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Surveillance: an important driver for public health action

Surveillance of Vaccine Preventable Diseases at the Provincial Level in BC

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Disclosure Statement

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

Objectives

- Show how data from surveillance on vaccine preventable diseases are obtained and used to:
 - plan and modify immunization policy
 - evaluate programs at the provincial level

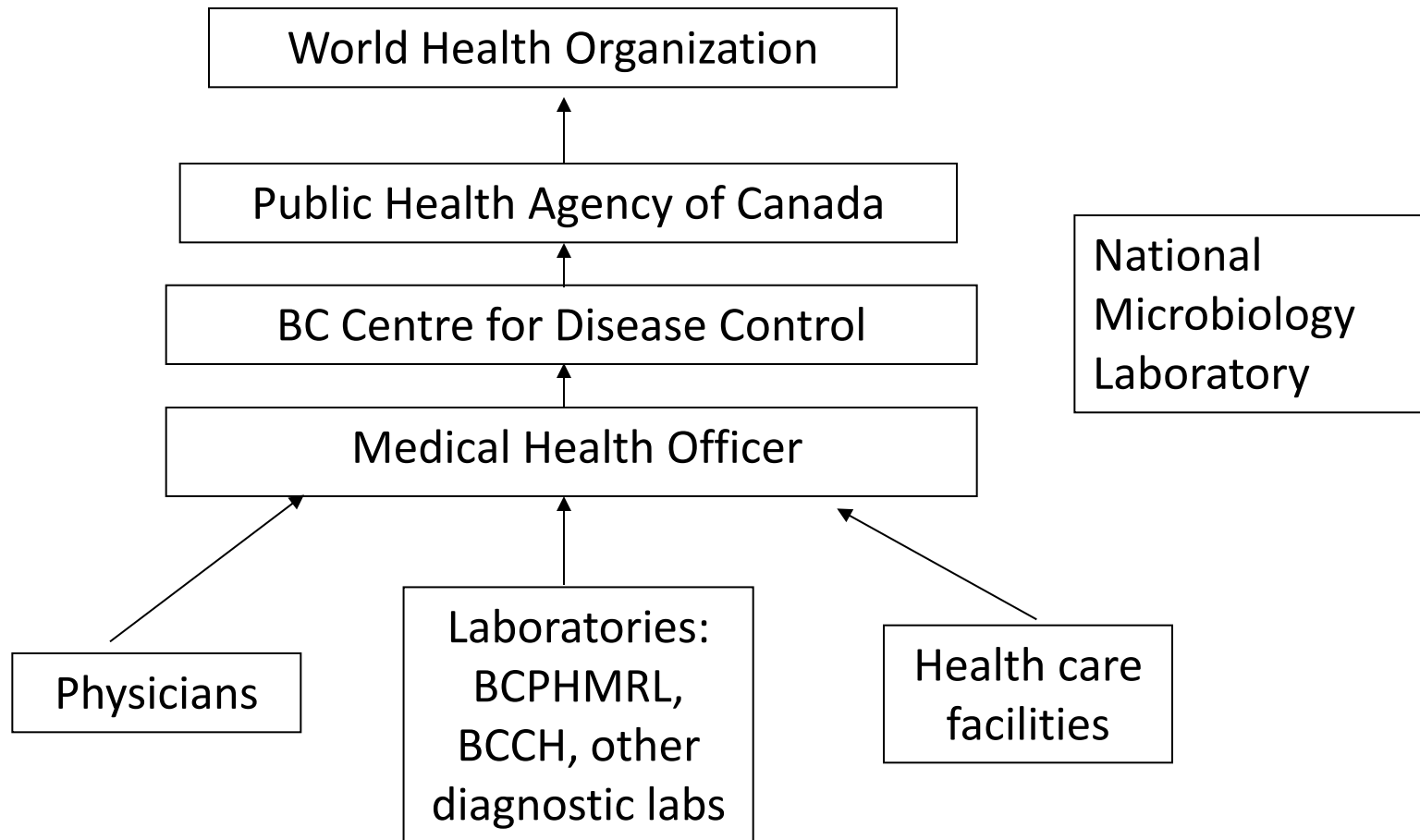


Surveillance relevant to immunization programs

- Disease surveillance
 - Incidence/ prevalence, outcomes (morbidity/ mortality), risk factors
 - Routine and outbreak-related
 - Examples: IPD, IMD, mumps, measles, varicella
- Immunization coverage
- Adverse events following immunization
- Public and provider knowledge, attitudes, and practices



Reporting relationships for notifiable disease surveillance



Reportable Communicable Diseases

Reportable Communicable Diseases in BC, March 2013

Schedule A: Reportable by all sources, including Laboratories

Acquired Immune Deficiency Syndrome	Invasive Streptococcus Pneumoniae Infection
Anthrax	Leprosy
Botulism	Lyme Disease
Brucellosis	Measles
Cholera	
Congenital infections:	Meningitis: All causes
Toxoplasmosis, Rubella, Cytomegalovirus,	(i) Bacterial:
Herpes Simplex, Varicella-zoster,	Hemophilus
Hepatitis B Virus, Listeriosis and any	Pneumococcal
other congenital infection	Other
Creutzfeldt-Jacob Disease	(ii) Viral
Cryptococcus neoformans	Meningococcal Disease:
Cryptosporidiosis	All Invasive
Cyclospora Infection	Including Primary Meningococcal
Diffuse Lamellar Keratitis (DLK)	Pneumonia and Primary Meningococcal
Diphtheria:	Conjunctivitis
Cases	Mumps
Carriers	Neonatal Group B Streptococcus Infection
Encephalitis:	Paralytic Shellfish Poisoning (PSP)
Post-infectious	Pertussis (Whooping Cough)
Subacute sclerosing panencephalitis	Plague
Vaccine-related	Poliomyelitis
Viral	Rabies
Foodborne illness:	Reye's Syndrome
All causes	Rubella:
Gastroenteritis epidemic:	Congenital Rubella Syndrome
Bacterial	Severe Acute Respiratory Syndrome
Parasitic	Smallpox
Viral	Tetanus
Genital Chlamydia Infection	Transfusion Transmitted Infection
Giardiasis	Tuberculosis
H5 and H7 strains of the Influenza virus	Tularemia
Haemophilus Influenzae Disease,	Typhoid Fever and Paratyphoid Fever
All Invasive, by Type	Venereal Disease:
Hantavirus Pulmonary Syndrome	Chancroid
Hemolytic Uremic Syndrome	Gonorrhoea - all sites
Hemorrhagic Viral Fevers	Syphilis
Hepatitis Viral:	Waterborne Illness:
Hepatitis A	All causes
Hepatitis B	West Nile Virus Infection
Hepatitis C	Yellow Fever
Hepatitis E	
Other Viral Hepatitis	
Human Immunodeficiency Virus	
Invasive Group A Streptococcal Disease	

Vaccine preventable diseases:

diphtheria, hepatitis A and B, Hib, measles, meningococcal disease, mumps, pertussis, pneumococcal disease, polio, rubella and congenital rubella syndrome, tetanus

NOT reportable: varicella, rotavirus, HPV

Other: influenza, travel related diseases, rabies, neonatal group B streptococcal disease, invasive group A streptococcal disease

Provincial supports for local / regional surveillance:

case definitions, case report forms for enhanced surveillance, surveillance guidelines, data sharing agreements, information systems, use of administrative data, coordination of vaccine effectiveness evaluation, coordination of surveillance related to outbreaks across jurisdictional boundaries

Annual Summary of Reportable Diseases

www.bccdc.ca

- Trends over time – incidence declines, outbreaks
- Geographic distribution of cases by health service delivery area
- Age and sex specific incidence for the prior year
- Relevant commentary : interpretation of surveillance data in the context of the disease prevention and control program



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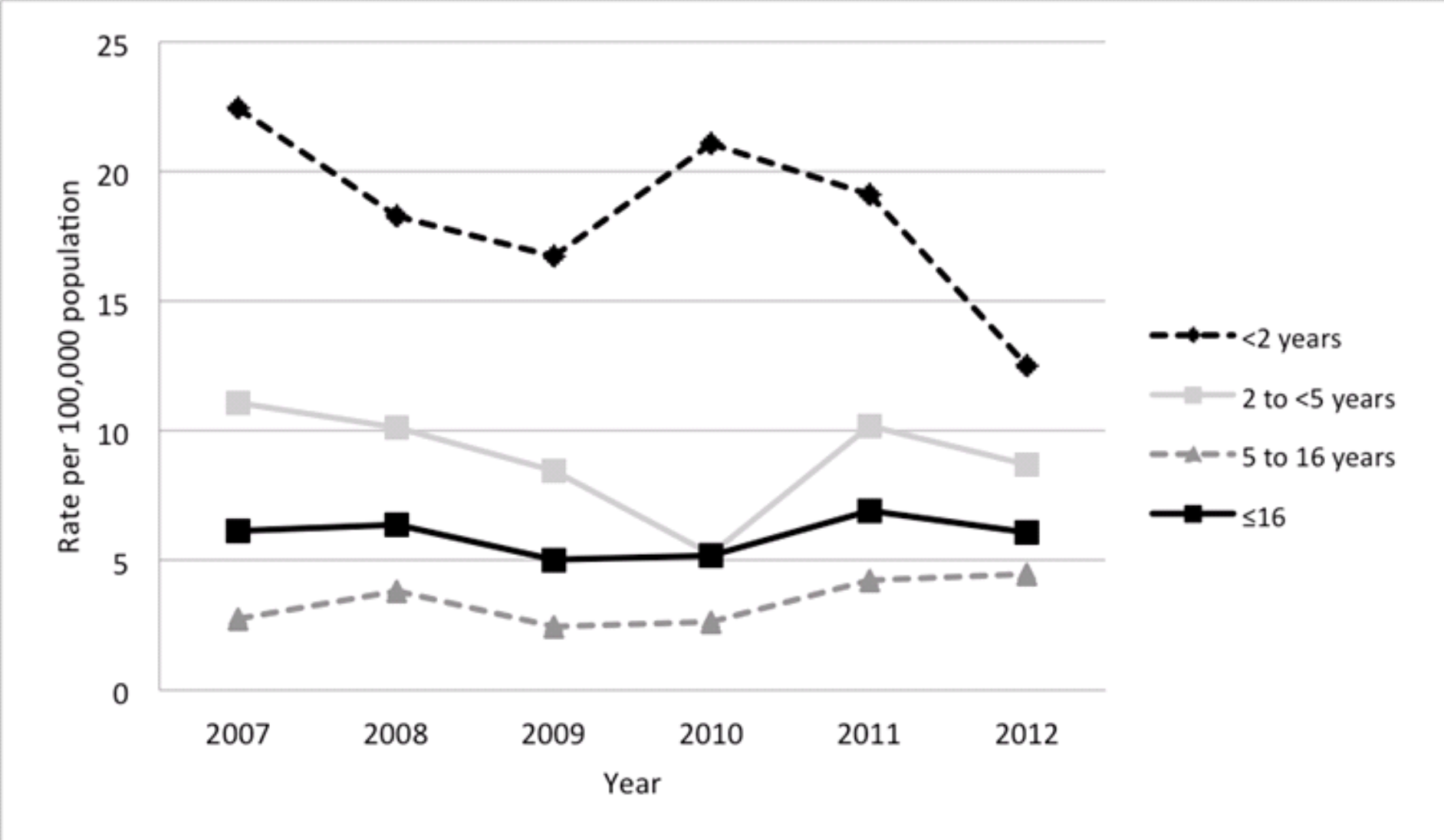
Pneumococcal disease: Catch-up program and 2+1 schedule

Incidence Rates for IPD Cases \leq 16 years, Not Aboriginal vs. Aboriginal Enhanced Surveillance Database linked to First Nations Client File British Columbia 2007-2009

	Not Aboriginal	Aboriginal	Status First Nations (Registered)
Total cases	132	12	10
Total population (\leq 16 years)	725,549	68,250	36,975
Incidence rate	6.06 cases per 100,000 population, per year	5.86 cases per 100,000 population per year	9.02 cases per 100,000 population per year
95% confidence intervals	4.27 to 7.86	0.12 to 11.60	0 to 18.69



Figure 1: Incidence of pediatric IPD (≤ 16 years of age) by age at onset in BC from 2007 to 2012



Invasive pneumococcal disease due to PCV13 serotypes among children eligible for PCV13

Age at Onset (mos)	Medical Risk Factor	Sero-group	Dose 1 Received (Eligible)	Dose 2 Received (Eligible)	Dose 3 Received (Eligible)	Delayed Immunizn	Vaccine Failure?	Pgm Failure?
1	UNK	7F	No (No)	No (No)	No (No)	n/a	No	No
2	No	7F	No (Yes)	No (No)	No (No)	n/a	No	Yes;TY
2	No	3	Yes (Yes)	No (No)	No (No)	No	No	No
3	No	19F	Yes (Yes)	No (No)	No (No)	No	No	No
5	Yes	19F	No (Yes)	No (Yes)	No (No)	n/a	No	Yes;UV
12	No	19F	Yes (Yes)	Yes (Yes)	No (Yes)	Yes	No	Yes;DEL
14	UNK	19A	Yes (Yes)	No (Yes)	No (Yes)	Yes	No	Yes;DEL



Meningococcal disease: assessment of reporting fraction

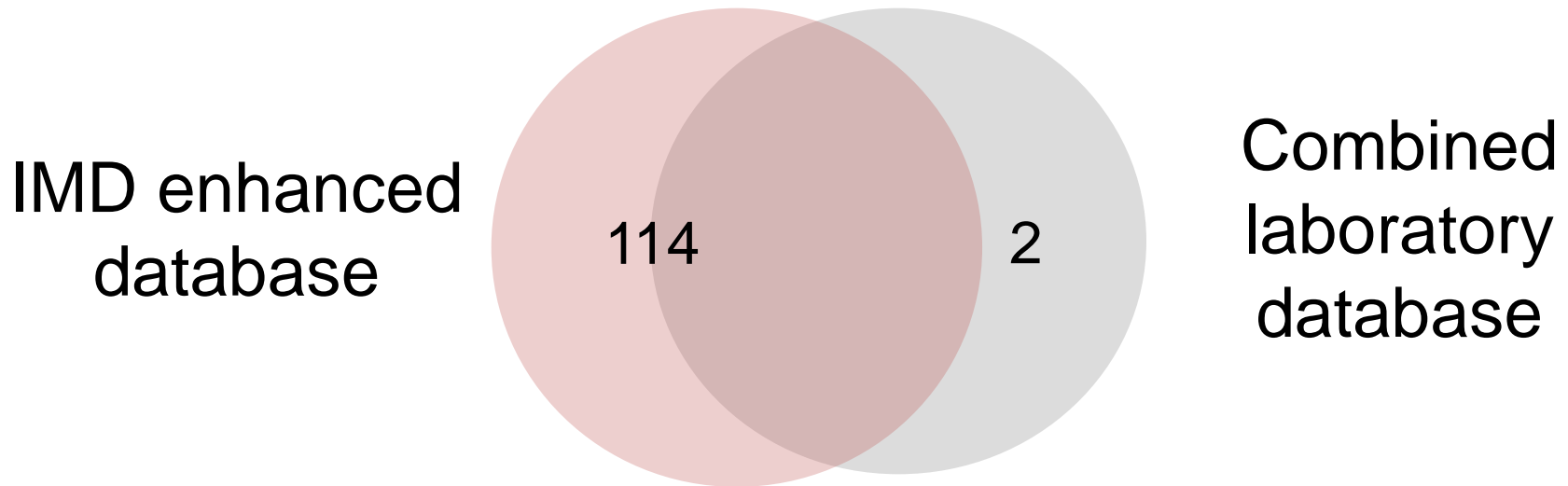


- Surveillance evaluation to validate completeness and accuracy of notifiable disease data for invasive meningococcal disease
- Retrieval from diagnostic laboratories in BC of identification of *N. meningitidis* (culture or PCR) from normally sterile sites



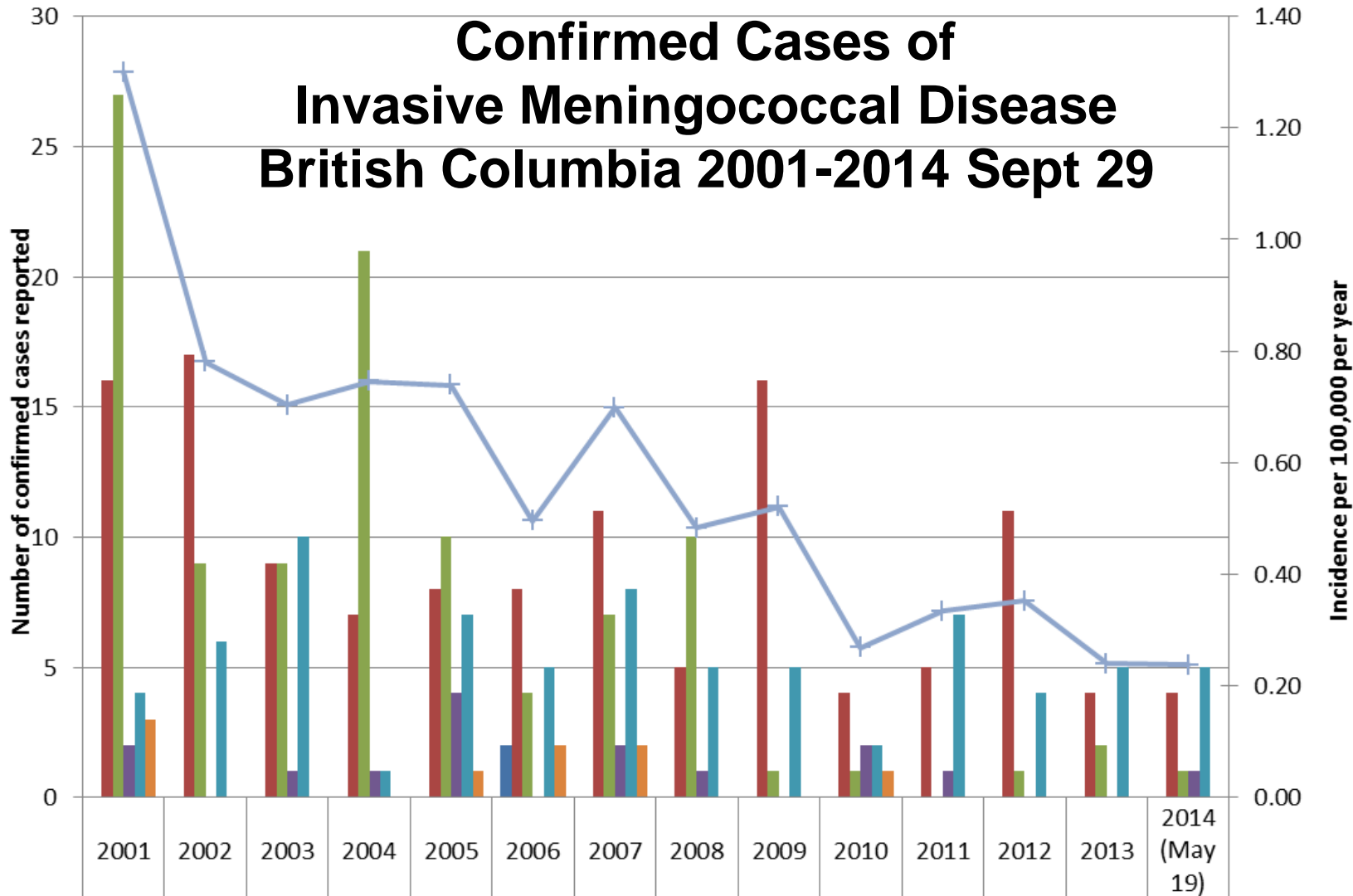
Sensitivity

Confirmed IMD cases, 2006–2011



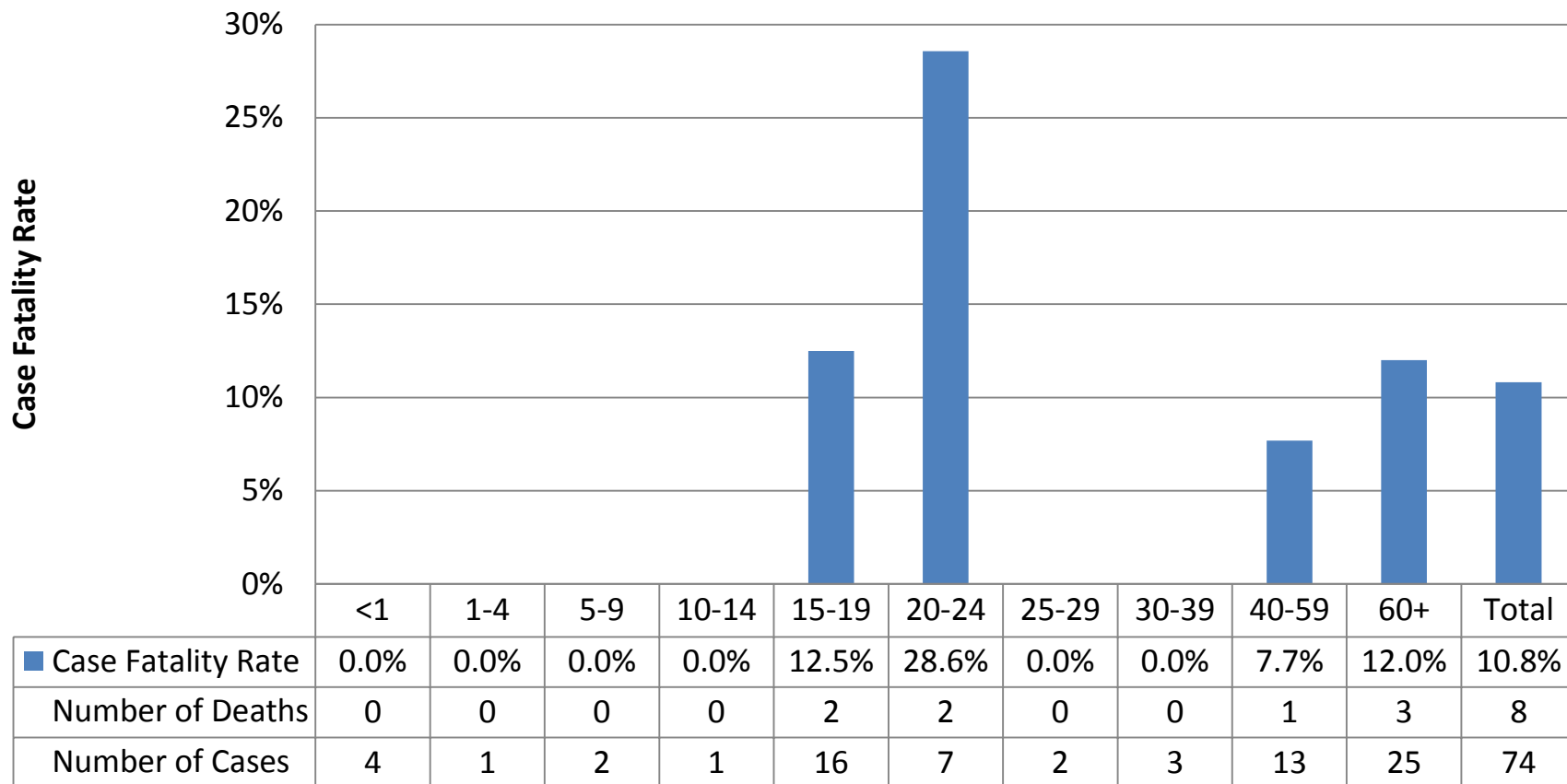
$$\begin{aligned}\text{Sensitivity} &= \frac{\# \text{ confirmed cases in the IMD Database}}{\# \text{ confirmed cases from labs}} \\ &= 114/116 = 98.2\%\end{aligned}$$

Confirmed Cases of Invasive Meningococcal Disease British Columbia 2001-2014 Sept 29



A	0	0	0	0	0	2	0	0	0	0	0	0	0	0
B	16	17	9	7	8	8	11	5	16	4	5	11	4	4
C	27	9	9	21	10	4	7	10	1	1	0	1	2	1
W-135	2	0	1	1	4	0	2	1	0	2	1	0	0	1
Y	4	6	10	1	7	5	8	5	5	2	7	4	5	5
UNKNOWN	3	0	0	0	1	2	2	0	0	1	0	0	0	0
Total Incidence	1.30	0.78	0.70	0.75	0.74	0.50	0.70	0.48	0.52	0.27	0.33	0.35	0.24	0.24

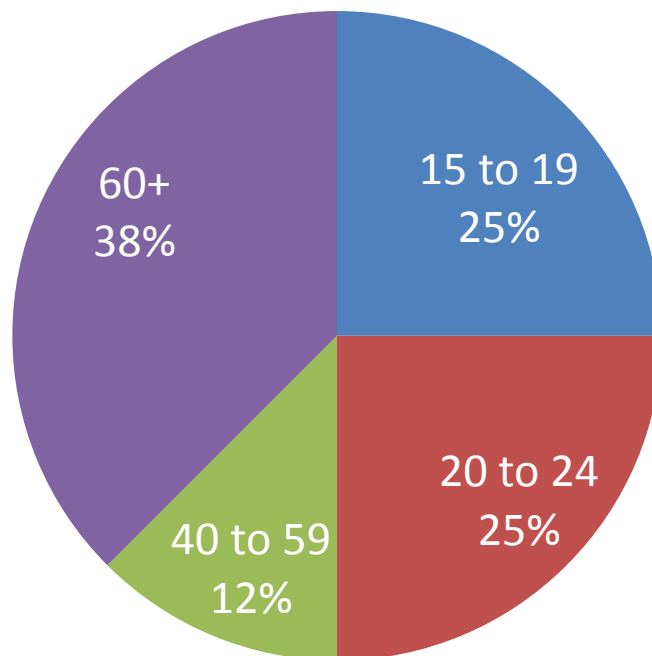
Serogroup Y Cases and Fatal Outcome by Age Group British Columbia, 2001-2014 (to September 29)



	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+	Total
■ Case Fatality Rate	0.0%	0.0%	0.0%	0.0%	12.5%	28.6%	0.0%	0.0%	7.7%	12.0%	10.8%
Number of Deaths	0	0	0	0	2	2	0	0	1	3	8
Number of Cases	4	1	2	1	16	7	2	3	13	25	74



Proportion of Serogroup Y Deaths by Age Group British Columbia, 2001-2014 (to September 29)



Note: There were no fatal cases in the <1, 5-9, 10-14, 25-29 and 30-39, age groups.



Mumps: surveillance informing period of respiratory isolation

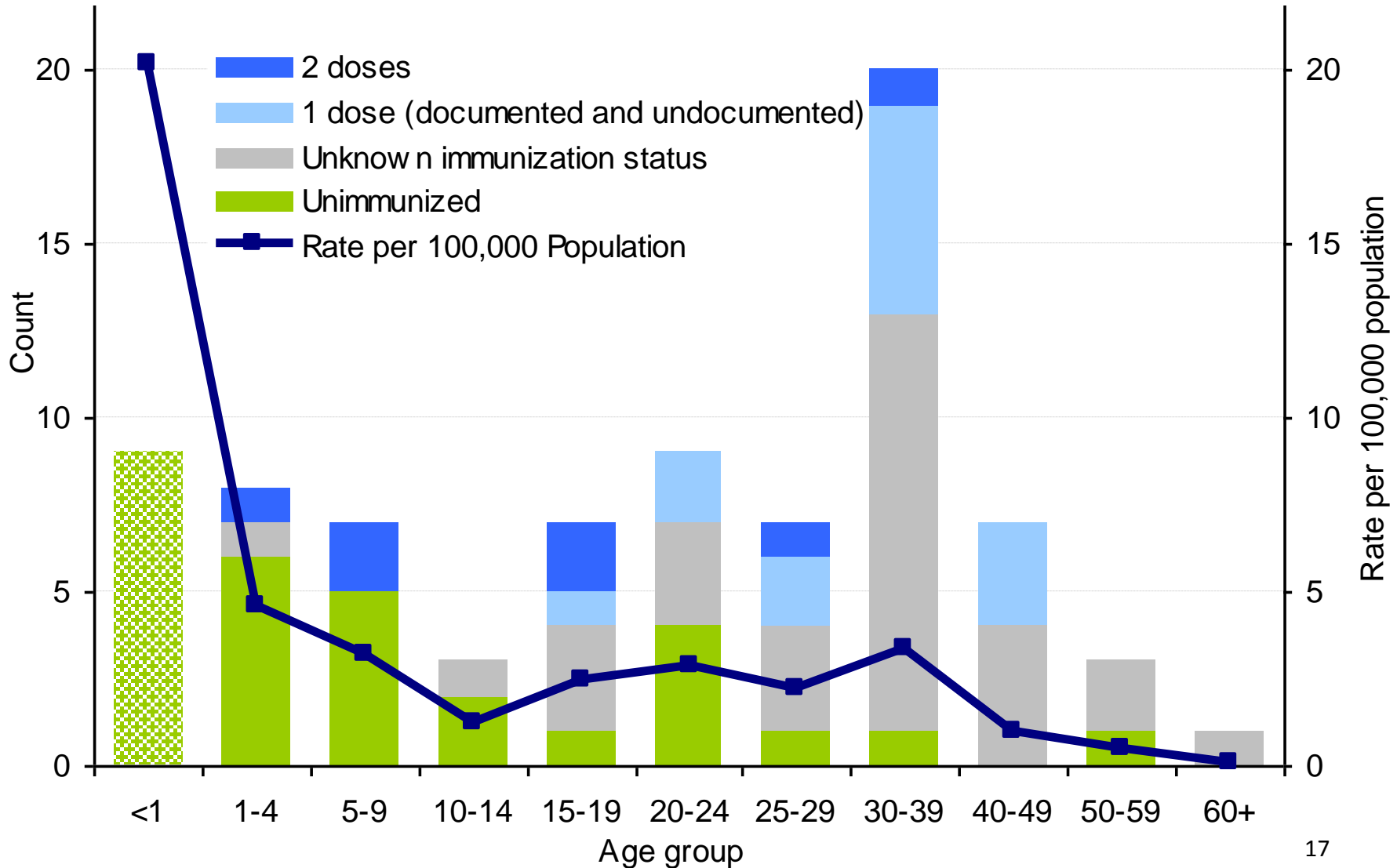
Table 2. Virus Detection in Buccal Specimens (n=61), by Days After Parotitis

# Days Post-parotitis	RT-PCR		Isolation in cell culture		RT-PCR or isolation % Positive
	Performed n	Positive n (%)	Performed n	Positive n (%)	
0-1	24	21 (88)	23	16 (70)	88
2-3	15	11 (73)	16	6 (38)	69
4-5*	10	7 (70)	10	2 (20)	70
7-9	9	5 (56)	9	3 (33)	56
>9†	2	0	2	0	0

* No specimens collected on day 6.

† Specimens collected on day 13 and 20.

Measles outbreak BC 2010: age specific incidence



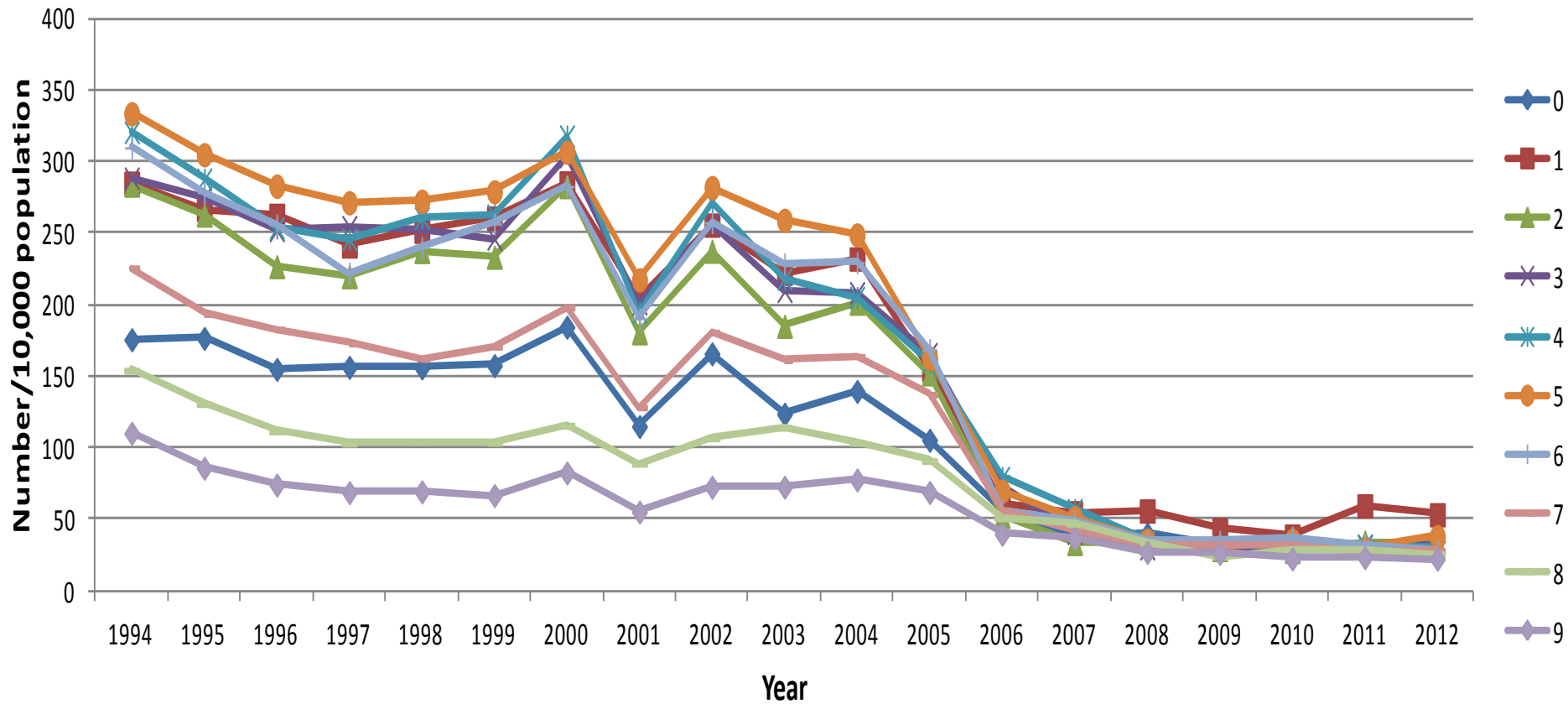
Serosurvey of prenatal specimens: measles seroimmunity by year of birth

Year of Birth	1960-69		1970-79	
% Measles IgG Positive	95% (631/661)		88% (588/665)	
	(42-51 years)		(32-41 years)	

Year of Birth	1960-64	1965-69	1970-74	1975-79
% Measles IgG Positive	97% (228/234)	94% (403/427)	91% (303/332)	85% (285/333)



Rate of varicella visits by age



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