Natural versus vaccine

  triggered protection
- Delivery methods

Do vaccines weaken the immune system?

- Vaccines make our immune system stronger!
- Protection of infants at an early age according to the immunization schedule
  - Length of passive immunity
  - Incomplete protection

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Can natural infection or a healthy lifestyle be effective alternatives to vaccine?

- Vaccines → Immunity without disease and without risk of disease complications
- Protection of breast feeding
- Natural products may boost immune system, but do not create antibodies

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Can giving a child several vaccines at the same time overload the immune system?

- Extensive testing for safety and effectiveness.
- Multiple vaccines protect against more diseases!
  - More rapid protection
  - Less injections
  - Less time/cost
  - ↓ risk of missed doses

Will my child have a reaction following a vaccine?

- Vaccines are safe
- Minor reactions
- Rarely more serious reaction

Who should not be vaccinated?

- Severe allergy to eggs
- Serious allergic reaction
- Severely immuno-compromised
- Very sick with a high fever

What ingredients are in vaccines?

- Killed or weakened germ, or part of the germ's cell
- Sterile water or salt solution
- Adjuvant – to boost the immune response
- Preservative or antibiotic to prevent bacterial growth
- Additives – stabilize vaccine (sugars, amino acids)
- Residuals – egg proteins
- Inactivating agents
  - to deactivate virus or bacterial toxins

Vaccine ingredient

Thimerosal

- Trace amounts in multi-dose vials of vaccines:
  - Hepatitis B vaccine and some influenza vaccine
- Preservative and stabilizer
- Contains ~40% ethyl mercury
  - Ethyl mercury broken down and excreted in body
- Scientific studies demonstrate no link between minute quantities of thimerosal in vaccines and neuro-developmental disease, brain damage, autism

How are vaccines made and licensed in Canada?

- High standards for safety
- Food and Drug Act and Regulations authorizes Health Canada to regulate safety, efficacy and quality of vaccines
- Requires scientific evidence to demonstrate safety and effectiveness
- Process includes pre-clinical trials → clinical trials →……. → surveillance
- Based on the precautionary principle

Adverse Event Reporting

- Process of reporting
  → Parent raises concern to Public Health
  → Medical Officer of Health reviews
  → Alberta Health
  → Public Health agency of Canada
  → Canadian Adverse Events Following Immunization Surveillance System database
- Over past > 10 years, infants given more complex vaccines, yet decrease in adverse events reported

Why do we need vaccines if we have better hygiene and sanitation to help prevent disease in Canada?

Why immunization is recommended

1. Many communities in Southern Alberta do not achieve herd immunity
2. Infants/unimmunized children not protected by the herd
3. Adults can be carriers of disease
4. Travel to endemic countries
5. Family participation in increased community activities/schools
6. Mechanisms of disease transmission
7. Risk of serious complications resulting from disease outweigh risks of immunization

Concept of Herd Immunity

- Protection of a population from the transmission of a vaccine preventable illness through immunization of this population (the “herd”, or group)
- Different vaccine preventable diseases have different targets to achieve herd immunity

Concept of Herd Immunity

- Dependent on various assumptions:
  - Human to human transmission
  - Random mixing of the population
  - Presence of non-human hosts
  - Vaccine efficacy
  - Circulating communicable diseases
- Modelling approach

Herd immunity and Southern Alberta?

- Heterogeneity in immunization rates between communities
- Homogeneity within schools; heterogeneity between schools
- High density of non-immunizing groups at a geographic and school level
- Leads to regular vaccine preventable outbreaks, not commonly seen in the developed world

Vaccine Preventable Outbreaks in Southwest Alberta

- **Measles 2013**
- Pertussis 2012
- Pertussis 2009
- Mumps 2008
- Pertussis 2003/2004
- Pertussis 1999
- Measles 1999
- Measles 1997
- Rubella 1996
- Polio case approximately 20 years ago

Whooping Cough Outbreak 2009

- **Southwest** (2008/2009)

  (4 doses of a Pertussis (whooping cough) containing vaccine by 2 years of age)

  – Overall rate = 74.3%

  – Range = 49.7 – 87.7% by geographic area

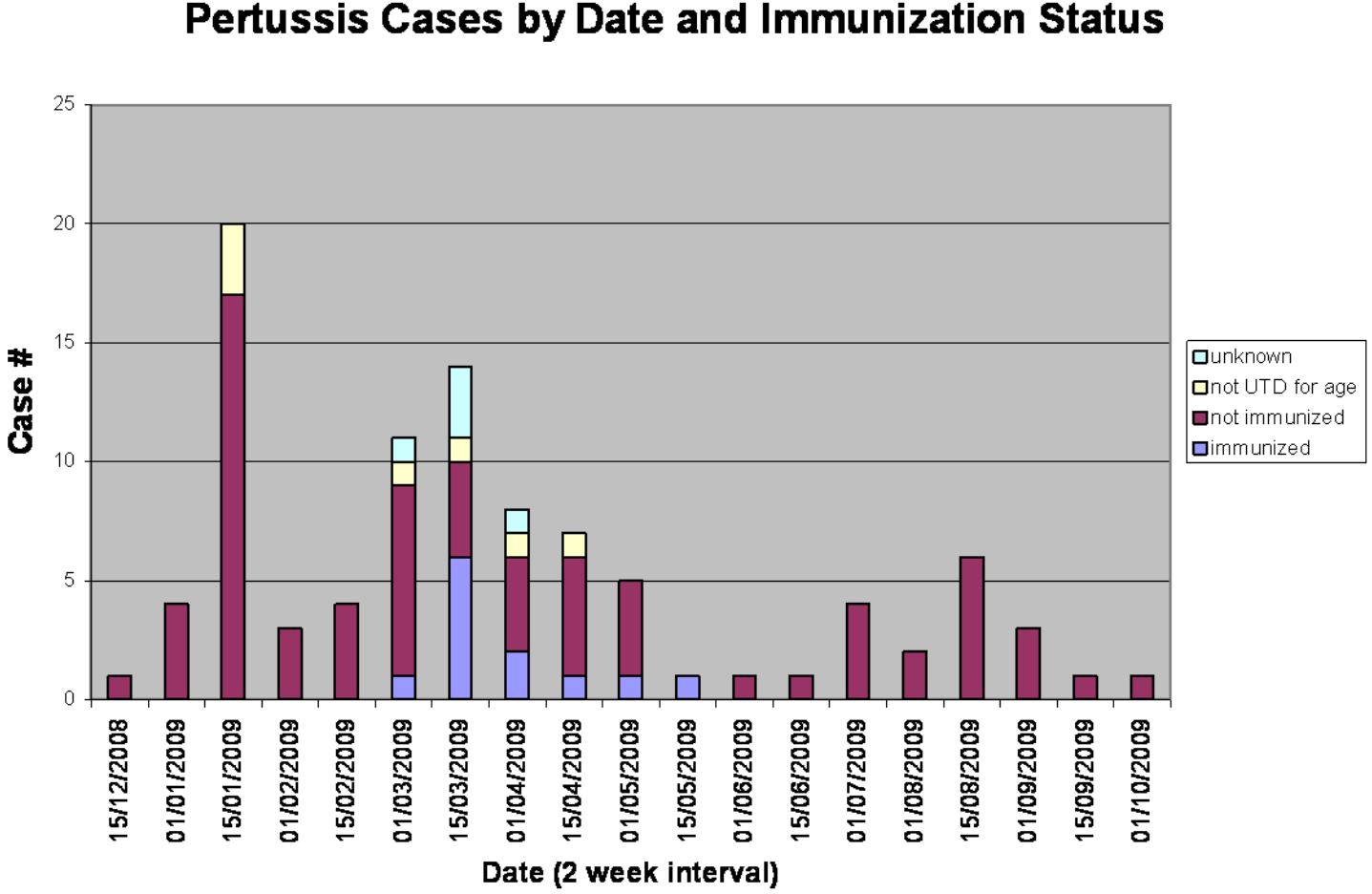
  – Lowest rates in County of Lethbridge

- **Southeast** (2009)

  – Overall rate = 86%

  – Range = 85.4 – 89.6

- Alberta target = 97%

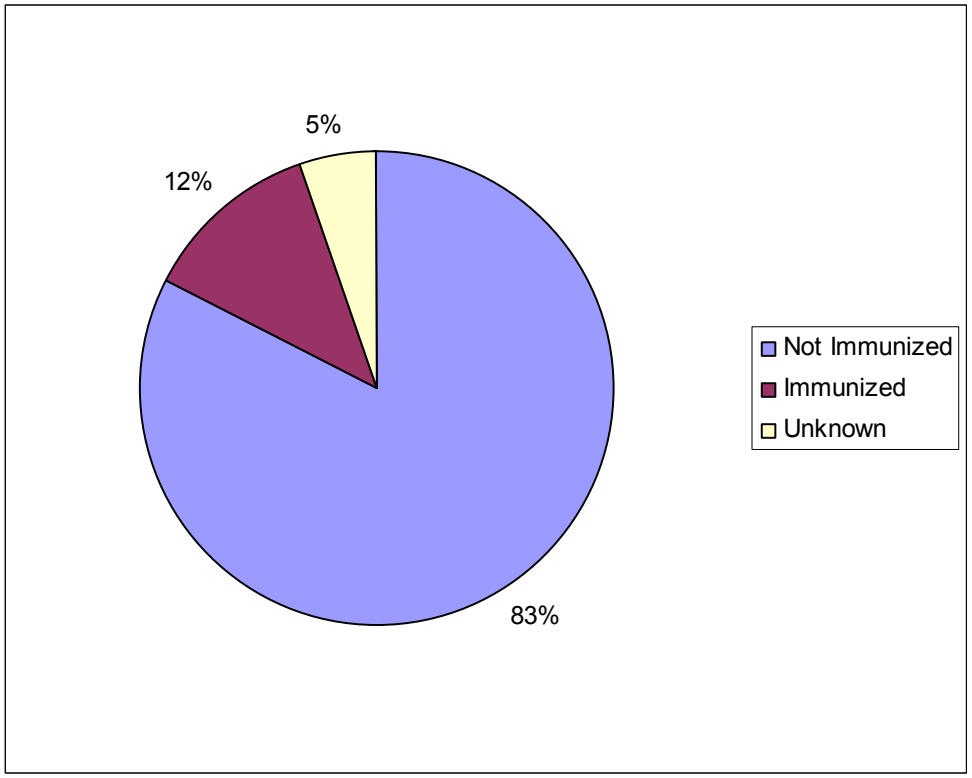


- Pertussis outbreak declared on January 12, 2009
- First case was confirmed on December 29, 2008
- First report of symptoms around December 8, 2008
- Outbreak declared over on November 17, 2009

Pertussis outbreak Southern Alberta

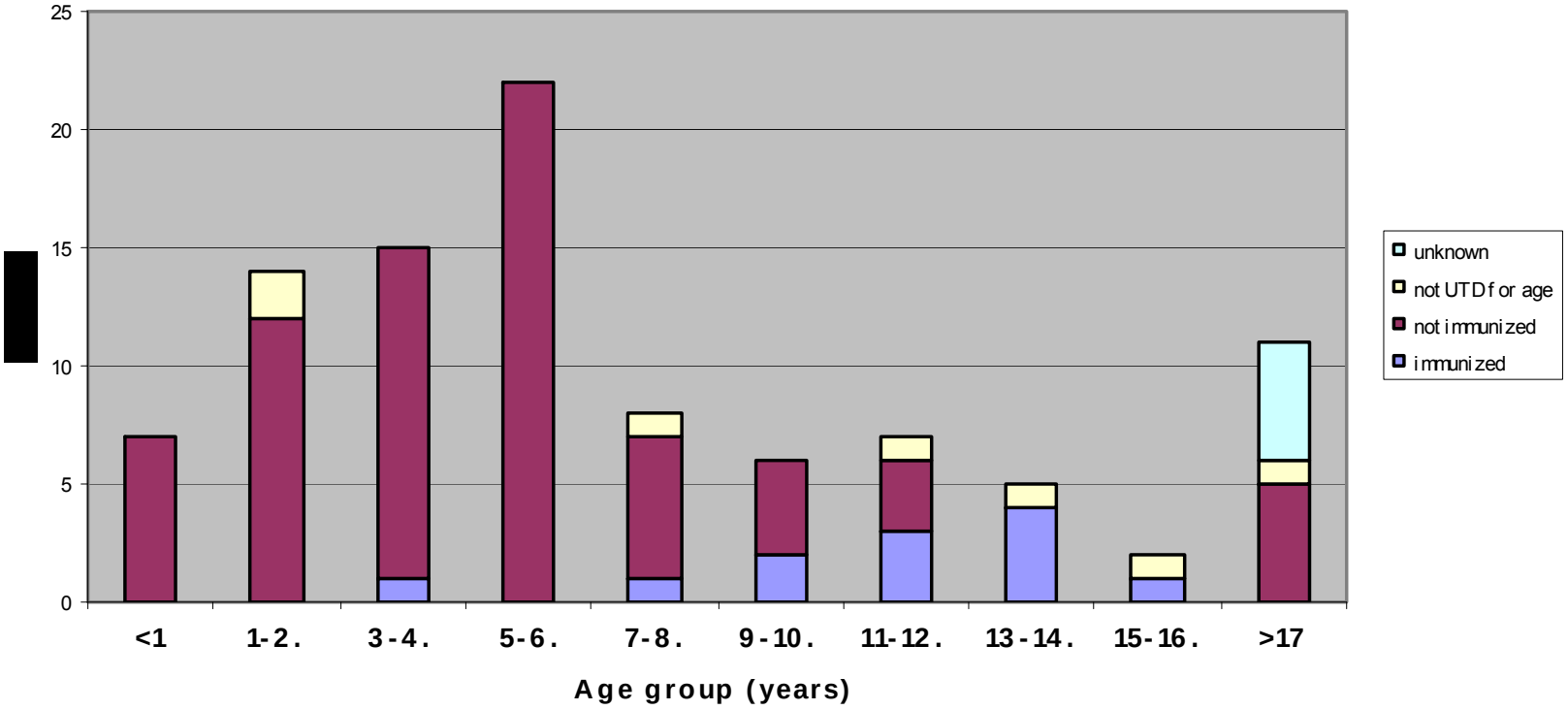
- Total of 97 cases of Pertussis reported by November 17, 2009 (one additional case on December 22)
- Most Pertussis cases were confirmed cases by NP swab
- **Under reporting of total Pertussis cases**
- **School based outbreak**

Proportion of cases not immunized

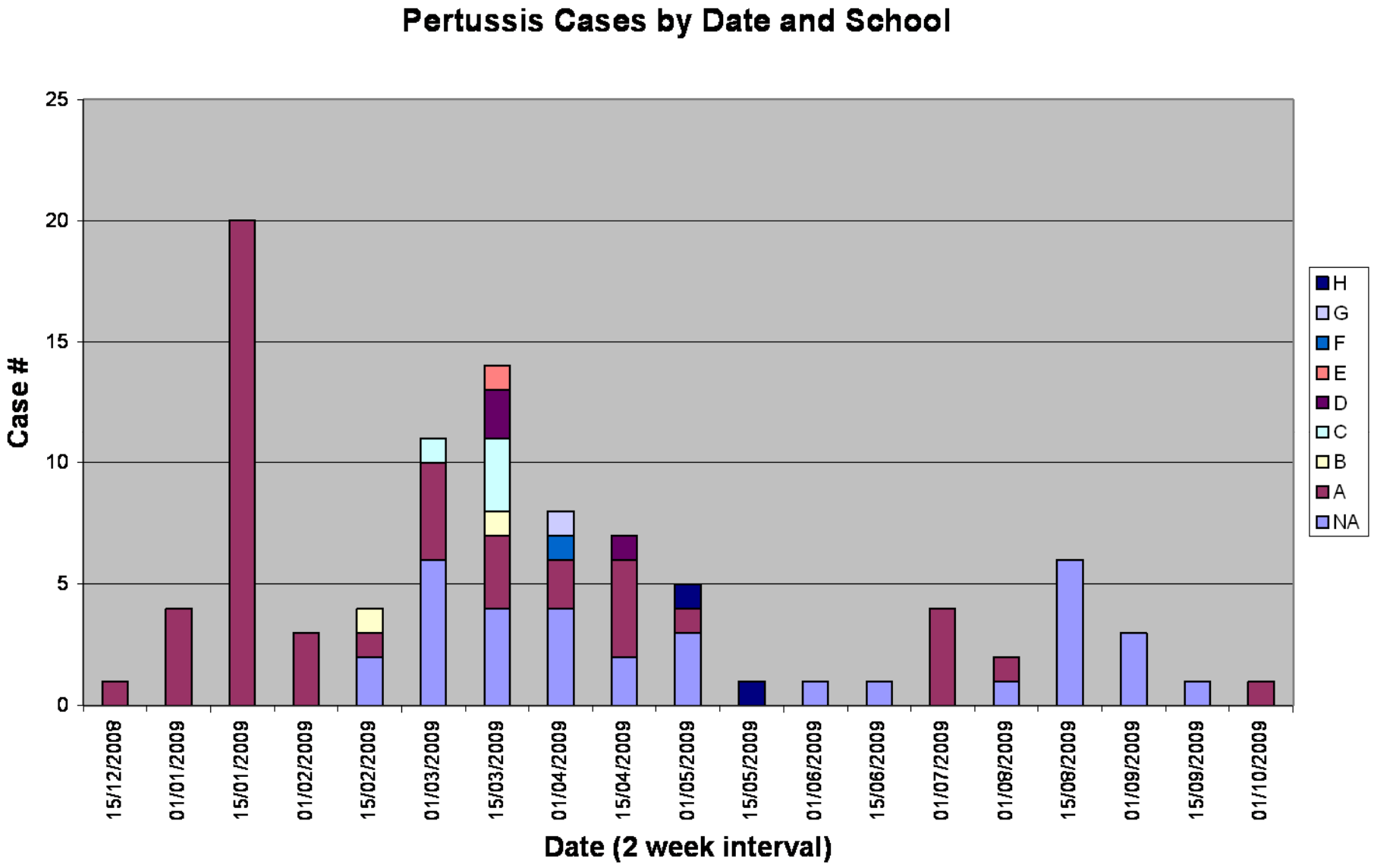


- Not immunized = unimmunized + those not up-to-date

Pertussis cases by age and immunization status

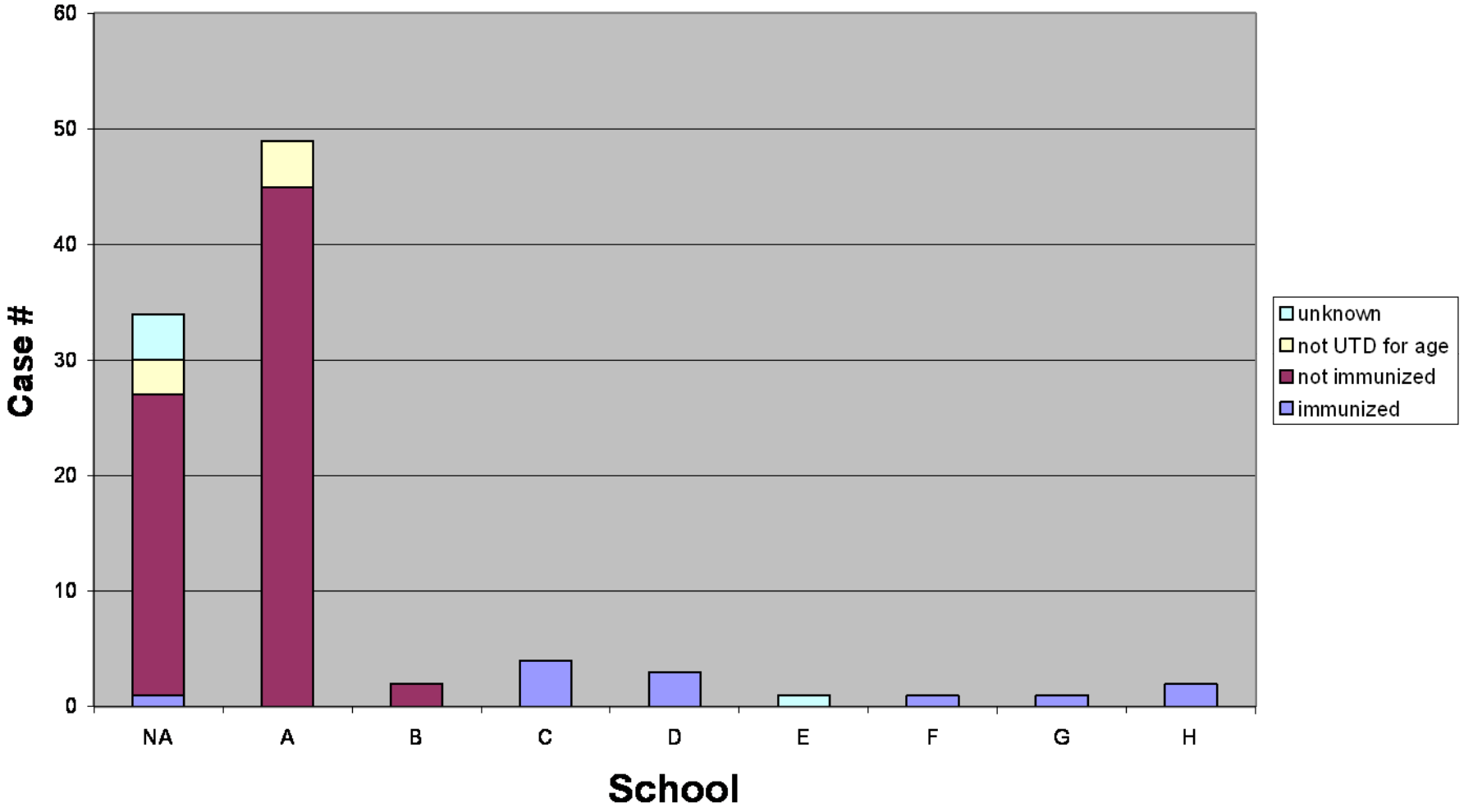


- Non-immunized children were primarily affected
- 60% of cases were children ≤ 6 years old
- 11% of cases were adults (≥ 17 years old)
- Last Pertussis outbreak in this community and school was in 2003/2004, most likely conferring immunity to the older children



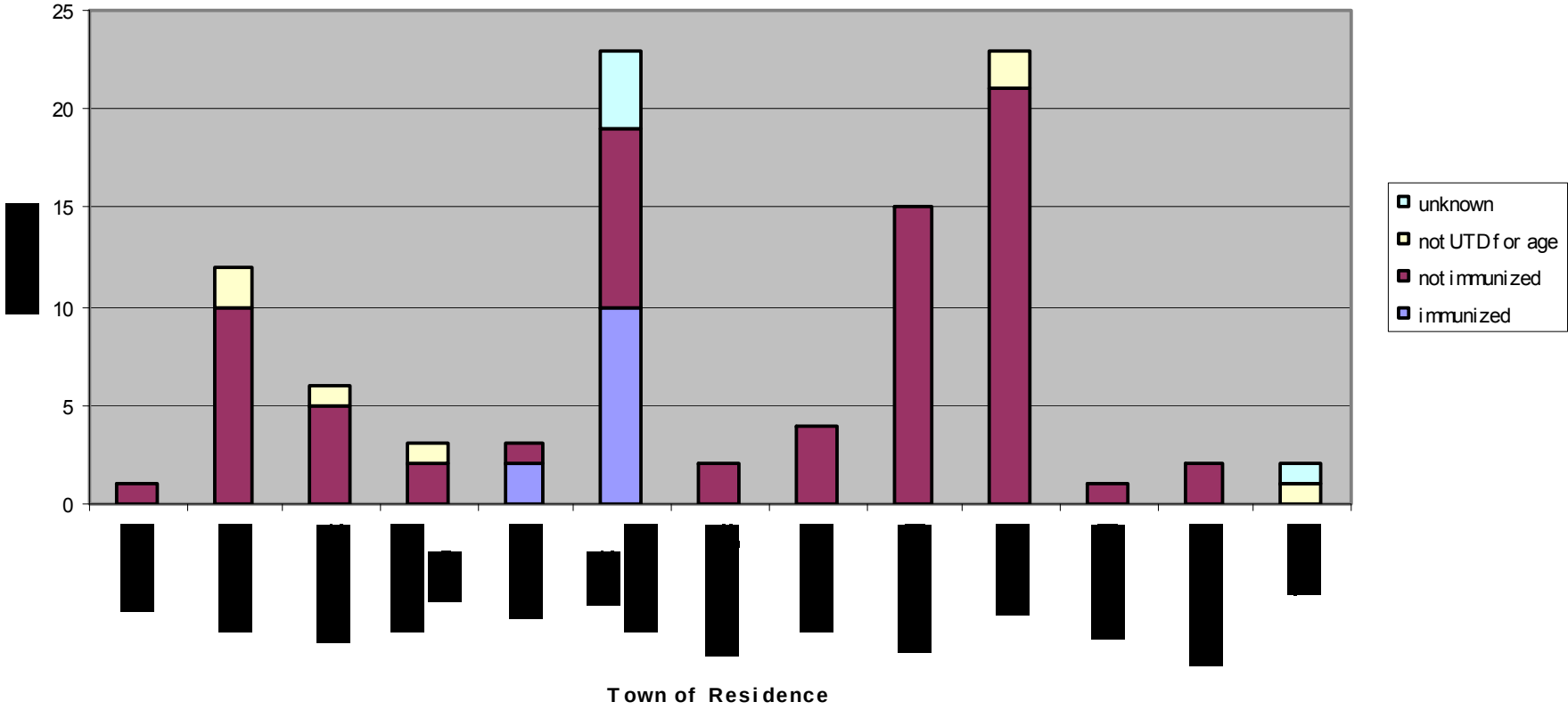
- **Ongoing spread of Pertussis disease in School A and Preschoolers (NA)**

Pertussis cases by school and immunization status



- Limited spread of disease in Schools where the majority of children are immunized, and where enhanced immunization campaign took place (dTap to grades 7, 8 and 9).

Pertussis cases by town of residence and immunization status



- School A has a large catchment area
- Many of these towns have known low immunization rates.
    - Eg. Picture Butte and Nobleford areas (2008/2009)
      49.7% of eligible children had received 4 doses of Pertussis containing vaccine by 2 years of age

Immunized cases

- Of the 12 cases immunized:

Doses received of Pertussis containing vaccine	# Cases	Age range
4	1	4
5	8	8 - 14
6	3	14 - 16

- Booster doses are necessary for Pertussis containing vaccine due to potential of waning immunity
- Vaccines have varying effectiveness

Measles

- Caused by measles virus
- Humans are only host
- One of the most highly communicable infectious diseases
- Need high herd immunity rate to disrupt transmission (98%)
- Complications common → 30%
  - Most common in children <5 years of age and adults
  - dehydration, ear infection, pneumonia, encephalitis, seizures
  - death (1-2/1000) in developed world
  - Sub-acute sclerosing panencephalitis

Measles 2013

- **Cause and Symptoms**:
  - Highly contagious **airborne** viral infection which can remain in a room for up to 2 hours
  - Incubation period: 7 – 21 days; average 10 days
  - Person to Person contact is NOT required
  - Communicable one day PRIOR to onset of prodromal sxs
  - Most infectious period is 4-5 days before rash onset, up to 4-5 days after rash appearance
  - Prodrome before rash onset is cough, runny nose, red irritated eyes and fever… how common is this presentation?

Measles 2013

- **No treatment; supportive treatment only**
- **Some complications treatable**
- **PREVENTION with vaccine**
  - Vaccine is effective and safe
  - One dose → 95% protection
  - Two doses → 99% protection
  - Note: no vaccine is 100% effective
  - Adults born prior to 1970 considered immune, with the exception of HCWs

MEASLES - Leading vaccine-preventable cause of death world-wide

- Prior to widespread immunization programs, world-wide estimates of disease impact:
  → estimated 100 million cases
  → estimated 6 million deaths
  → epidemics every 2 – 4 years
- 1963 – first vaccine licensed
- 1966 – killed measles vaccine introduced in Alberta
- 1970 – live vaccine, Alberta

Source: AH Notifiable Disease Guidelines November 2013

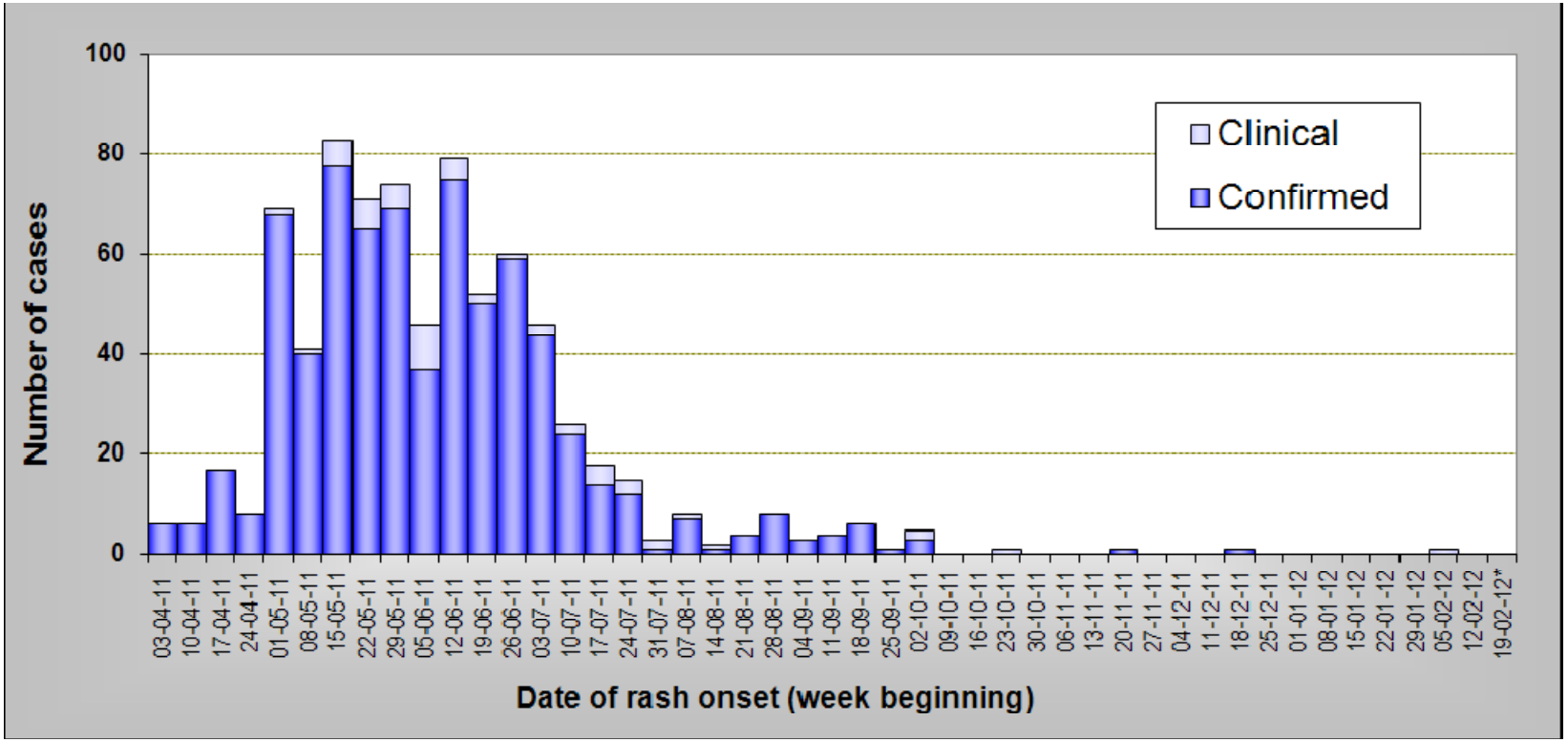
MEASLES - Leading vaccine-preventable cause of death world-wide

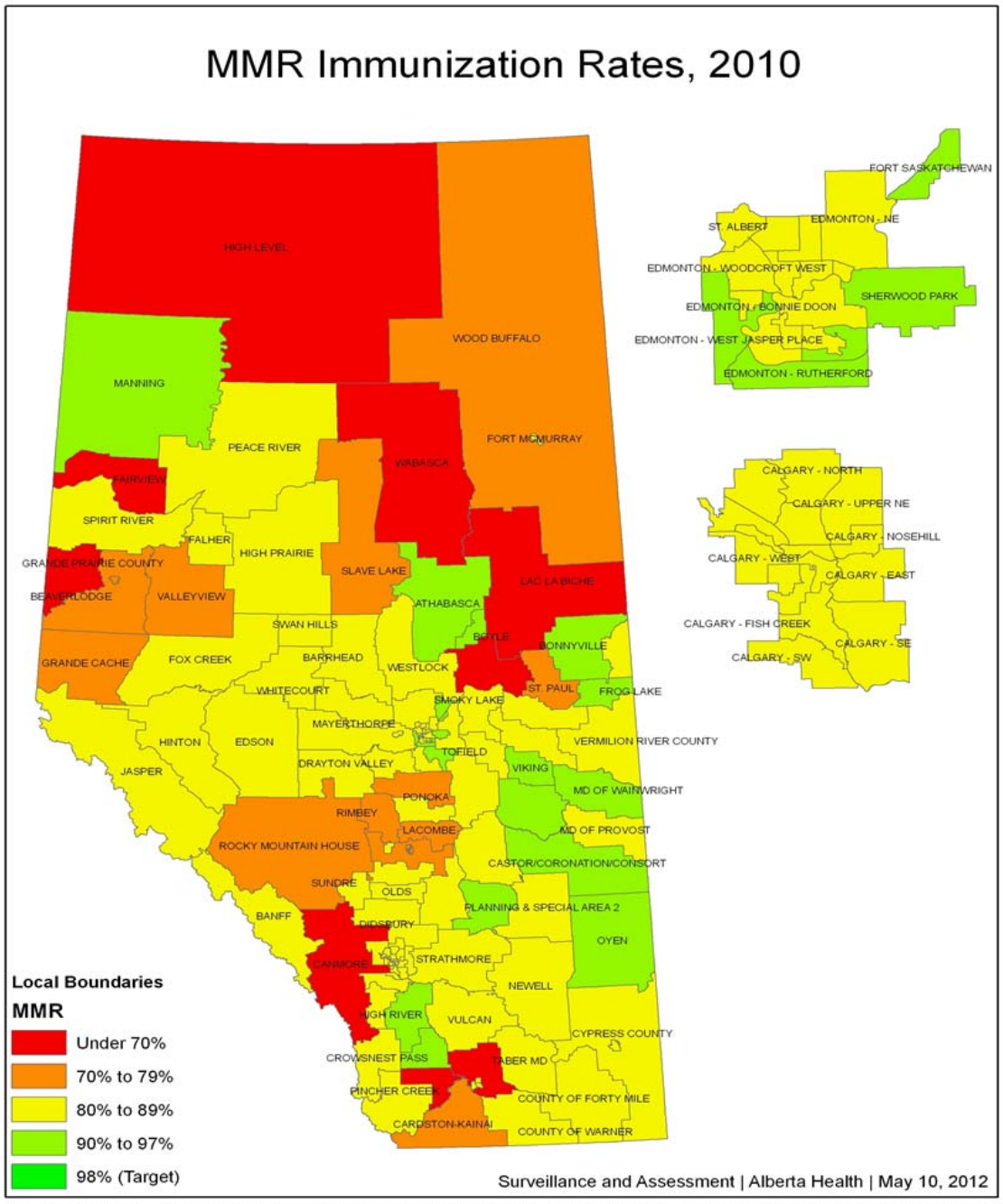
- 1999 → 873,000
- 2004 → 454,000 deaths; 30 million cases
- 2005 → 345,000
- 2008 → 164,000
- 2010 → 139, 300 (WHO measles surveillance)

Source: AH Notifiable Disease Guidelines November 2013

Measles outbreak in Quebec 2011

Source: Measles outbreak in Quebec: situation report for February 22, 2012





This coverage is for children at 2 years of age. The method used in these estimates use birth cohorts and account for migration into and out of the province, as well as migration between zones. Estimates exclude First Nations and Lloydminster residents.

Alberta Health
May 2012

Measles 2013

Background

- Last outbreak in Southern Alberta 1997
  - Thus, 16 year cohort of kids who are unimmunized and at risk.
  - Last outbreak was also identified early, potentially leaving a larger unimmunized demographic at risk.
- Biggest risk is unimmunized, and partially immunized
- Low immunization rates in Southwest Alberta

Measles 2013

Background:

- Measles outbreak in the Netherlands (May to current) with over 2,000 cases reported to date.
- Under-reporting
- Importation of same D8 strain this year to Ontario and BC
- Historically, these 3 Canadian locations have shared vaccine preventable illness (e.g.. Mumps in 2008, Pertussis 2009).

Measles Outbreak October 2013

- Outbreak declared October 17th, with one confirmed case
- 19 confirmed cases to date
- Communities of Fort Macleod, Picture Butte and Coaldale, Diamond City
- Multiple families under quarantine
- Isolation of measles cases
- Most cases directly exposed to index case or confirmed case; newer reported cases no direct links

South Zone Measles Preparedness

- Commence August 2013
- Engagement with community stakeholders
- Immunization to children (1 and 4 years of age)
- Immunization of Healthcare workers
- Hospital readiness – Negative pressure room capacity
- Development of a Measles Assessment Centre plan

Measles 2013

South Zone Measles Outbreak Strategies:

- South Zone Emergency Operating Centre opened – Oct 19th
- Immunization - Children, Health care workers, physicians
  - Outbreak dose for infants 6 – 12 months of age
- Measles Hotline – collaboration with Health Link Alberta
- Mobile Measles Assessment Team (MMAT)
- Measles Assessment Centre at CRH – PICS tent
- Capacity at some rural and the 2 regional hospitals for negative pressure rooms in case admission required

Measles Assessment Centre

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Measles Assessment Centre

Summary

- Vaccines used in Canada are highly effective and safe.
- Serious adverse reactions are rare. Dangers of vaccine-preventable diseases are many times greater.
- There is no evidence that vaccines cause chronic diseases.
- Recurrence of vaccine preventable disease in areas with low herd immunity
- Immunization – personal choice

Thank You!

We all strive to make the best decisions for our children