

Immunization across the age span: What's new and/or improved?



BC Centre for Disease Control
An agency of the Provincial Health Services Authority



PICNet 2018 Educational
Conference
March 9 2018



Monika Naus MD MHSc FRCPC FACPM
BC Centre for Disease Control
School of Population and Public Health
University of British Columbia

Conflicts of interest: I have no affiliation (financial or otherwise) with a commercial or other industry interest



Roles related to immunization in Canada

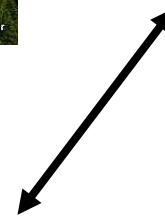
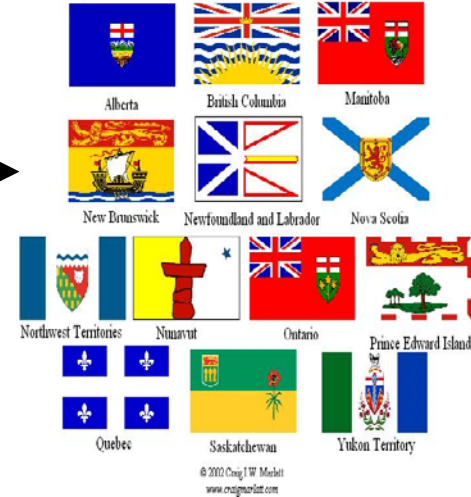
Manufacturer



Health Canada and
Public Health Agency of Canada

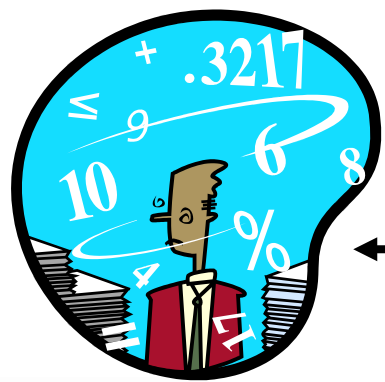


Flags of the Provinces and Territories



Program planning
and implementation

Program monitoring and evaluation



BC Centre for Disease Control
An Agency of the Provincial Health Services Authority



Child and adolescent immunization schedule BC 2018 April

Age	Vaccine(s)
2 mo	DPT-Polio/Hepatitis B/ Hib, PCV13, MenC, rotavirus
4 mo	DPT-Polio/Hepatitis B/ Hib, PCV13, rotavirus
6 mo	DPT-Polio/Hepatitis B/ Hib, rotavirus Influenza (2 doses, to 23 mos only) Hepatitis A (aboriginal)
12 mo	MMR, MenC, PCV13, Varicella
18 mo	DPT-Polio/Hib, Hepatitis A (aboriginal)
4-6 years/ Kindergarten	DPT-Polio, MMR, Varicella
11 years/ Grade 6	HPV girls and boys
14-16 years/ Grade 9	Tdap, Men4C

Against 16 diseases, given from 2 months through 14 years of age

See www.bccdc.ca Immunization Manual



BC Centre for Disease Control
An Agency of the Provincial Health Services Authority



Adult immunization schedule - BC 2018

Age, interval, risk group	Vaccine(s)
Any adult	Td every 10 years 65+: influenza annually, PPV23 once MMR 2 nd dose based on age varicella if susceptible
High risk adults: lifestyle and medical risk factors	hepatitis B, hepatitis A <65: influenza, PPV23 MCV4, Hib, PCV13 HPV
Health care workers	As any adult above; hepatitis B, MMR 2 nd dose, IPV one lifetime booster, influenza
Travelers - some free	hepatitis A/ B, MMR, IPV, meningococcal, yellow fever, Japanese encephalitis, rabies, other
Other - available for purchase	HPV (non high risk males, older women), Zoster/ Shingles, Tdap, non-high risk MCV4, MenB, PCV13

Pertussis

- Acellular vaccines: why did these replace whole cell vaccines?
- Tdap:
 - routine adult booster doses are not publicly funded in BC
 - Low incidence and limited morbidity of adult pertussis
 - Rapidly waning immunity after a booster dose
 - for pregnant women to protect infants prior to receipt of 1st dose
 - 2018 NACI recommends Tdap at 27-32 weeks gestation for each pregnancy
 - Passive immunity for infant prior to development of active immunity
 - To be discussed at BC committee June 2018

NACI statements: <https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci.html>



BC Centre for Disease Control
An Agency of the Provincial Health Services Authority



MMR recommendations by year of birth and HCW

Health care workers

Year of birth	Measles	Mumps②	Rubella①	MMR vaccine
Prior to 1957	0 doses	0 doses	1 dose	1 dose
1957 – 1969	2 doses	1 dose		2 doses
1970+		2 doses		2 doses

All others

Year of birth	Measles	Mumps②	Rubella	MMR vaccine
Prior to 1957	0 doses	0 doses	0 doses	0 dose
1957 – 1969			1 dose	1 dose
1970+	2 doses	1 or 2 doses		2 doses

① One dose of MMR for rubella protection is recommended for all health care workers regardless of age, and for adults born after 1956 who do not have documentation of receiving 1 dose of rubella containing vaccine on / after their first birthday or laboratory evidence of immunity or laboratory confirmed rubella.

② One dose of mumps vaccine is recommended for any susceptible adult born in 1970 and later. The following should receive two doses: children as per routine schedule; students of post-secondary educational settings and travelers to outside of North America. Health care workers should receive 1 dose if born between January 1, 1957-December 31, 1969; 2 doses if born on or after 1970.

Is shedding of live vaccines an issue?

- Some live vaccines can be transmitted from vaccinated individuals
- This can be a risk for immunocompromised contacts
- NOT seen following MMR vaccine
- Varicella vaccine: if vaccine recipient has a varicella-like rash, it should be covered and direct contact with immunocompromised contact should be avoided
- Rotavirus:
 - shedding may occur up to 1 month post vaccination
 - handwashing following diaper changing
- LAIV:
 - Cold adapted and replicate poorly at core temperature; no cases of vaccine strain illness among HCWs or immunocompromised contacts*



Influenza vaccines

- Quadrivalent
 - 2nd B primarily of benefit for pediatric age groups
 - Expected to replace TIV after 2020/1
- Live attenuated (LAIV)
 - US ACIP reinstating recommendation effective 2018/9
 - A/H1N1 virus strain tested for replicative efficiency
- High dose
 - 60 ug/strain per dose, trivalent
 - Substantially higher cost
 - Small incremental benefit: single RCT reduced risk from 1.9 to 1.4% for a NNV of 200 to prevent 1 case
- Cell tissue culture vaccines
 - Non-reliant on eggs for manufacture

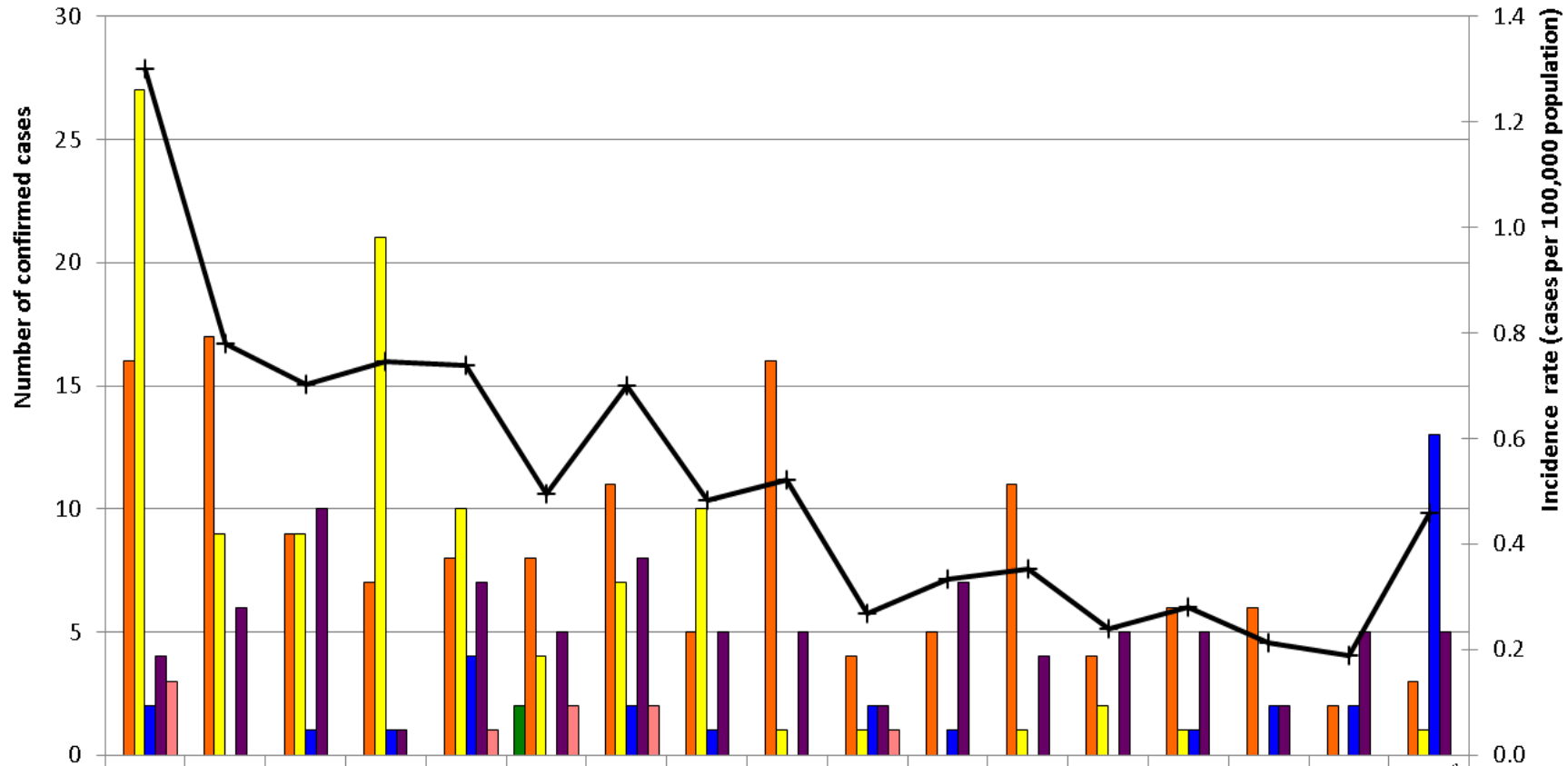


Meningococcal vaccines and BC program

- C conjugate:
 - 2 and 12 months since early 2000s; adolescent catchup
- ACYW conjugate:
 - Grade 9 since 2016/7
- B:
 - NACI: no recommendation for routine use
 - BC use: close contacts of cases
- Health Canada has approved two B vaccines
 - 4 component (GSK, 2 doses, 3+1 for infants) and FHbp (Pfizer, 2 or 3 dose high risk)
 - No routine programs in Canada; low incidence and high NNV
 - 4 component used for outbreak Quebec
 - Short term protection; US ACIP recommends for 16-23 yo



Invasive Meningococcal Disease Cases and Incidence Rates by Year British Columbia, 2001-2017*



■ A	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
■ B	16	17	9	7	8	8	11	5	16	4	5	11	4	6	6	2	3
■ C	27	9	9	21	10	4	7	10	1	1	0	1	2	1	0	0	1
■ W	2	0	1	1	4	0	2	1	0	2	1	0	0	1	2	2	13
■ Y	4	6	10	1	7	5	8	5	5	2	7	4	5	5	2	5	5
■ UNKNOWN	3	0	0	0	1	2	2	0	0	1	0	0	0	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	0.28	0.21	0.19	0.46

* 2017 cases include those reported to BCCDC by November 9, 2017.

Vaccination with conjugate vaccines adolescents reduces disease in all ages because peak nasopharyngeal carriage is at age 19

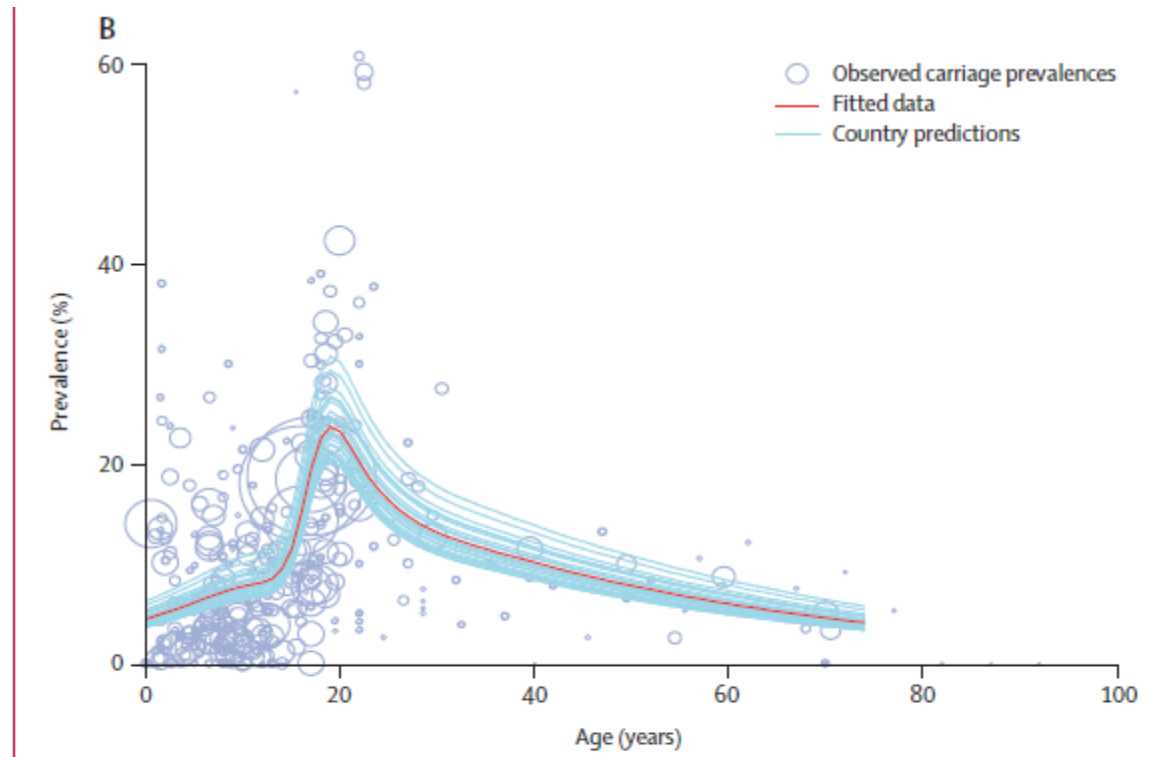


Figure 2: Estimates of meningococcal carriage by age when swabs were plated immediately after collection
Circles are the datapoints included, with the larger circles representing a larger sample size. The largest circles represent the results of the serial cross-sectional studies in teenagers aged 15–19 years old in the UK, before and after the introduction of the meningococcal serogroup C vaccine.^{105,110,113} (A) 95% bias-corrected CIs. (B) With individual country predictions.

From: Christensen. *Lancet Infect Dis* 2010; 10: 853–61



Rotavirus vaccines

- Two approved vaccines
- Both orally administered

Canadian contract is migrating from one to the other spring 2018



<https://www.fhi.no/en/studies/rotavirus-study/about-rotavirus-study/>

'rix': 2012-2018	'Teq': 2018-
Monovalent human live attenuated	Pentavalent human bovine reassortant
2 dose	3 dose



BC Centre for Disease Control
An Agency of the Provincial Health Services Authority



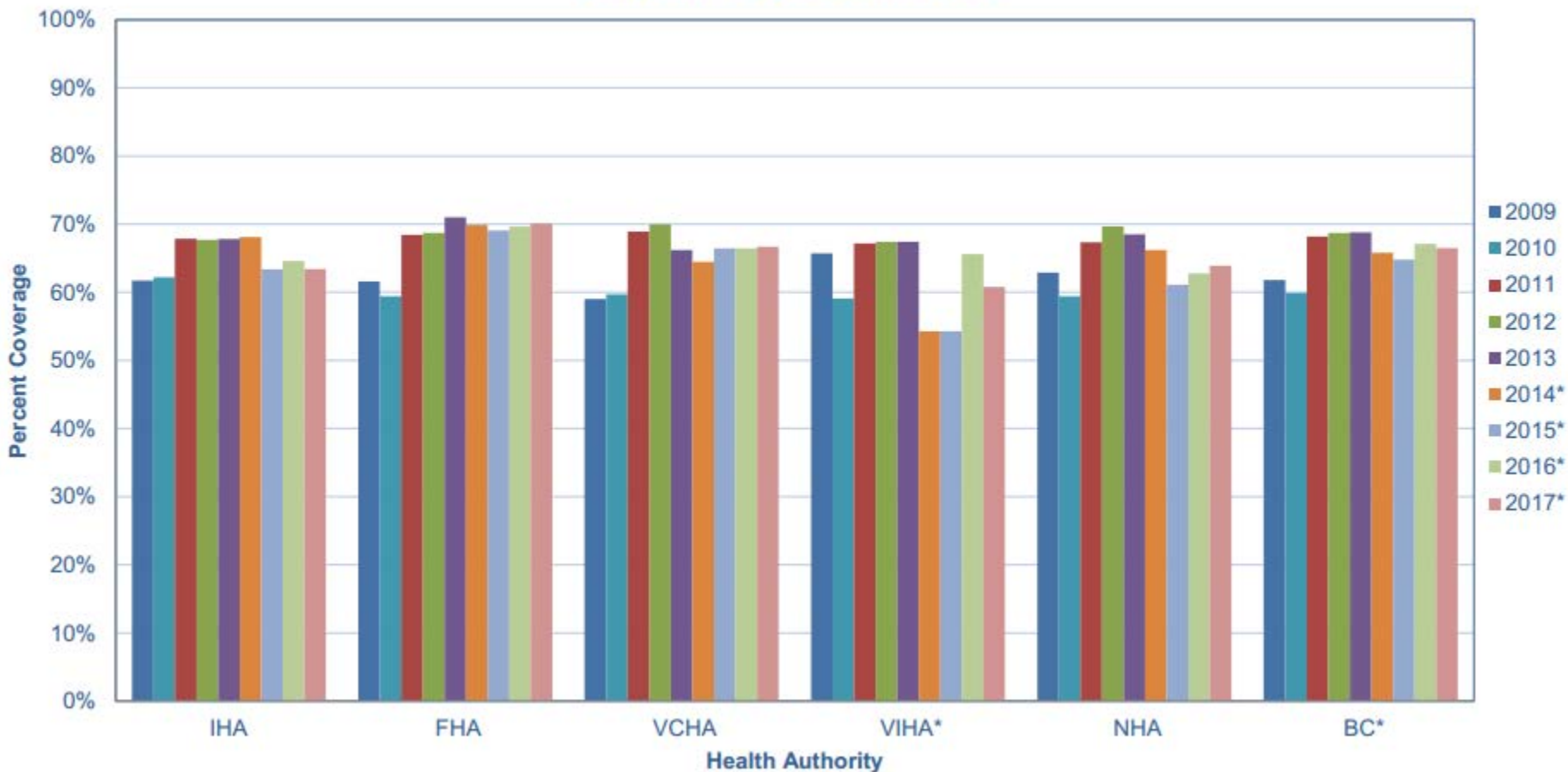
Hepatitis A

- BC program:
 - Vaccination of high risk individuals: IDU, MSM, hepatitis B/C/chronic liver disease, others
 - Declining rates of hepatitis A
- BC outbreaks in 1995-2011:
 - 1995-96: at least 35 cases among FN people in the Duncan area
 - 1999: 23 cases (incl. 18 FN) in Northern Interior Health Region
 - 2000: 19 cases, mostly FN children, in Quesnel
 - 2004: 8 cases secondary to 3 travel-related cases in a religious community in NHA
 - 2010-11: over 85 cases among FN people in Cowichan-VIHA
 - Low uptake of vaccine in response to the outbreak
- Program introduced for aboriginal children on/off reserve 2012:
 - Routine infant schedule 2 doses at 6 and 18 months
 - Kindergarten catch-up program
 - Opportunistic offering to aboriginal individuals under 19 years old
 - Self-identified 'aboriginal' ethnicity



HPV vaccine uptake in grade 6 BC girls

Grade 6 Females with Up-to-date Immunizations, 2009-2017* Human Papillomavirus



Recent BC expansions of publicly funded HPV vaccine programs:

- September 2015, for males starting series up to age 26:
 - MSM
 - HIV positive
 - Street involved youth
 - In the care of Ministry of Child and Family Development (to age 18)
 - Youth custody (12-17 years old)
- 2017/8 school year:
 - HPV 9 valent: has replaced HPV4 with a 2-dose series
 - Routine school based male vaccination in grade 6 started
 - Uptake appears to be on par with girls



Age specific incidence of zoster

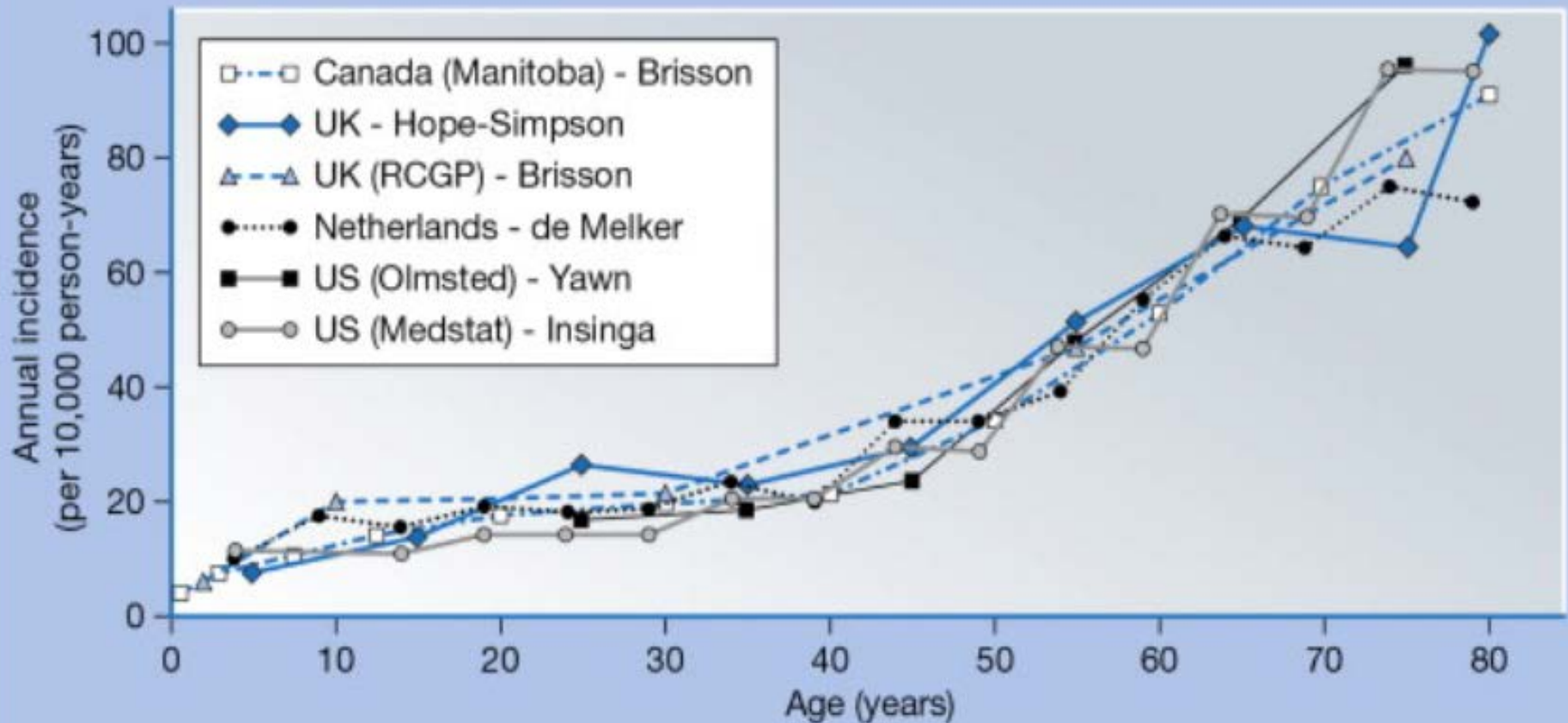


Figure 39-2 Age-specific incidence of herpes zoster as a function of age.

From: Vaccines, 6th edition. Plotkin S, Orenstein W, Offit P. Elsevier 2013. Page 972

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

JUNE 2, 2005

VOL. 352 NO. 22

A Vaccine to Prevent Herpes Zoster and Postherpetic Neuralgia in Older Adults

M.N. Oxman, M.D., M.J. Levin, M.D., G.R. Johnson, M.S., K.E. Schmader, M.D., S.E. Straus, M.D., L.D. Gelb, M.D., R.D. Arbeit, M.D., M.S. Simberkoff, M.D., A.A. Gershon, M.D., L.E. Davis, M.D., A. Weinberg, M.D., K.D. Boardman, R.Ph.,

Live Oka strain vaccine, about 14x the PFU of varicella vaccine, VE:

- 51.3% (95% CI, 44.2–57.6%) for confirmed zoster incidence
- 66.5% (95% CI, 47.5–79.2%) for post-herpetic neuralgia (PHN)
- Single dose SC
- Lower VE at older ages
- Waning immunity with <35% by year 6

Adjuvanted subunit zoster vaccine:

- VE 97.4% in adults 60-69 yo and persistence of protection at 70+yo; high levels of protection against PHN; protection maintained at 4 years (pending results for longer)
- 2 dose IM
- ~16% grade 3 reactions, including local
- Not contraindicated in immunocompromised

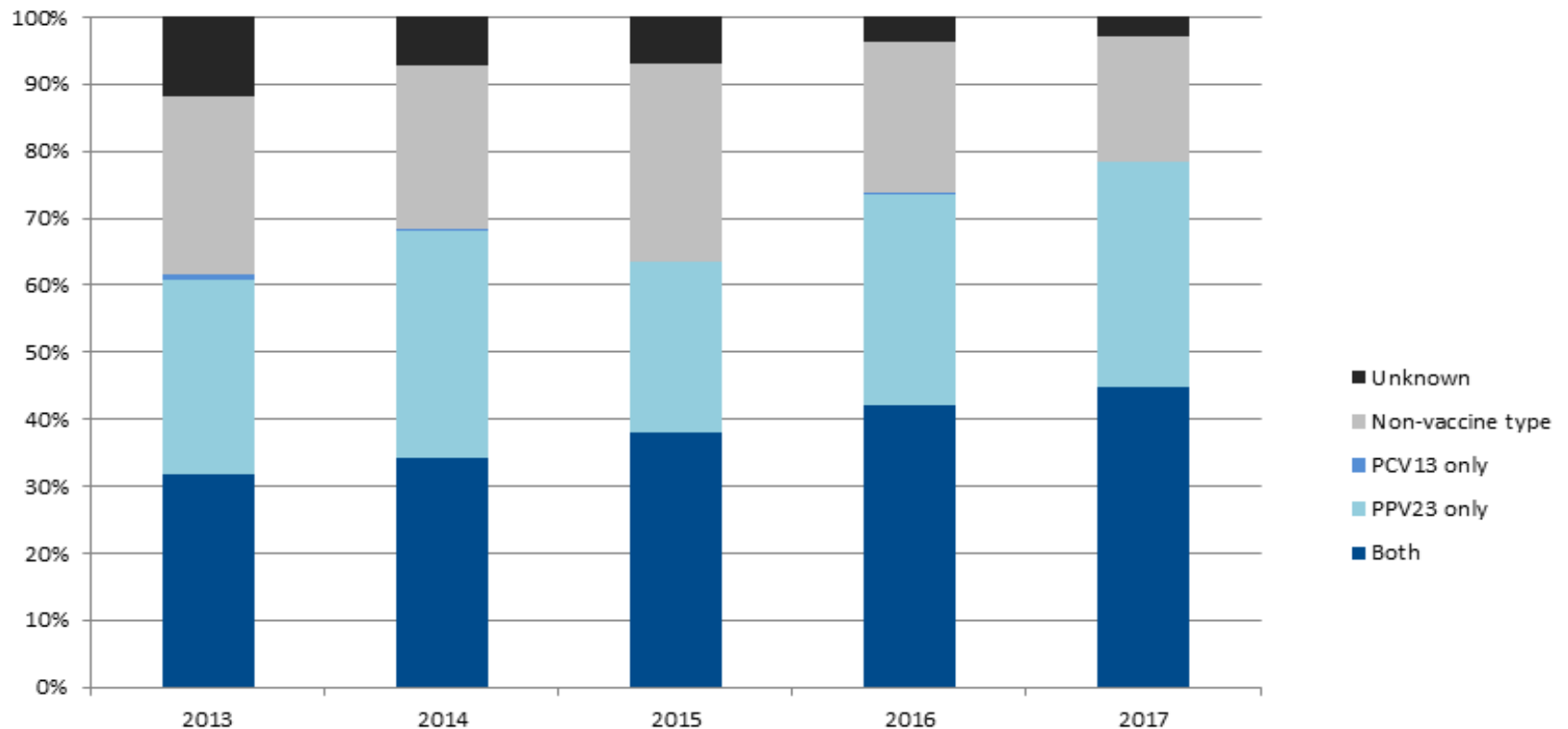
Pneumococcal vaccines: PCV13 & PPV23

- PCV13 trial in the Netherlands found VE: Bonten et al. NEJM 2015
 - Community acquired pneumonia 45.6% (CI 21.8-62.5%)
 - Nonbacteremic non-invasive community acquired pneumonia 45% (CI 14-65.3%)
 - Invasive pneumococcal disease 75% (CI 41.4-90.8%)
 - Persistence of efficacy to 4 years
- PCV13 Health Canada approval July 2015:
 - adults 18+: pneumonia and invasive pneumococcal disease
- BC program for adults is:
 - PPV23 for high risk and 65+ one dose
 - PCV13 for HSCT and HIV infected (NACI 'good' evidence)
 - NACI concludes 'fair' evidence for immunocompromised adults, and 'insufficient evidence' for others e.g., cancer, diabetes
 - No PCV13 for 65+ (as per NACI 2016 recommendations; US ACIP 2014 recommends routine PCV13 for 65+)



Pneumococcal serotype distribution adult cases of IPD in BC

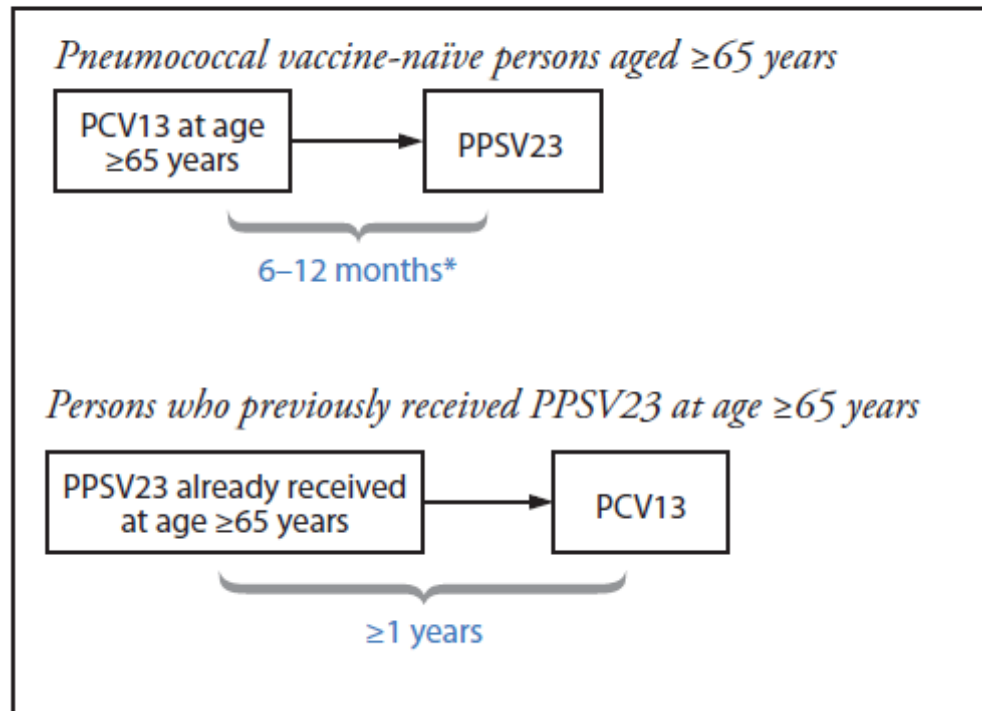
Adult (≥ 17 years of age) Invasive Pneumococcal Disease (IPD) cases by
Vaccine Serotype in British Columbia, 2013-2017



Prepared by BCCDC IPVPS. Data Source: VPD Data Mart, data extracted March 5, 2018
Confirmed and probable IPD cases among individuals 17 years of age or older at time of case.
Non-vaccine type: Serotypes not covered by conjugate or polysaccharide vaccines.
PCV13: Serotype unique to PCV13 (6A)
PPV23: Serotypes unique to both PPV23 (2, 8, 9N, 10A, 11A, 12F, 15B, 17F, 20, 22F, 33F)
Both: Serotypes common to both PCV13 and PPV23 (4,6B, 9V, 14, 18C, 19F, 23F, 1,5, 7F, 3, 19A)

PCV13 & PPV23 sequential vaccination

BOX. Sequential administration and recommended intervals for PCV13 and PPSV23 for adults aged ≥ 65 years — Advisory Committee on Immunization Practices, United States



Source: MMWR September 19 2014



BC Centre for Disease Control
An Agency of the Provincial Health Services Authority



PPV23 revaccination recommendations

A once-only revaccination should be offered 5 years after the initial immunization to those who have:

- Anatomic or functional asplenia
- Sickle cell disease
- immunosuppression related to disease (e.g., HIV, lymphoma, Hodgkin's, multiple myeloma) or therapy (e.g., high dose, systemic steroids)
- Congenital immunodeficiency states (as above)
- Chronic kidney disease
- Chronic liver disease including cirrhosis, chronic hepatitis B, & hepatitis C

NACI (not publicly funded in BC): PPV23 recommended for children and adults with asthma. An additional dose of PPV23 is also recommended for those who were first immunized when younger, at the time they turn 65 years old (with an interval of at least 5 years after last PPV23 dose; NACI 2014 and 2015 statements. NACI has longstanding recommendation for PPV23 for smokers.

<https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci.html>



BC Centre for Disease Control
An Agency of the Provincial Health Services Authority



Non-publicly funded vaccines

BRITISH COLUMBIA **ImmunizeBC** Evidence-based immunization information and tools for B.C. residents

Search keywords or ask a question

Home About Vaccines & Diseases Vaccine Safety Vaccines for All Ages Find a Clinic Tools & Resources

It's influenza (flu) season! Protect yourself and those around you. Find a clinic near you!

The HPV vaccine is now free for grade 6 boys!

BC Pediatric Society vaccine fact sheets and resources for physicians and families

Welcome

Sip Smart! BC™

The BC Pediatric Society, with the support of funding from the BC Centre for Disease Control and various unrestricted educational grants, has produced a number of resources that we hope you will find helpful. Some of these resources are aimed at physicians and others at families.

Vaccine Fact Sheets and Resources for Physicians and Families

- Hepatitis A
- Meningococcal Disease
- Influenza
- Travel-Related Diseases

HPV Vaccine Coverage for Boys

Social Relationships & Friendships

Diagnosis Verification Form

Disability Tax Credits

The decision about vaccinating children is made by parents and caregivers. To do this, parents need comprehensive information about all vaccines.

When considering vaccines for their children, families trust their physician recommendation and the information he or she can provide. As a physician, you have a vital role to play in ensuring patients make informed decisions about their health and well-being!

This online resource provides information about vaccines approved by Health Canada not included in the regular immunization program in BC. Information was prepared by the BC Pediatric Society in cooperation with representatives of the Society of General Practitioners (SGP), BC College of Family Physicians (BCCFP), and practicing BC physicians.

PROFESSIONAL RESOURCES FOR PHYSICIANS

- Why Consider Non-publicly Funded (NPF) Vaccines?
- Best Practices in NPF Immunizations
- Factsheets for Physicians:
 - Human Papillomavirus (HPV)
 - Hepatitis A: Local Risks
 - Influenza
 - Meningococcal Disease
 - Travel Vaccines: Enterically borne
 - To Order HPV Tear Off Pads
 - Make Prevention Contagious

RESOURCES FOR PHYSICIANS TO GIVE TO FAMILIES

- Vaccine Information (Trusted Websites)
- NPF Vaccines: Costs
- NPF Vaccines: Insurance
- NPF Vaccines: Access
- Extra Protection Checklist
- Meningococcal B Vaccine: What Parents Need to Know
- HPV Vaccines: What Parents Need to Know
- HPV Tear Off Sheet

Information for the public about approved/recommended but not publicly funded vaccines is available on:

www.Immunizebc.ca

BC Pedes <http://www.bcpeds.ca/>

Vaccines of interest in clinical trials

- Hepatitis B more immunogenic
 - HEPLISAV-B recently approved in US, novel TLR adjuvant
- *Clostridium difficile*
 - Clinicaltrials.gov 18 studies, 12 completed
 - Phase II, two companies, 3 doses
 - Safety and immunogenicity, dosing for phase III
- Staph. aureus – pre-op orthopedic
- Neonatal Group B Streptococcus
- Congenital CMV
- Lyme, Zika, Chikungunya





monika.naus@bccdc.ca

Call your local health unit

Also see our web sites:

www.bccdc.ca Health Professionals channel

Subscribe to updates to the Immunization Manual at this link:

<http://www.bccdc.ca/health-professionals/clinical-resources/communicable-disease-control-manual>

www.immunizebc.ca for your patient



BC Centre for Disease Control
An Agency of the Provincial Health Services Authority

