PICNet 5th Annual Educational Conference

Fear of immunization: addressing public and HCWs' concerns about MMR

Monika Naus, MD, MHSc, FRCPC, FACPM
BC Centre for Disease Control
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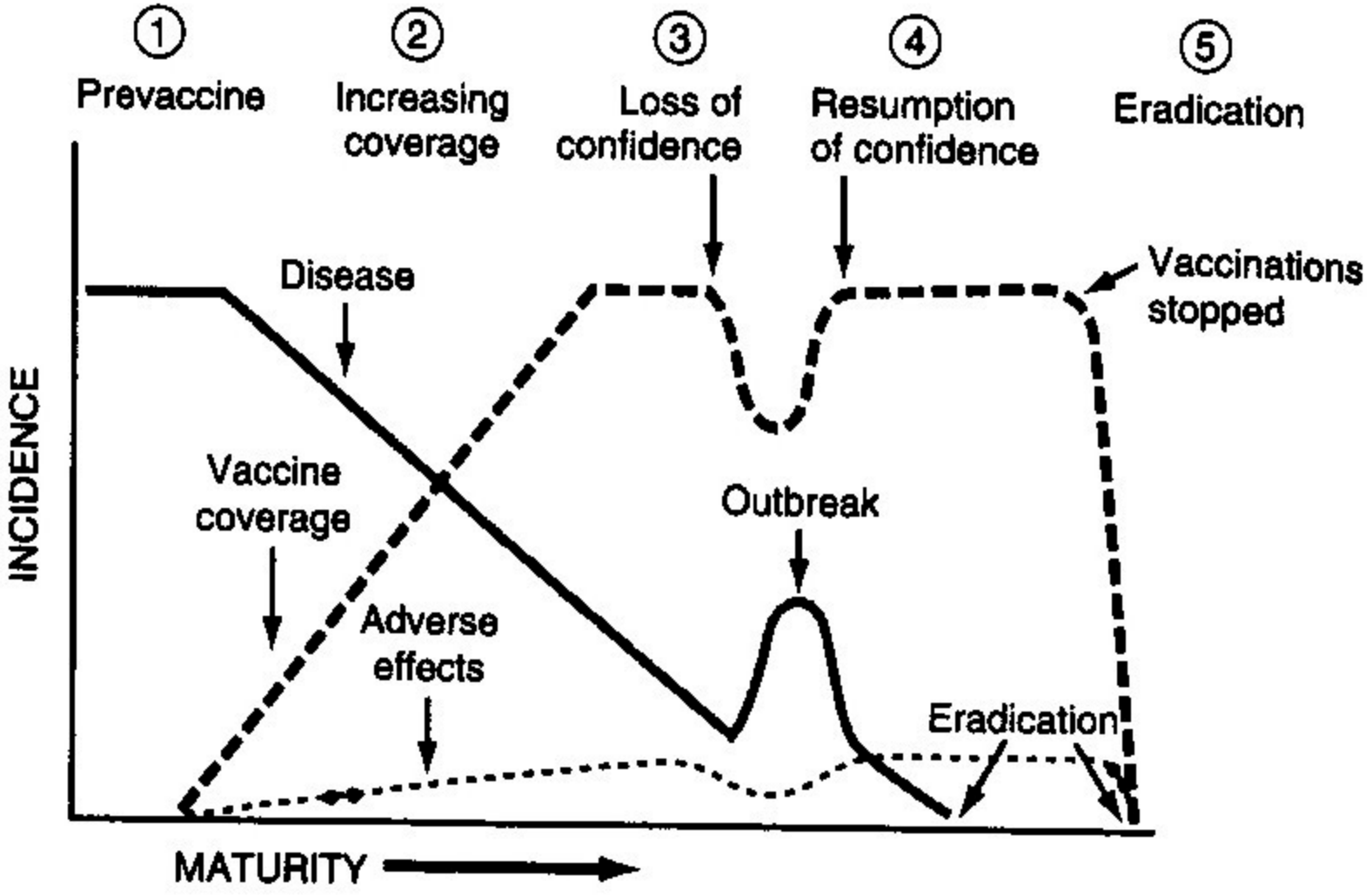
Outline

- Context in BC
- Overview of recent literature on public and HCW concerns
  - Key findings and issues
- Measles, mumps and rubella vaccine
  - Evolution of vaccination policy
  - Recent BC outbreaks and HCW risk
  - Vaccine safety

Context:

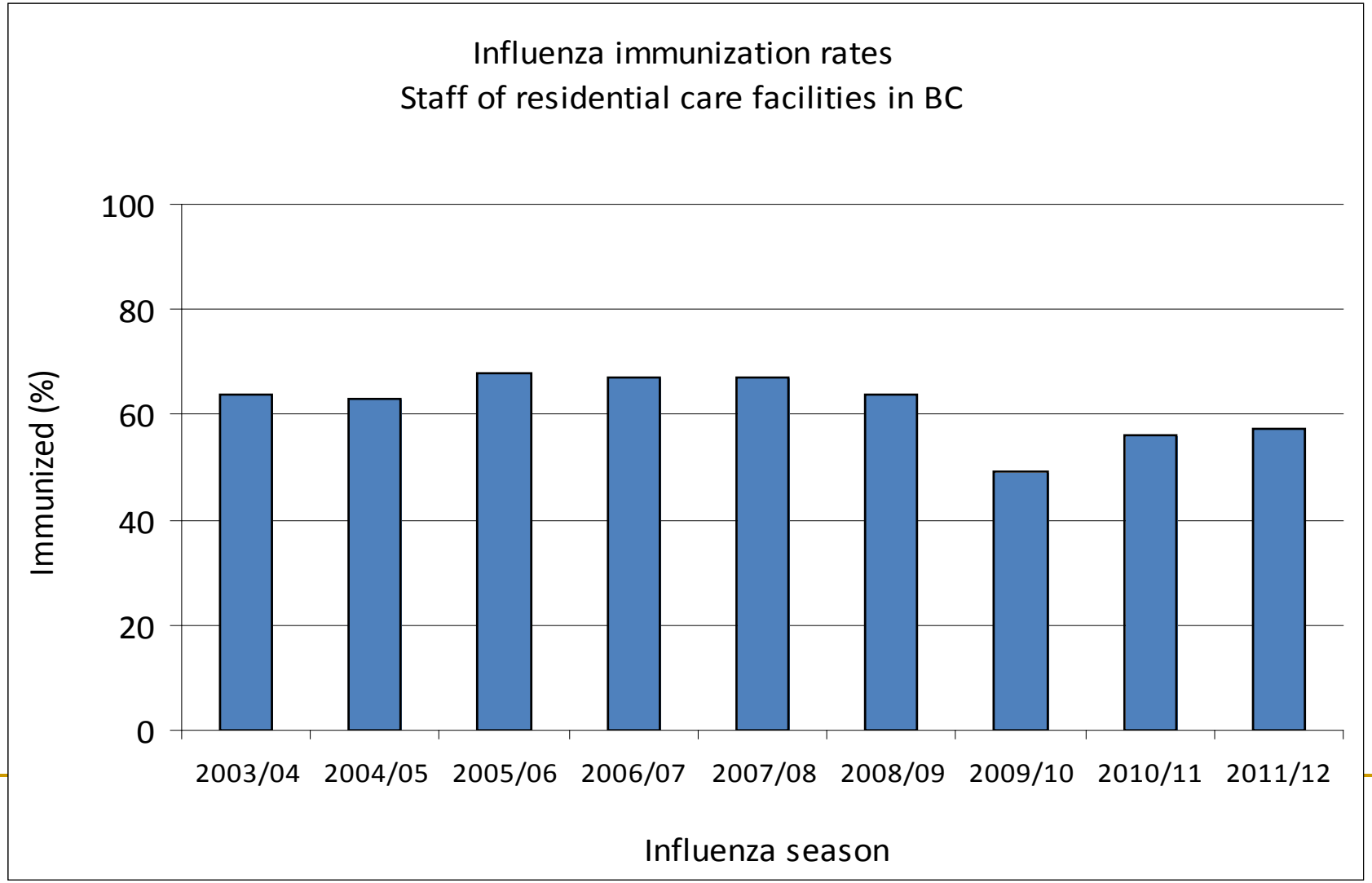
- High coverage is needed for individual and population protection (herd immunity)
- Ongoing low uptake of influenza vaccine in BC HCWs and incomplete documentation of immunization status; the specter of ‘Mandatory immunization’
- East to west trends
- Cohort effect and future vulnerability
  - Public and health care providers
- Religious versus ‘conscientious objectors’
  - Geographic clustering versus heterogeneous mixing – risk assessment at local level
  - Ability to influence decision making

Evolution of immunization program and prominence of vaccine safety

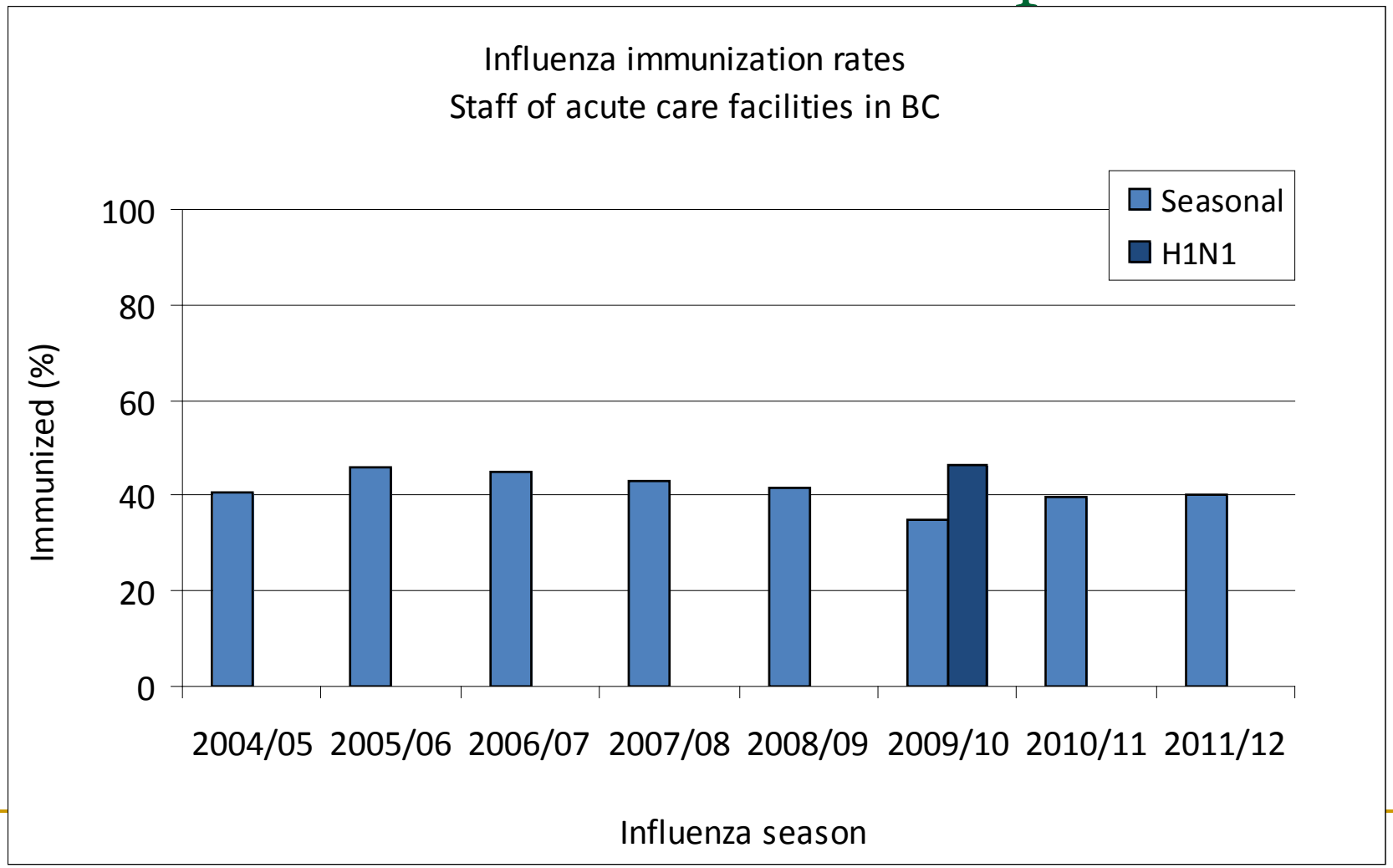


From Plotkin S, Orenstein W. Vaccines, 4th edition, Saunders, 2004: 1558

Influenza vaccine uptake in BC
Staff of long term care facilities



Influenza vaccine uptake BC
Staff of acute care hospitals



Key findings from the literature: Factors associated with acceptance of vaccination

- Recommendation from a trusted health care provider is strongest factor
- Knowledge is important
- Perceptions of **personal** risk (of disease and vaccine) vs. benefit (of vaccine effectiveness)
- Less anxiety for 2nd child, practitioners directly involved in vaccination, physicians compared to nurses

Immunization Communication Tool

For Immunizers

In the last 50 years immunization has saved more lives than any other health intervention.

BRITISH COLUMBIA
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ImmunizeBC

Key findings from the literature (HCW):

- Best predictor of future vaccination is past vaccination (influenza++)
- Emotional benefits are a key driver: HCW who recognize high emotional benefits were 11.7x more likely to be immunized
- Young HCWs may be more influenced by initiatives; young or older more likely to be immunized; physicians higher uptake of flu
- Mandatory initiatives:
  - Likely to be poorly accepted
  - Some propose these as solution

Chor J+Amodio E Vaccine 2011; Thompson M Vaccine 2012; Fedson D ICHE 1996; Seale H MedJAus September 2011; Caplan A Lancet 2011; Maltezou H JOI 2012

Key findings from the literature:

- Use of internet
  - Mixed findings in literature
  - ‘immunization’ and ‘vaccination’ yield positive and negative results, respectively
  - Fuel myths and misconceptions
- Woman unable to walk after receiving influenza vaccine
  - http://www.youtube.com/watch?v=5ztiAN9k584
- Penn & Teller’s Bull*?&? Vaccinations
  - http://www.youtube.com/watch?v=lhk7-5eBCrs
- Immunize: The Vaccine Anthem ZDoggMD
  - http://www.youtube.com/watch?v=-vQOM91C7us&feature=player_embedded

Kata A+ Reyna V+Garcia-Basteiro Vaccine 2011;Witterman H+ Connolly T Vaccine 2012

Findings from the literature (MMR)

- doctors too resolute about the safety of MMR questioned by parents about motives and knowledge
- conversely when healthcare providers sounded vague, parents interpreted this as concern that MMR is unsafe
- lack of appropriate information accounted for 22% of the missed or delayed MMR vaccinations

Hilton S BMC Public Health 2007; Ciofi degli Atti ML Vaccine 2004

Findings from the literature (MMR)

- Australian MMR scare broadcast
- Study of internet posts in 3.5 hrs following
- Analysis of 466 posts from 166 individuals
- 1/3 critical of MMR immunization; 1/3 sought information; 5% ambivalent but seeking no information; 14% supportive; 15% unstated
- only 4% self-identified as HCP
- Topics: alleged adverse effects of immunization (35%); autism spectrum disorders treatment and causes (31%); vaccine ingredients (12%); a conspiracy (9%)
- Personal anecdotes prevailed over scientific concepts of evidence
- Concluded: HCPs/ other advocates should be more active online strategically respectfully and using known drivers of decision making

Nicholson M Vaccine 2011

Findings from the literature: MMR

- RCT intervention study UK parents:
  - Leaflet only (‘your questions about MMR answered’) vs. Leaflet + group parent/ researcher facilitated meeting with a nurse educator
  - 73% vs. 93% initiation of MMR

Jackson et al. BMC Public Health 2011, 11:475

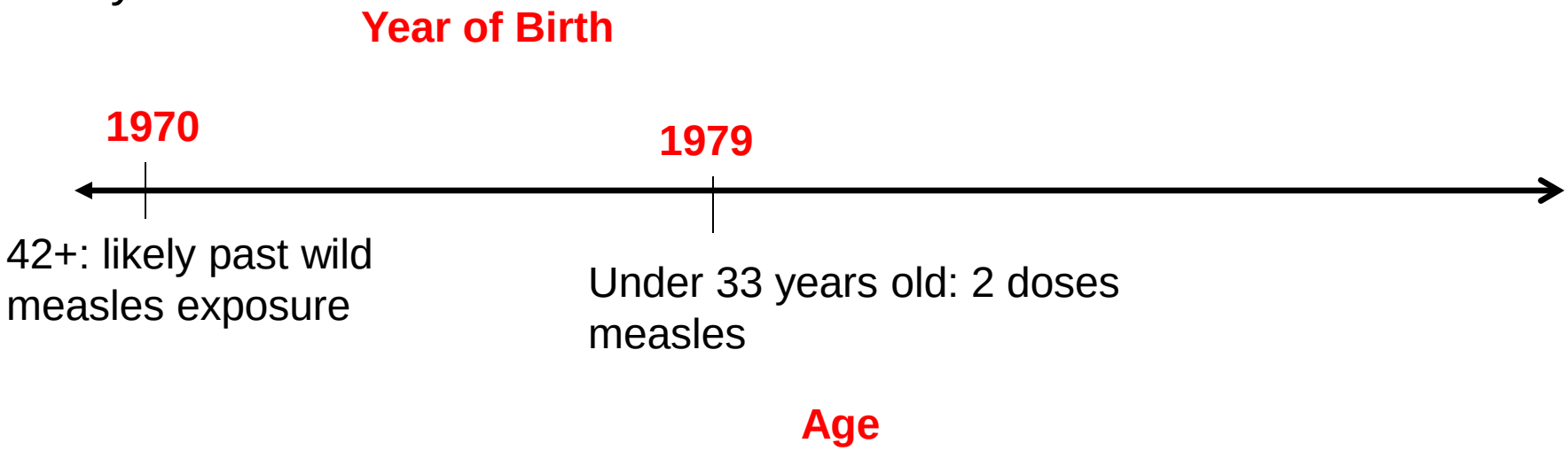
MMR vaccine: measles, mumps and rubella

- Viral infections of children and young people spread by respiratory route
- Edmonston (measles), Jerryl Lynn (mumps) and RA27/3 (rubella) components in vaccines in use in North America
  - Separate growth in cell lines prior to formulation of a live attenuated combination vaccine
  - Advantage of combination vaccine
  - Vary in efficacy or ‘take’ (primary vaccine failure), duration of protection (secondary vaccine failure or waning immunity); rubella>measles>mumps; gradual change in dosing recommendations
  - Vary in reactogenicity (side effects)

Measles vaccine policy in BC

- 1969: measles vaccine for children 12 mos, preschool and susceptible school children
- 1972: MMR vaccine approved
- 1981: MMR publicly funded in BC at 12 mos, preschoolers, susceptible school children
- 1985-6: MMR campaign K–12
- 1996: 2nd dose MMR at 18 mos; recommended for HCW born 1956+ and students of colleges/ universities

By 2012:



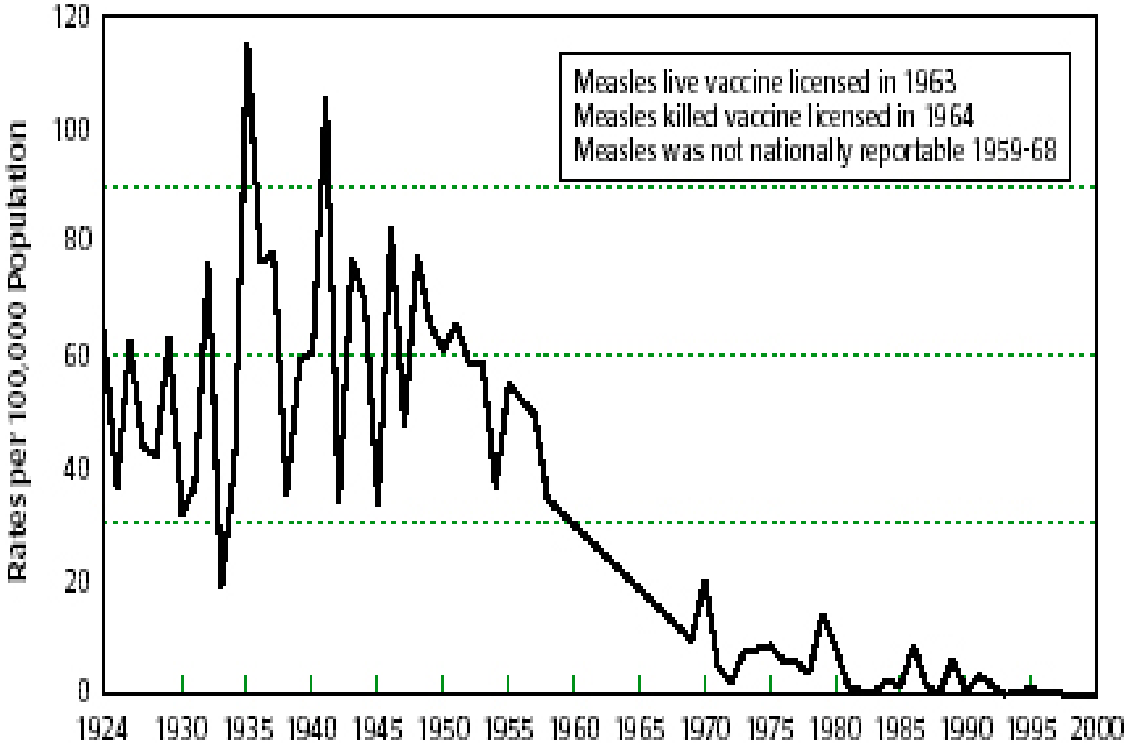
MMR vaccination recommendations

The following table summarizes the number of doses of MMR vaccine recommended for BC residents based on its constituent components:

Date of birth	Measles	Mumps	Rubella❶	MMR vaccine❶
Prior to 1957	0 doses	0 doses	0 doses	0 doses
1957 – 1969	2 doses	1 dose	1 dose	2 doses
1970+	2 doses	2 doses	1 dose	2 doses

❶ One dose of MMR for rubella protection is recommended for all Health Care Workers regardless of age.

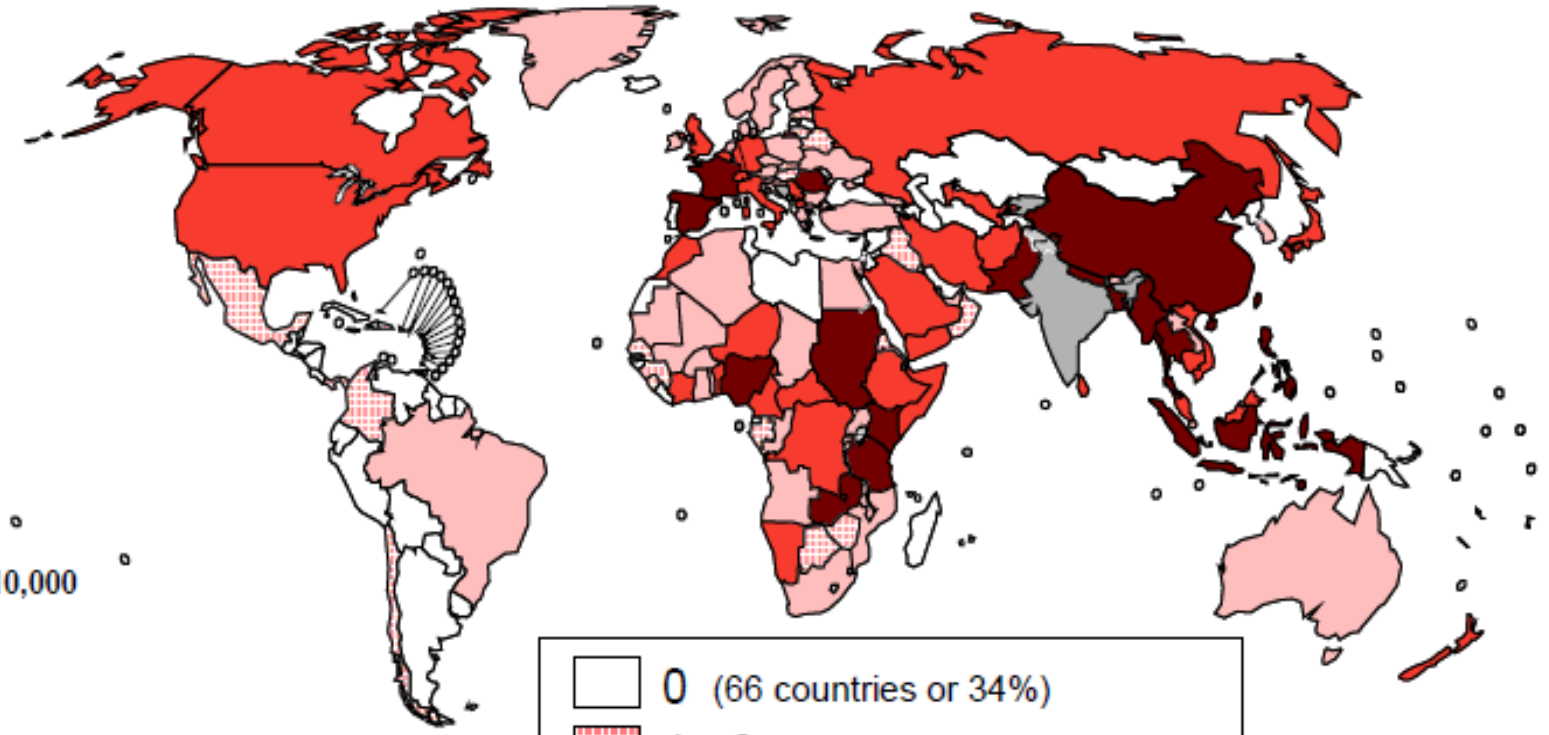
Measles Elimination in Canada in 1996



Elimination goal adopted by PAHO 1994
1996 campaigns and introduction of 2 doses

Measles in a 1 year old

Number of Reported Measles Cases with onset date from Apr 2011 to Oct 2011



Countries with >10,000 measles cases:

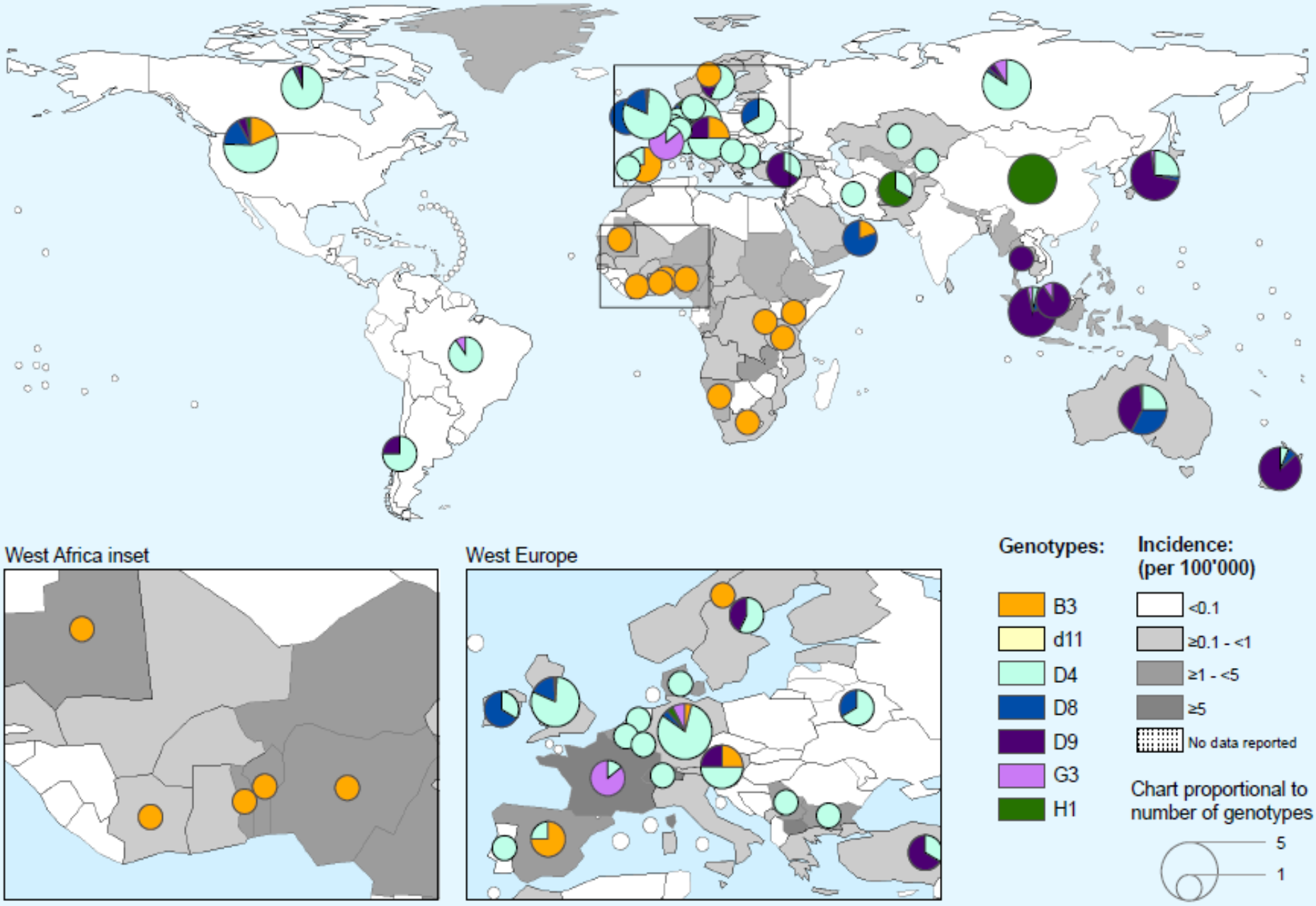
DRC	123537*
France	14600
Zambia	13190*
Somalia	14358*
Niger	10523*
Nigeria	26989*
China	10361
Indonesia	16812
Bangladesh	14146

* from aggregate reports

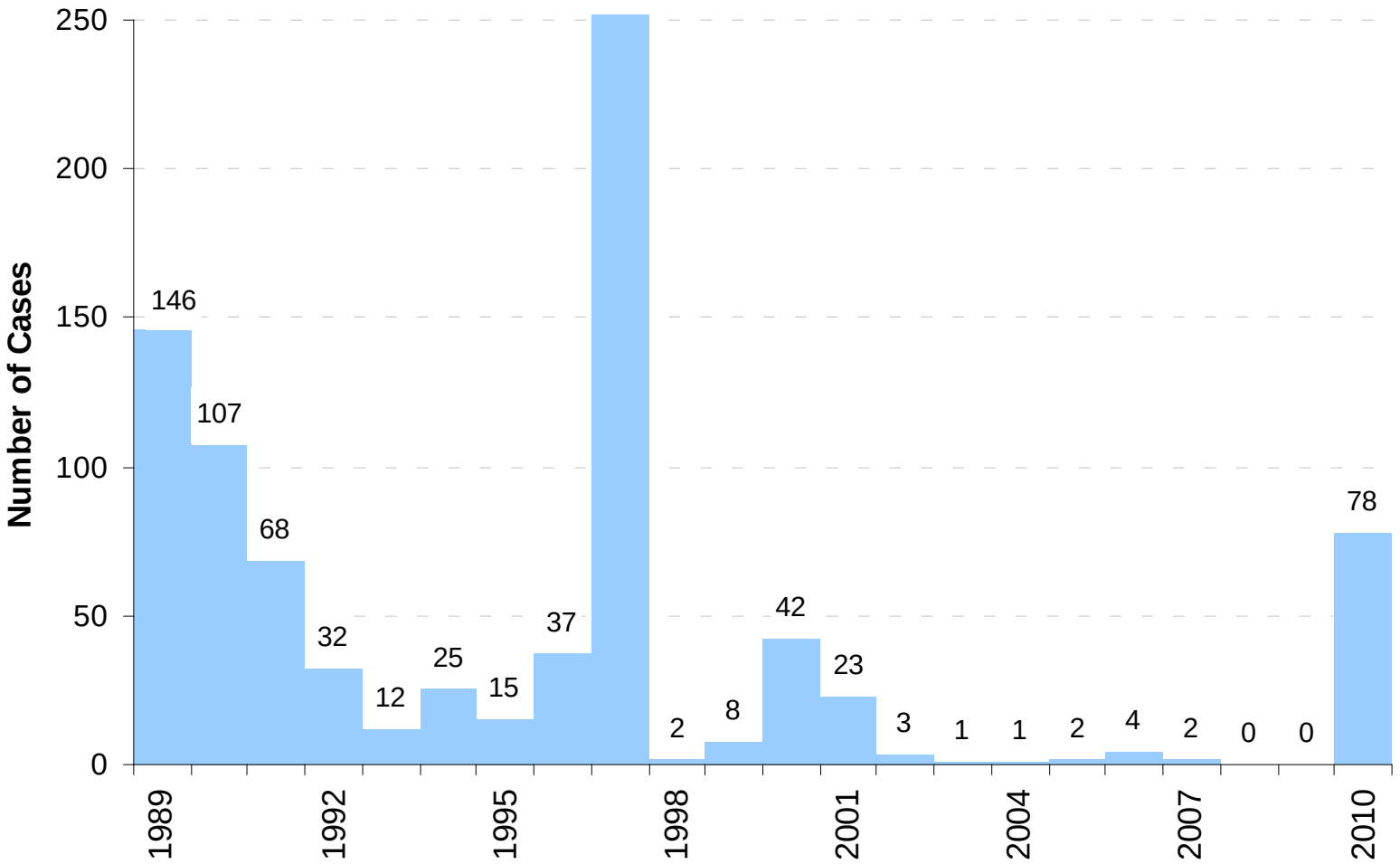
- 0 (66 countries or 34%)
- 1 - 9 (27 countries or 14%)
- 10 - 99 (40 countries or 21%)
- 100 - 999 (31 countries or 16%)
- ≥1000 (17 countries or 9%)
- No data reported to WHO HQ (12 countries or 6%)

WHO

Distribution of measles genotypes, 2011. Data as of 4 August 2011



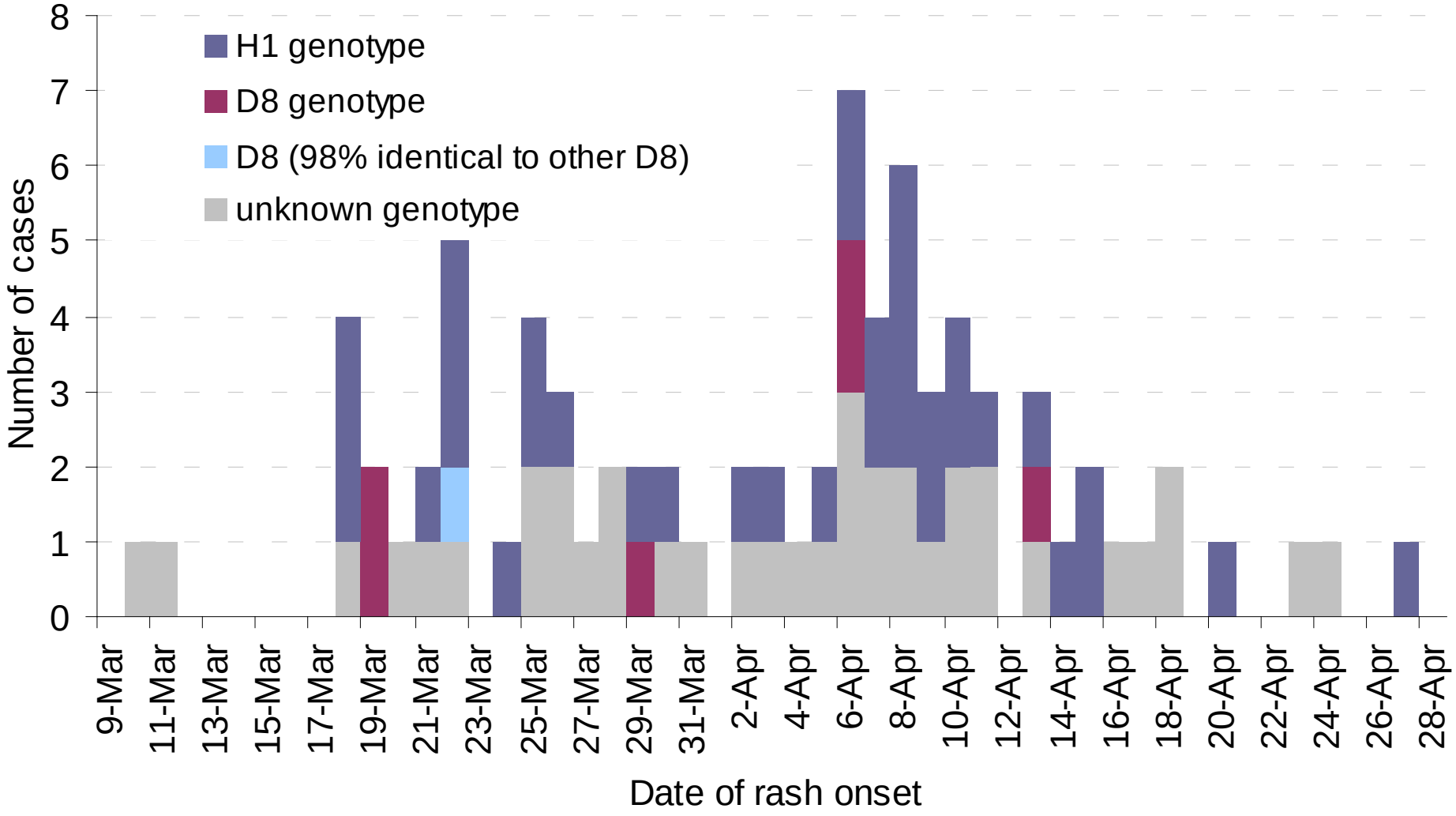
Measles in BC



Measles Outbreak

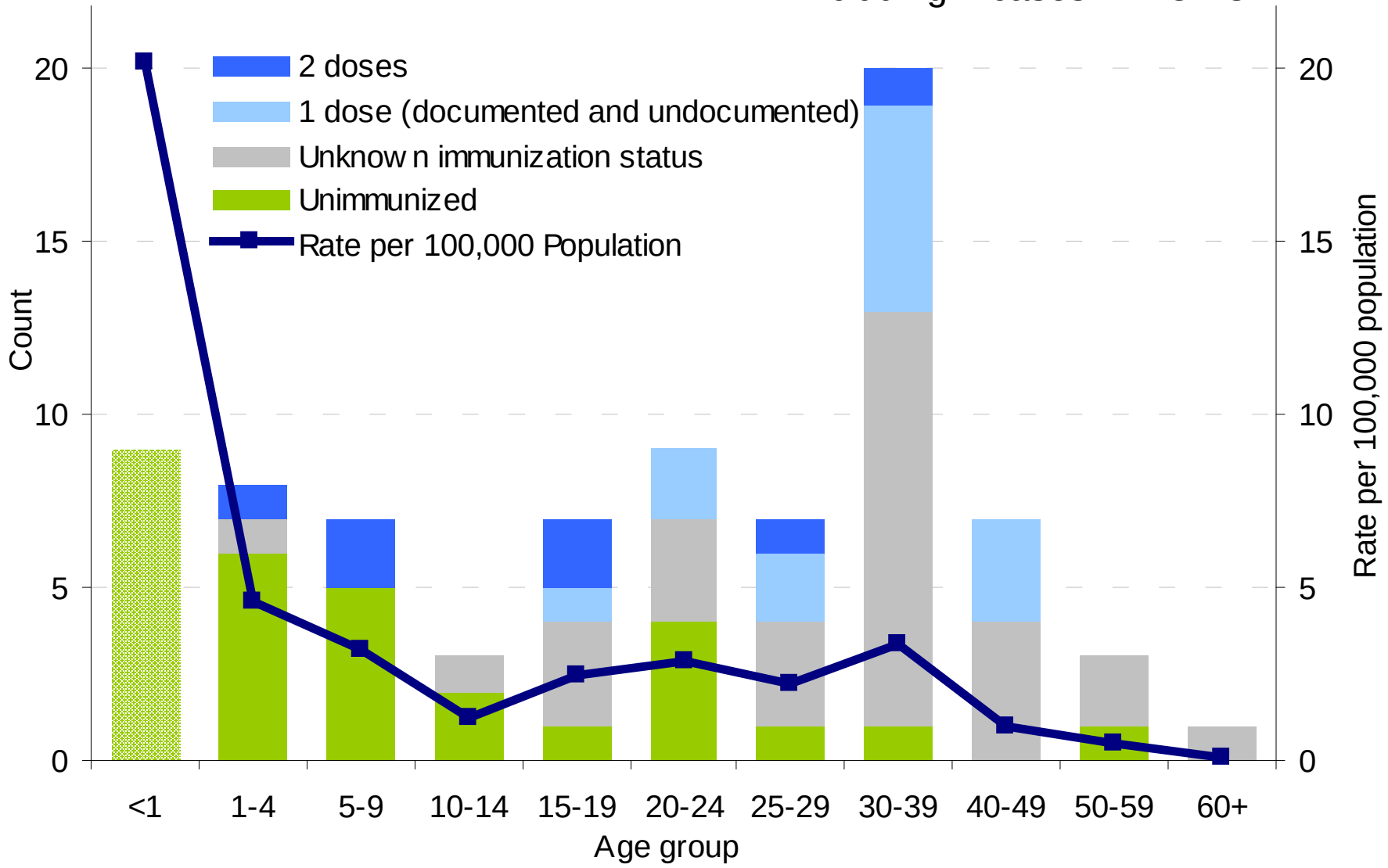
- 3 co-primary cases (rash onsets: March 9-11)
- Exposure in downtown Vancouver during the Olympic Period

Measles Outbreak Epidemic Curve British Columbia, 2010, by Genotype



Age Specific Incidence

- Age d 4 mo-64 yr, mean= 23 years
- 65% attended ERs
- 23% hospitalized
- 4 cases exposed in HC setting including 2 cases in HCWs



Results of measles exposed HCW survey

- Among 61 case/ hospital encounters:
  - 21 had no HCW exposure assessments
  - 41 were assessed:
    - 662 workers were deemed exposed
    - Average of 11 workers per event
      - 1 event with 221 HCW exposures not counted in calculation of average; otherwise 16 workers per event
    - 56 % of exposures were in ER
    - 44% of exposures were on the ward
    - RESULTS: 48% immune, 5% susceptible, 47% **UNKNOWN** of which 12% were able to produce a record and 8.5% were susceptible after testing

Measles Seroimmunity in Prenatal Specimens, 2010, BC

Year of Birth	**1960-69**	**1970-79**
% Measles IgG Positive **(Behring Assay)**	**95% (631/661)** (94-97%)	**88% (588/665)** (86-91%)

Year of Birth	**1960-64**	**1965-69**	**1970-74**	**1975-79**
% Measles IgG Positive **(Behring Assay)**	**97% (228/234) (95-99%)**	**94% (403/427) (92%-97%)**	**91% (303/332) (88-94%)**	**85% (285/333) (81-89%)**

1. Positive results are greater 337mIU (200 Absorbance Value) using the Behring 2000/ELISA Assay
2. Equivocal results are not included in the IgG positive results

Herd immunity

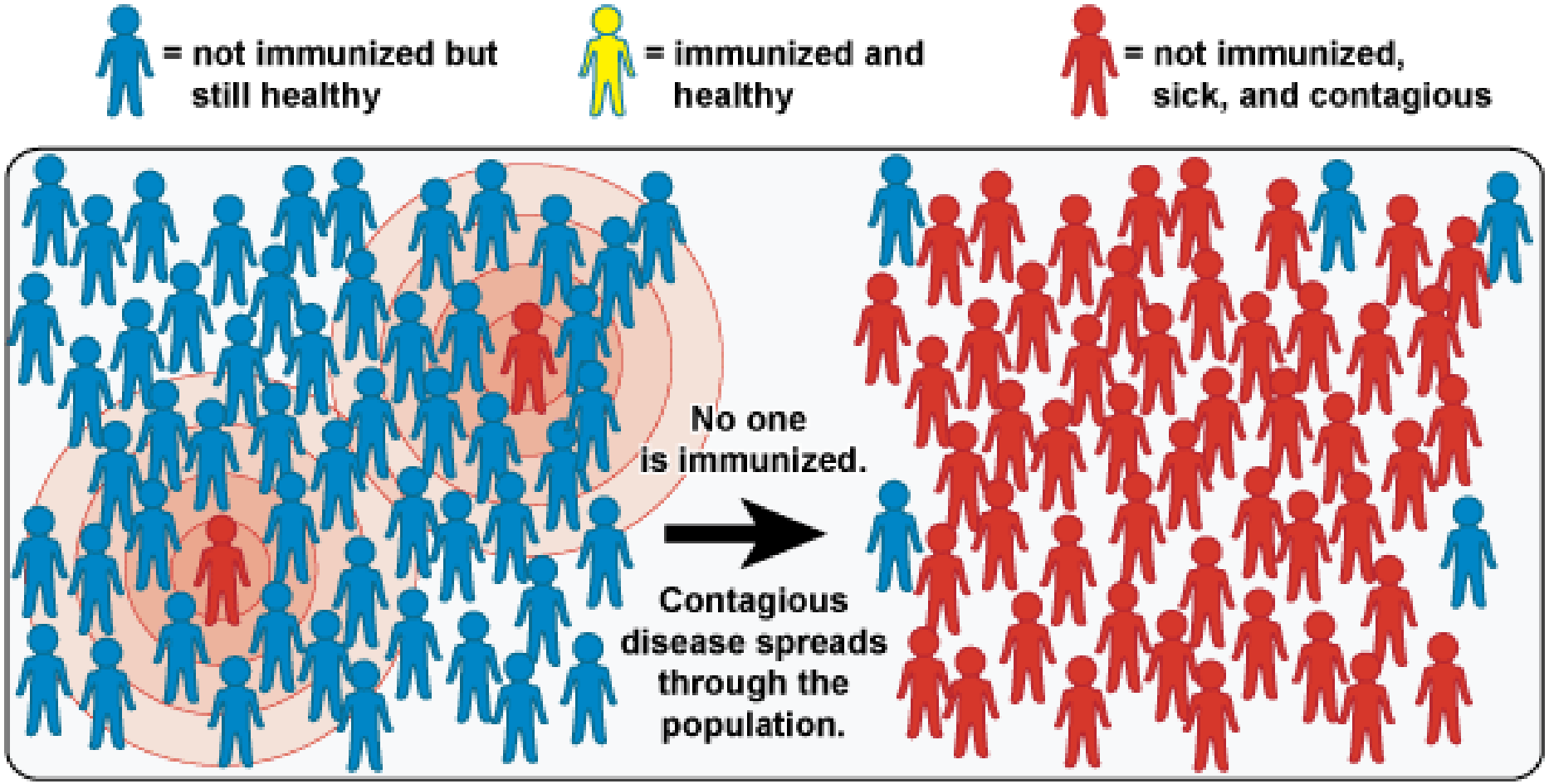


Image courtesy of www.niaid.nih.gov/.../communityimmunity.aspx

Mumps

Virus spread mainly by direct contact with respiratory secretions including during prodrome and up to 9 days after onset

Causes parotitis, orchitis, meningitis, encephalitis. Before vaccine was most common cause of encephalitis (1/3 cases) and of acquired sensorineural deafness in children

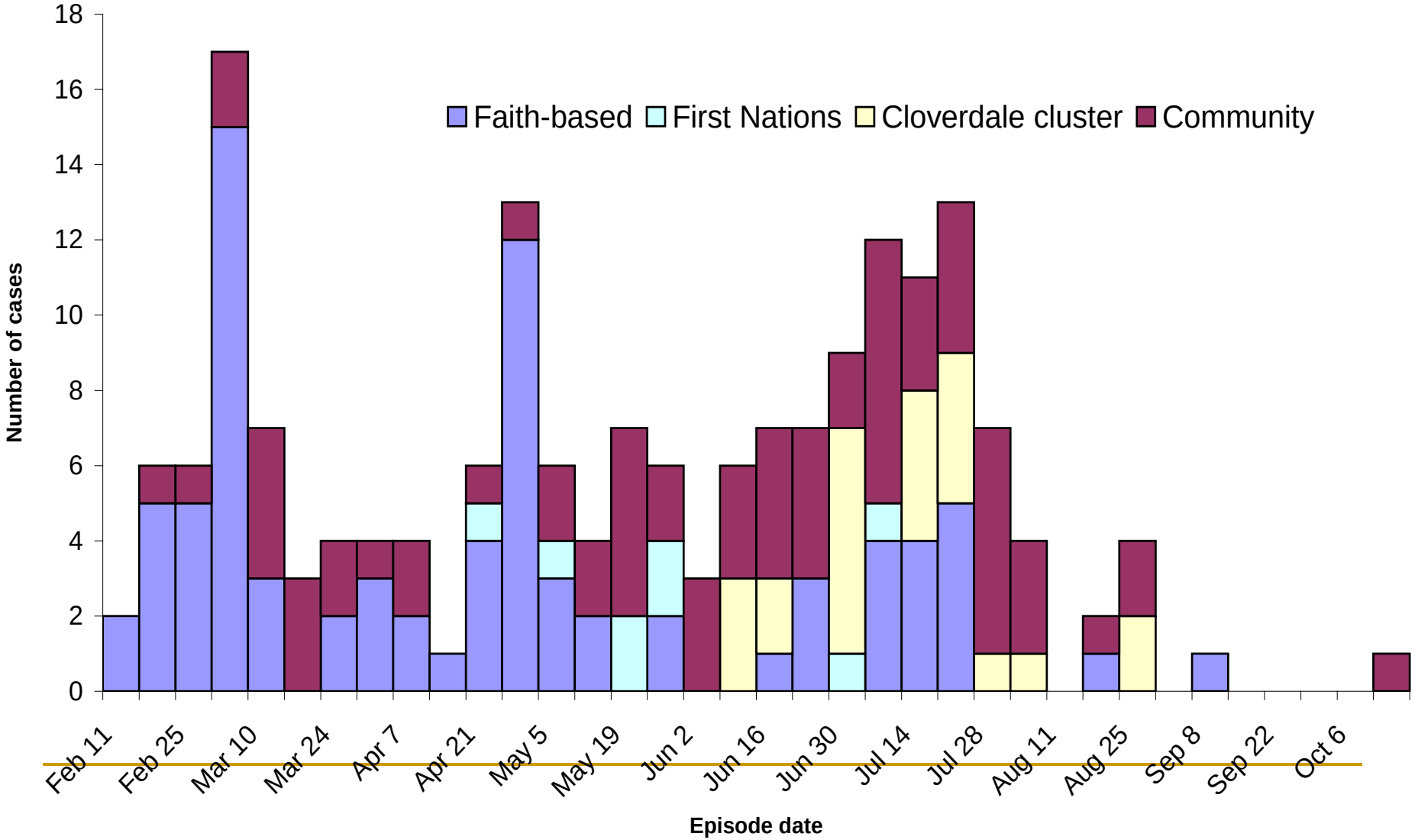
Preventable by vaccine available in Canada since 1969; 2 doses now recommended

Outbreaks in the UK, US, Canada in recent years in young adults

BC outbreak in 2008 with 200+ cases started in a faith based unvaccinated community; 2011 young adults

Images courtesy of Centers for Disease Control and Prevention, and Nova Scotia Department of Health

Epi-curve by exposure setting (n=183)



Health Care Workers (HCW)

- 17 (6%) HCWs assessed as possible cases
- 6 confirmed
  - 3 epidemiologically-linked
  - 3 laboratory confirmed
- BC Biomedical laboratory worker

Rubella

Causes fever, lymphadenopathy, rash, arthralgia. Infection in pregnancy is associated with high risk of congenital rubella syndrome: heart disease, deafness, cataracts, mental retardation, chronic shedding of virus

Pre-vaccine, 250,000 cases of rubella were reported each year in Canada with 200 cases of CRS; now rare case of CRS in Canada usually in immigrant mothers; 2010 import-associated outbreak in a workplace in Lower Mainland in 9 adults aged 39-60 (2 unimmunized/7 unknown status). Now considered eliminated in Canada

Rubella vaccine (given as MMR) is routine for all children and adults, especially important for women of childbearing age

Images Courtesy of Centers for Disease Control and Prevention, Atlanta

MMR vaccine safety and tolerability

- Known adverse events are:
  - Measles: fever in up to 15% and rash in up to 5% of measles vaccine recipients
  - Mumps: low grade fever and parotitis in up to 0.7%
  - Rubella: lymphadenopathy (up to 9% of recipients), transient arthralgia or arthritis (up to 10%) and possibly the rare chronic arthropathy

Jefferson T. Vaccine 2003

MMR vaccine safety: serious events

- Causal association:
  - Thrombocytopenia: 1:40,000 recipients
  - Febrile seizures: causally associated
  - Anaphylaxis
  - Transient arthralgia
  - MIBE (measles inclusion body encephalitis): in individuals with demonstrated immunodeficiencies.
- Rejection of causal association:
  - Autism; Type I DM

IOM Adverse Effects of Vaccines: Evidence and Causality, 2012
http://www.nap.edu/catalog.php?record_id=13164

MMR vaccine safety: serious events

- Evidence inadequate to accept or reject causal relationship:
  - Encephalitis and Encephalopathy; Meningitis; Ataxia; ADEM; Transverse myelitis; Optic neuritis; Neuromyelitis optica; MS; GBS; CIDP; OMS; brachial neuritis; Chronic arthralgia, arthritis, arthropathy; Hepatitis; CFS; Fibromyalgia; Hearing loss

IOM Adverse Effects of Vaccines: Evidence and Causality, 2012
http://www.nap.edu/catalog.php?record_id=13164

Chronic arthritis/arthropathy and rubella vaccine

Setting.—Large health maintenance organization in northern California.

Patients.—Women aged 15 to 59 years serotested for rubella during 1990 with continuous health plan membership for 2 years before and after the date of their serological test. Seronegative women immunized within 1 year of serotesting (n=971) were defined as exposed. Primary comparison groups included all unvaccinated, seronegative women (n=924) and randomly selected seropositive, unvaccinated women (n=2421) matched to exposed subjects on serological test date and age (±3 years).

Main Outcome Measures.—Prevalence and incidence of chronic joint and neurologic symptoms during 1-year follow-up period stratified by age and serological findings, immunization, and postpartum status.

Results.—No significantly increased risk was associated with receipt of rubella vaccine for any outcome except for prevalence of carpal tunnel syndrome in vaccinated women at least 30 years old compared with seropositive, unvaccinated women (2.9% vs 1.4%; *P*=.03). A total of 34 women had onset of conditions within the 1-year follow-up period; 9 of these were in the group of seronegative, immunized women, of whom 6 had onset of symptoms within 6 weeks of vaccination. Among these 6 women, symptoms included transient arthritis or arthralgias (<6 weeks duration) in 4 women, arthralgia of indeterminate chronicity in 1 woman, and carpal tunnel syndrome in 1 woman. Postpartum women across all groups were less likely to be seen for nontraumatic arthropathies than nonpostpartum women (4.5% vs 7.2%, *P*=.08 in vaccinated women; 4.8% vs 8.1%, *P*=.09 in seronegative controls; and 4.8% vs 10.0%, *P*=.01 in seropositive controls).

Conclusions.—In this large retrospective cohort analysis there was no evidence of any increased risk of new onset chronic arthropathies or neurologic conditions in women receiving the RA 27/3 rubella vaccine. These data support the continued vaccination of rubella-susceptible women to reduce the risk of congenital rubella syndrome.

JAMA. 1997;278:551-556

Ray P JAMA 1997; IOM 2012

Eight-Step Approach to Respond to Parents Unsure About Immunization

1. Listen, Evaluate, and Categorize
2. Recognize Legitimate Concerns
3. Provide Context
4. Refute Misinformation
5. Provide Valid Information
6. Recognize That it is the Parents' Decision
7. Educate About Potential Consequences
8. Make a Clear Recommendation

"How to advise parents unsure about immunization" Halperin S immunize.cpha.ca