

# CIC 2014 CCI

December 2-4  
2 - 4 décembre  
OTTAWA

Canadian Immunization Conference  
Conférence canadienne sur l'immunisation

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## Cost-Effectiveness of Quadrivalent vs Monovalent Vaccination against Meningococcal Disease in Canada

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# Disclosure Statement

Disclosure of Relationship*	Company/Organization
I am a member of an Advisory Board or equivalent with a commercial organization.	No
I am a member of a Speaker Bureau.	No
I have received payment from a commercial organization (including gifts or other consideration or 'in kind' compensation).	Sanofi Pasteur GSK
I hold a patent for a product referred to in the CME/CPD program or that is marketing by a commercial organization	Some authors are employees of Sanofi Pasteur which holds patents and patent applications related to quadrivalent vaccines
I hold investments in a pharmaceutical organization, medical devices company or communications firms.	Sanofi Pasteur GSK
I am currently participating in or have participated in a clinical trial within the past two years.).	No

\*Provided for all authors

# Background

- Recommendations for immunization against meningococcal disease with monovalent conjugate vaccines (MCV-C) and quadrivalent conjugate vaccines (MCV-4) vary across provinces in Canada

# Background

Province/ Territory	Population*, in 000s (%)	Infants, Months			Adolescents, Grade				
		2	4	12	4	6	7	9	Other
ON	13,506 (39)			MCV-C			MCV-4		
QC	8,055 (23)			MCV-C					MCV-C**
BC	4,623 (13)	MCV-C		MCV-C		MCV-C			
AL	3,874 (11)	MCV-C	MCV-C	MCV-C				MCV-4	
MB	1,267 (4)			MCV-C	MCV-C				
SA	1,080 (3)			MCV-C		MCV-4			
NS	949 (3)			MCV-C			MCV-C		
NB	756 (2)			MCV-C				MCV-4	
NF	513 (2)			MCV-C	MCV-4				
PEI	146 (<1)			MCV-C				MCV-4	
NWT	43 (<1)	MCV-C		MCV-C				MCV-C	
YU	36 (<1)	MCV-C		MCV-C		MCV-C			
NU	34 (<1)			MCV-C				MCV-C	

MCV-C: meningococcal conjugate vaccine - serogroup C; MCV-4: meningococcal conjugate vaccine - quadrivalent (serogroups A, C, Y, W135)

\*\*Vaccination recommended before age 18 years

# Objective

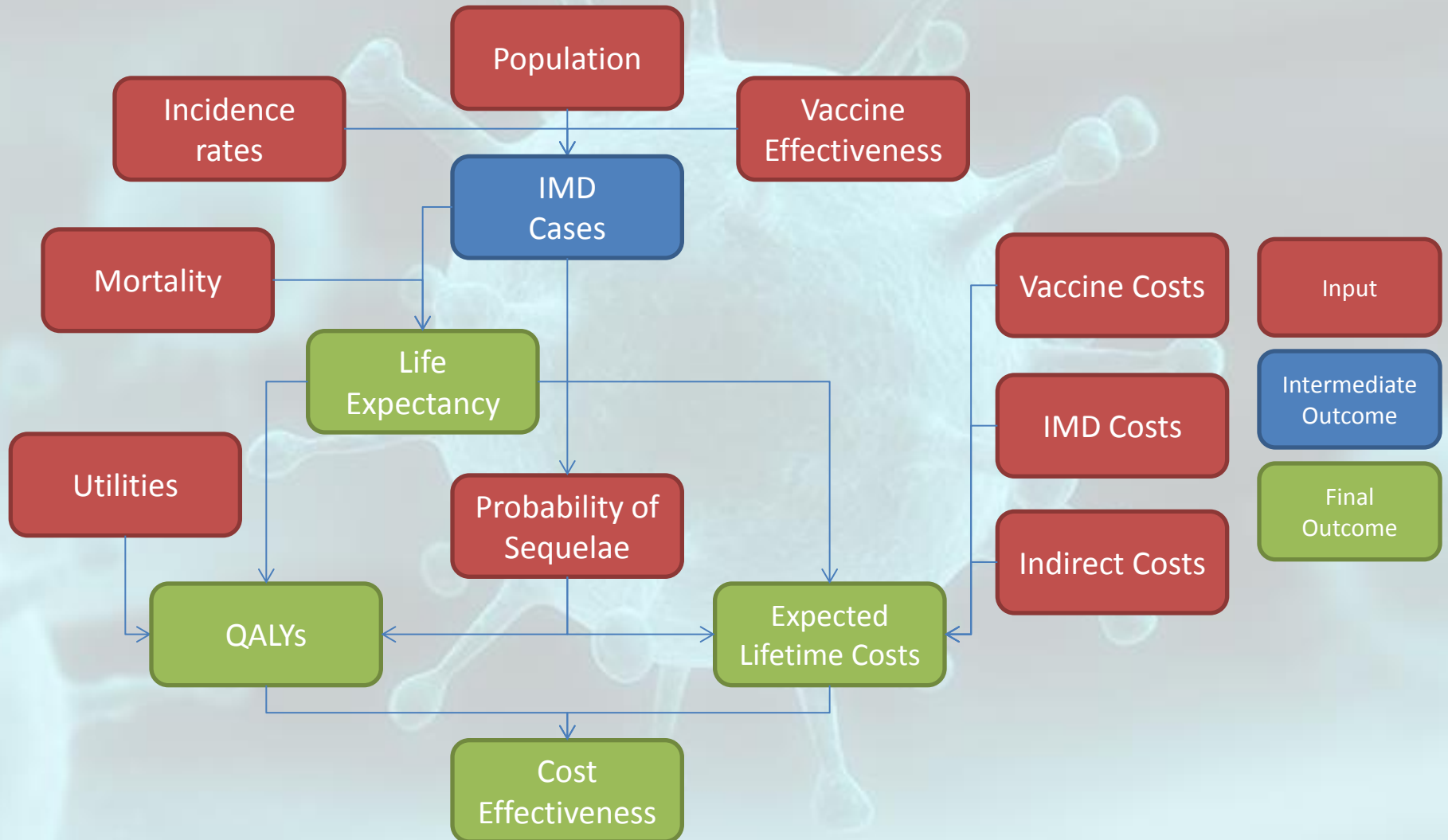


- To estimate the cost effectiveness of MCV-4 vs. MCV-C vaccination of adolescents and infants in Canada

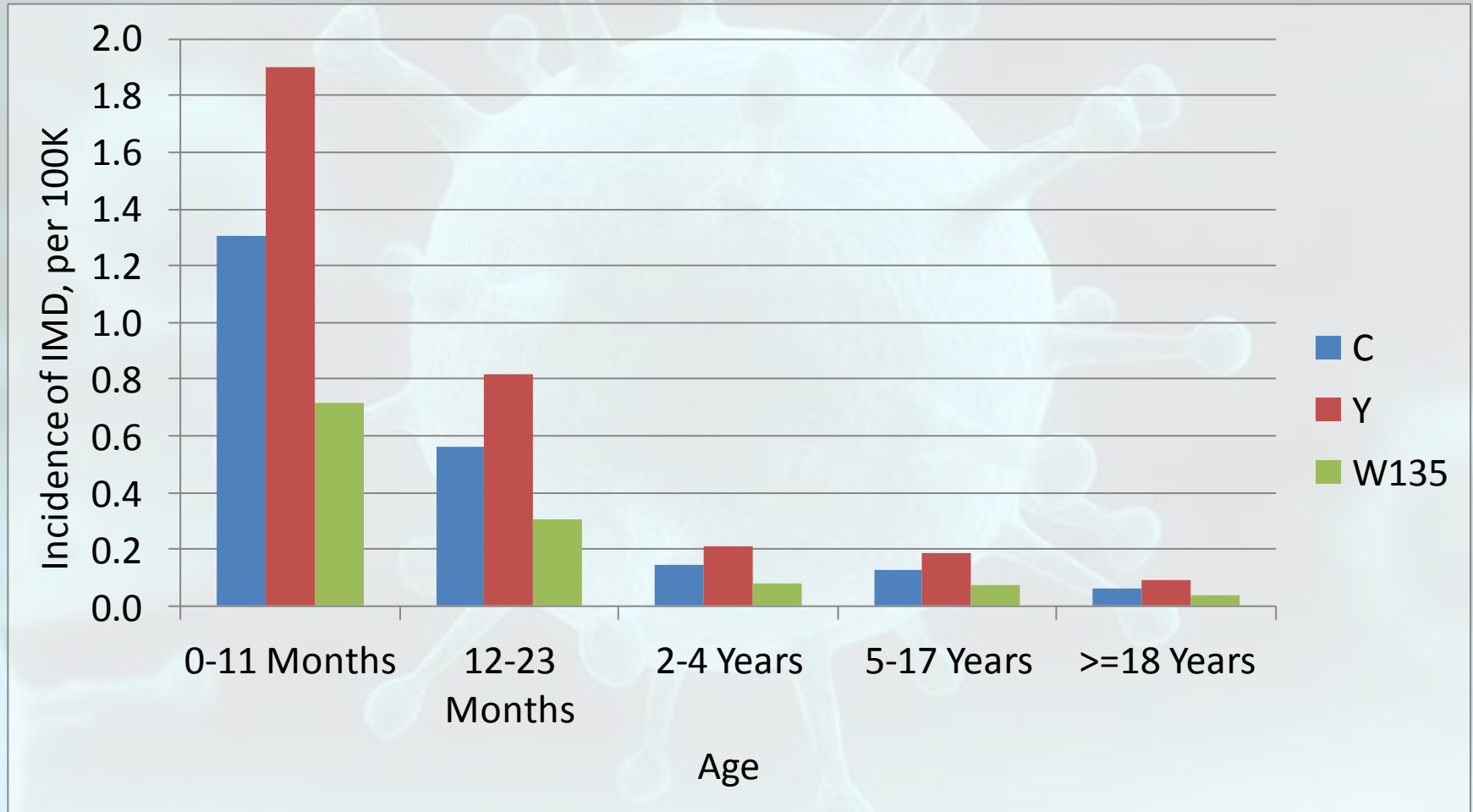
# Model Overview

Approach	Probabilistic cohort model
Population	Prevalent cohort of 35 mm Canadians of all ages
Comparisons	<ol style="list-style-type: none"><li>1. MCV-C/MCV-C: Infant (1y) and adolescent (15 y) MCV-C</li><li>2. MCV-C/MCV-4: Infant (1y) MCV-C and adolescent (15 y) MCV-4</li><li>3. MCV-4/MCV-4: Infant (1y) and adolescent (15 y) MCV-4</li></ol>
Perspective	Societal
Time horizon	Lifetime (up to 100 y)
Outcomes	Cases of IMD (C, Y, and W135) IMD deaths LYs and QALYs lost to IMD Lifetime costs of IMD (direct and indirect) (\$ CAN 2012) Cost per QALY gained
Discounting	5%

# Model Schematic

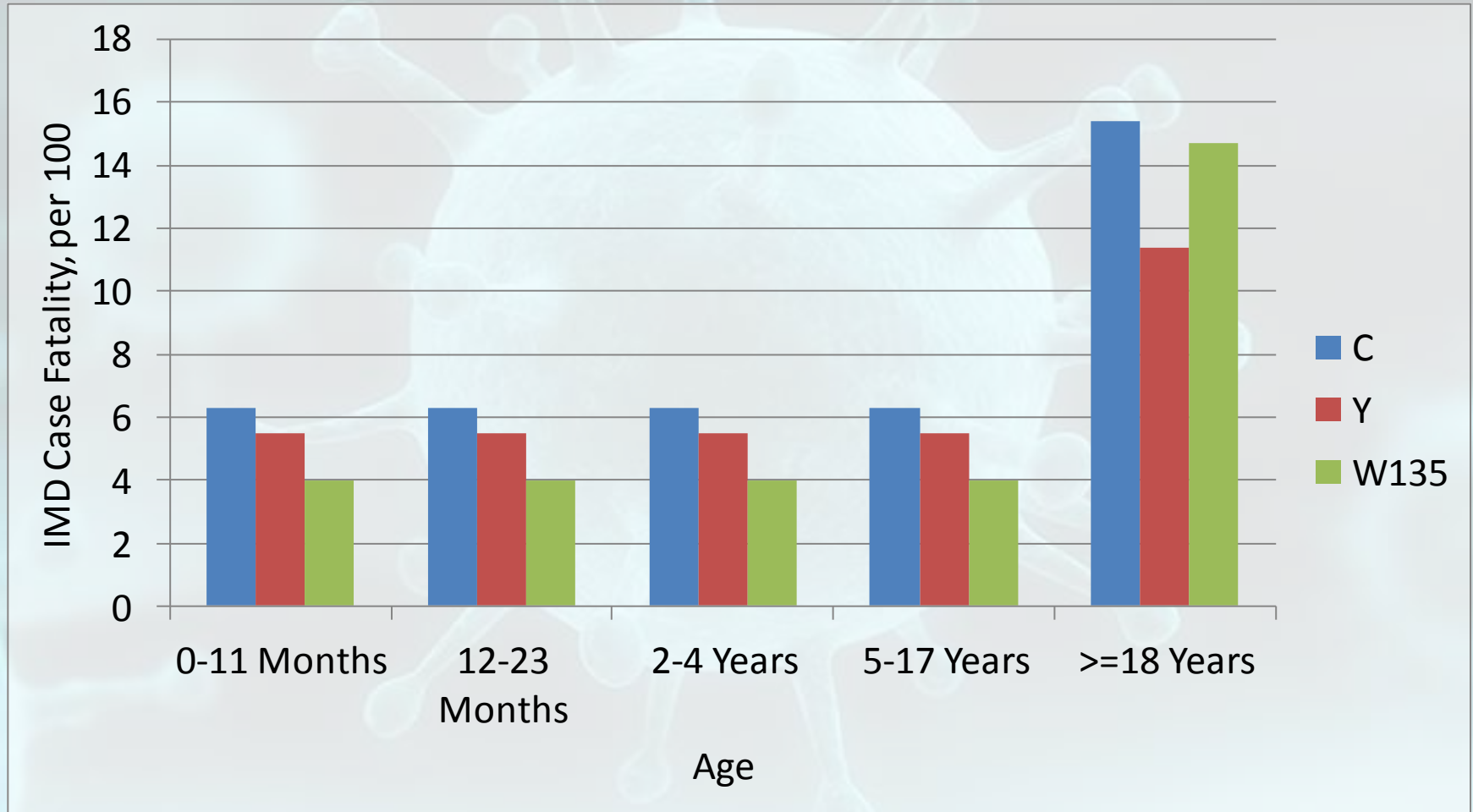


# Annual Incidence of IMD in Canada

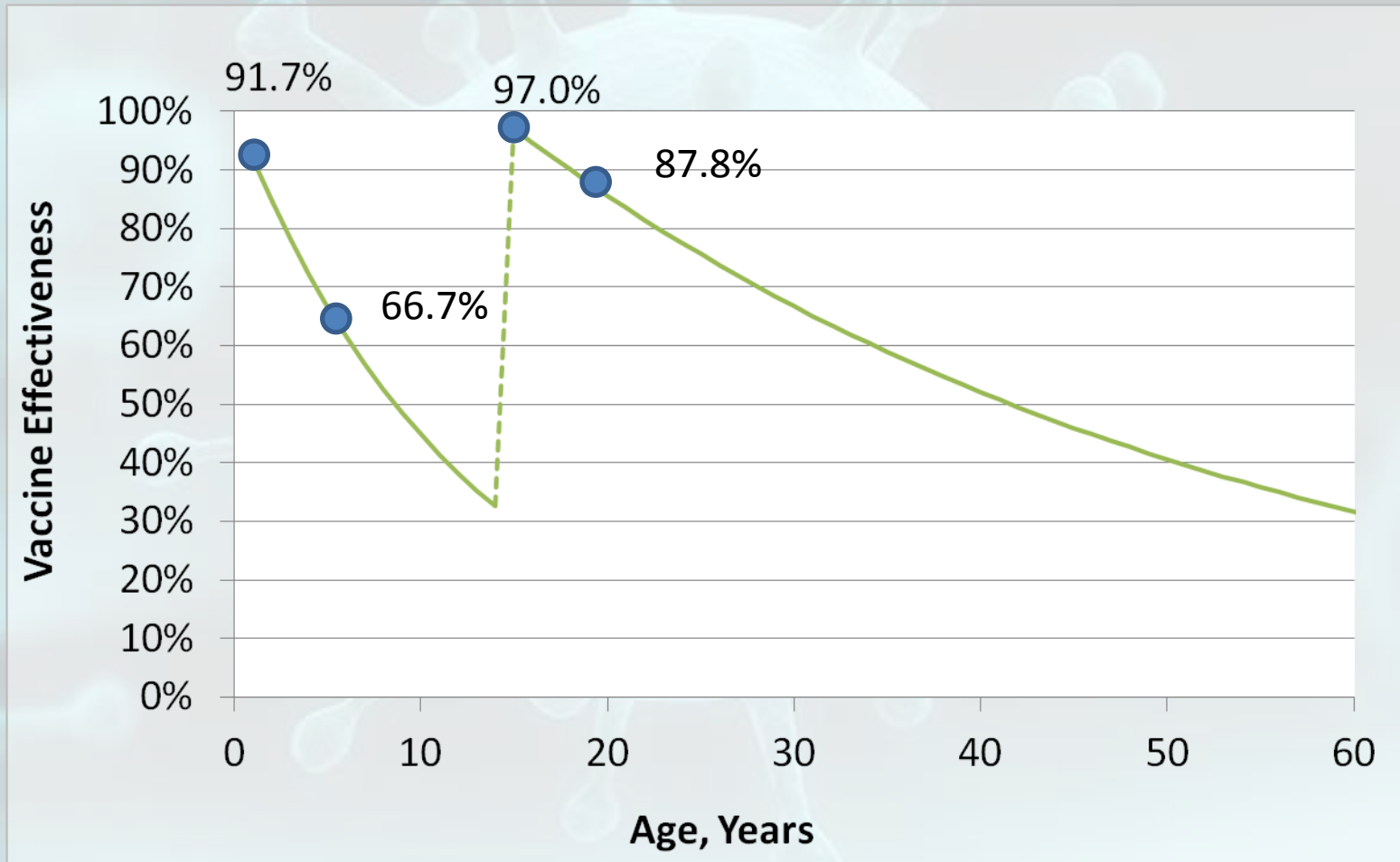




# IMD Case Fatality in Canada



# Vaccine Effectiveness by Age



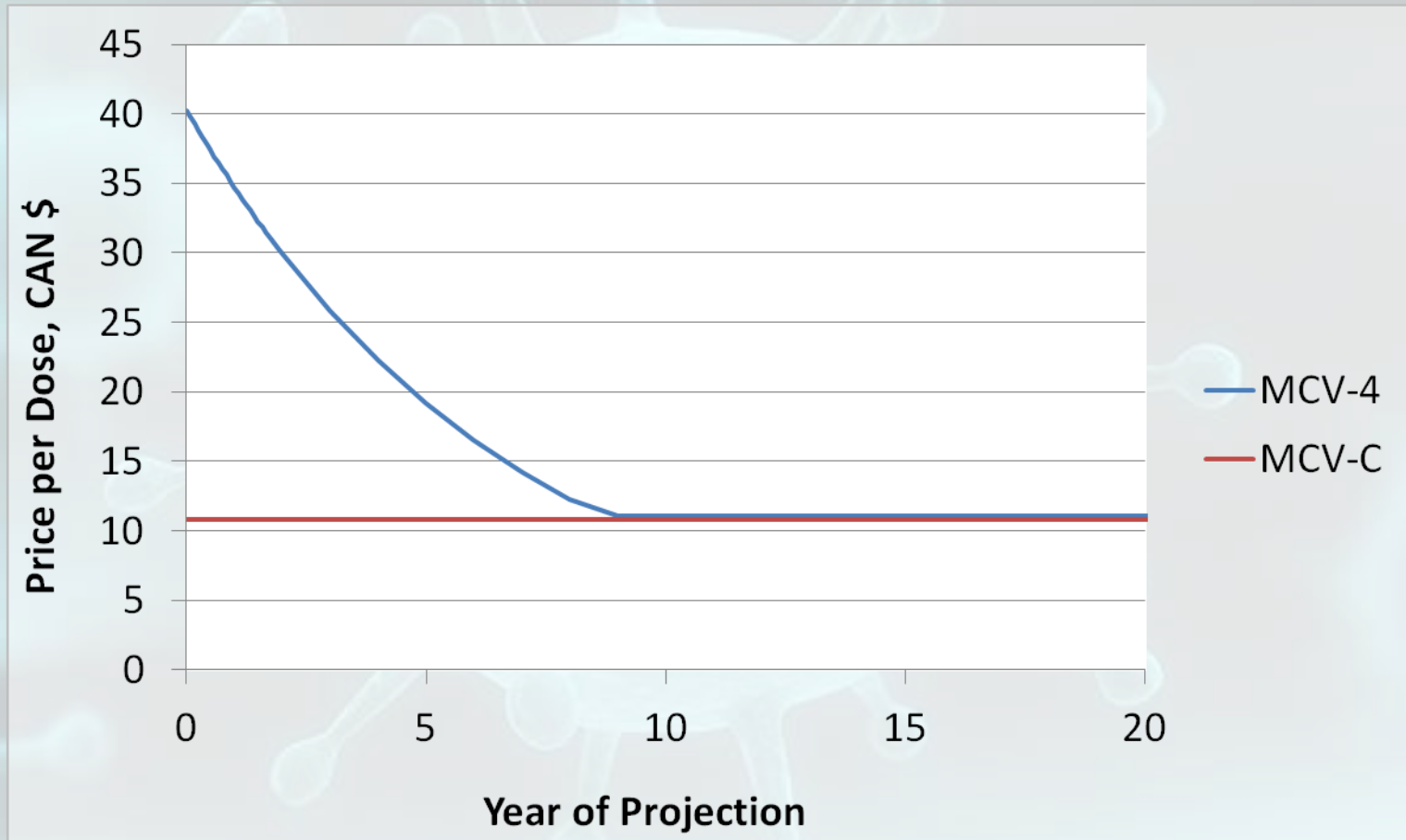
SOURCES: De Wals P, et al. *Effectiveness of serogroup C meningococcal conjugate vaccine: A 7-year follow-up in Quebec, Canada.* Ped Infect Dis J. 2011.

# Herd Effects



- Based on conservative “first order approximation” of herd effects described by Bauch et al. (2009) and further described by Van Vlaenderen et al. (2013)
  - Takes into account only the reduction in the number of susceptible individuals due to vaccination

# Vaccine Prices



**\*\* Infant MCV-4 assumed to require 2 doses \*\***

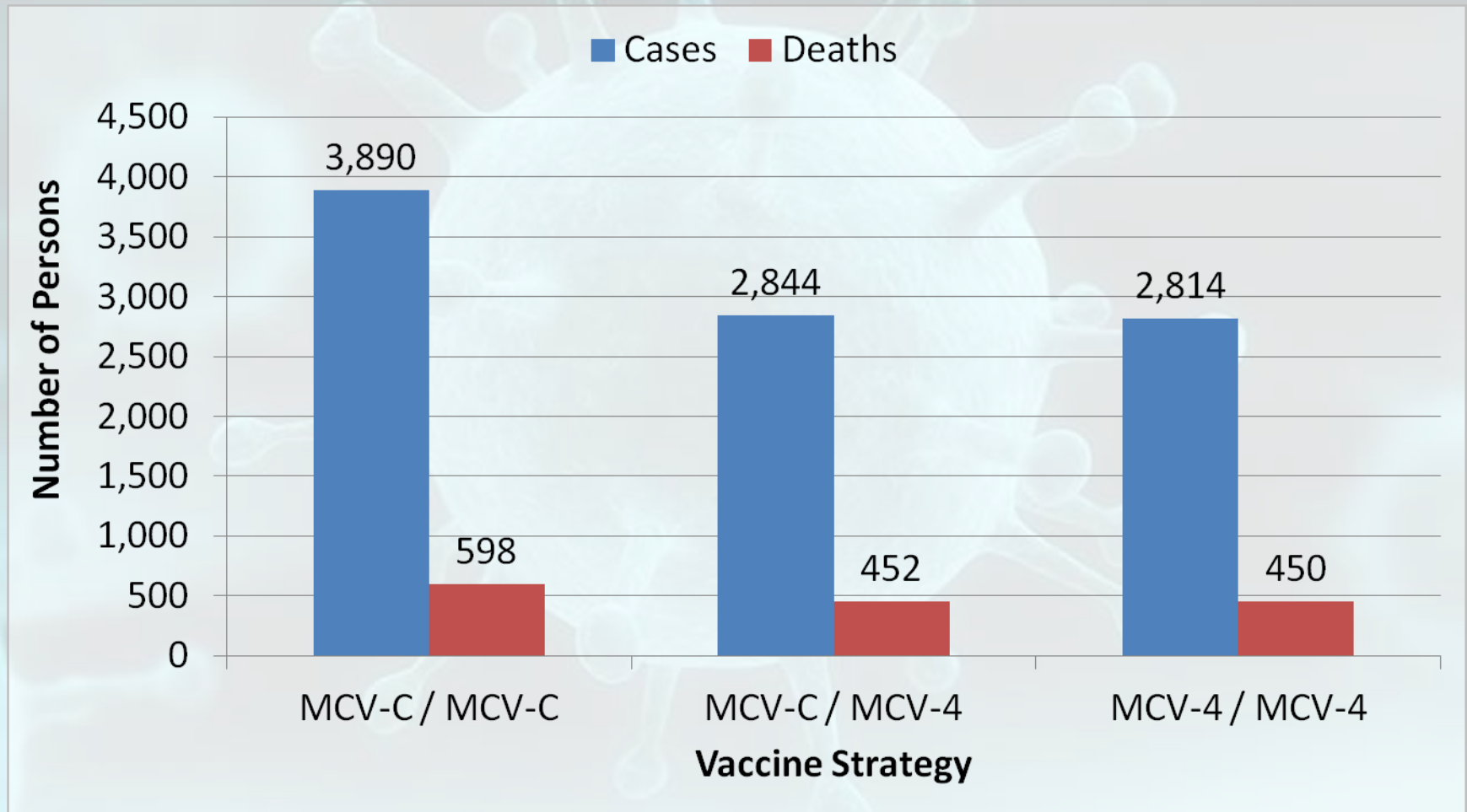
# Costs and Utility Values

		Age<18y	Age≥18y
Vaccine administration, per dose, \$CAN		4.96	11.25
Vaccine AEs, per dose, \$CAN		0.07	
IMD per case, \$CAN	Treatment	13,839	
	Public health response	4,159	
Sequelae, per case, per year, \$CAN		18,712	3,997
Indirect, per case, \$CAN	Premature death	1.8 mm	848 k
	Short-term indirect costs	2,930	
Utilities	Persons without IMD	0.98-0.59	
	Disutility from sequelae	0.28	0.27

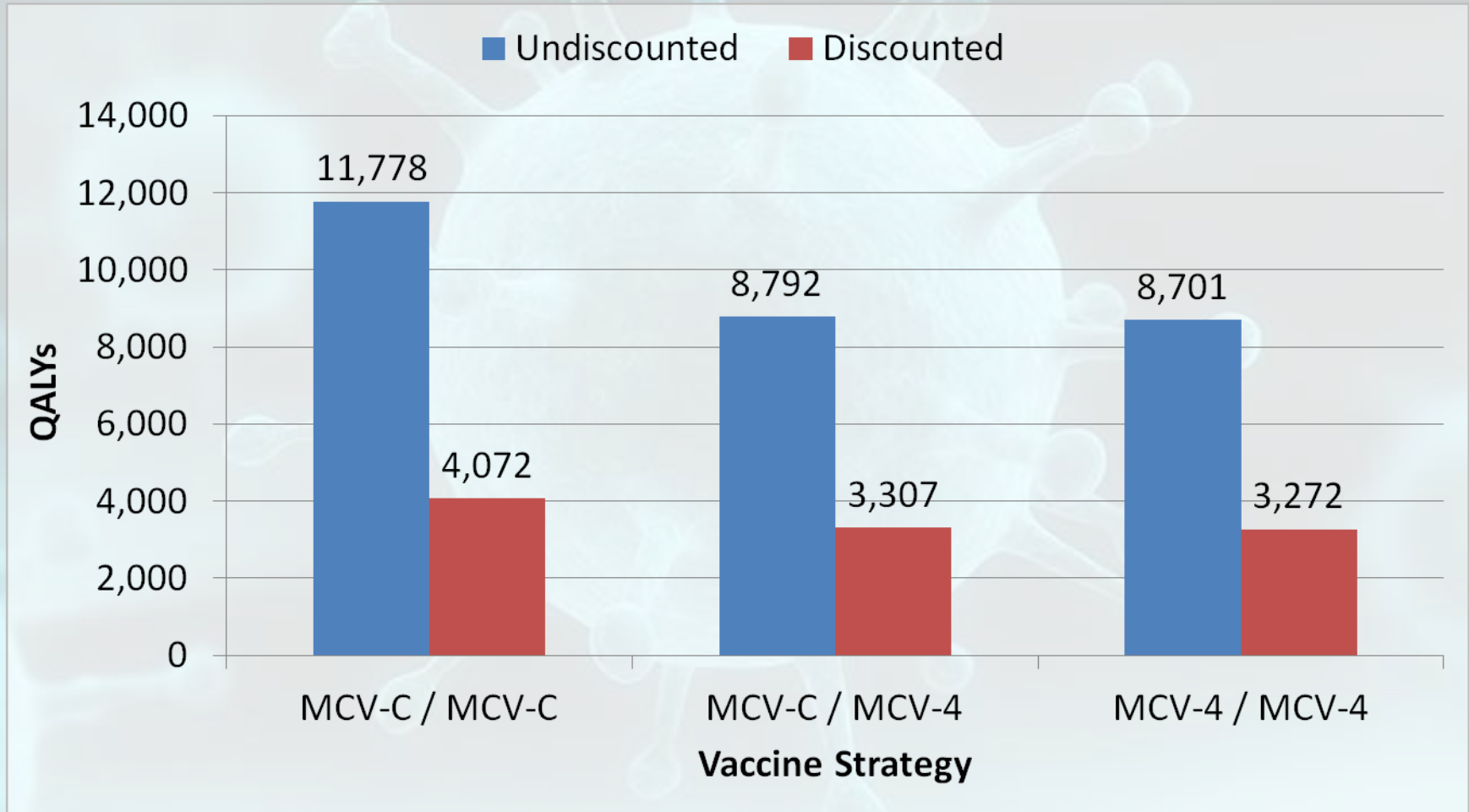
\*All costs adjusted to 2012 price levels

SOURCES: De Wals P, et al. *Vaccinating adolescents against meningococcal disease in Canada: A cost-effectiveness analysis*. Vaccine, 2007; Statistics Canada, CANSIM, table 282-0087.

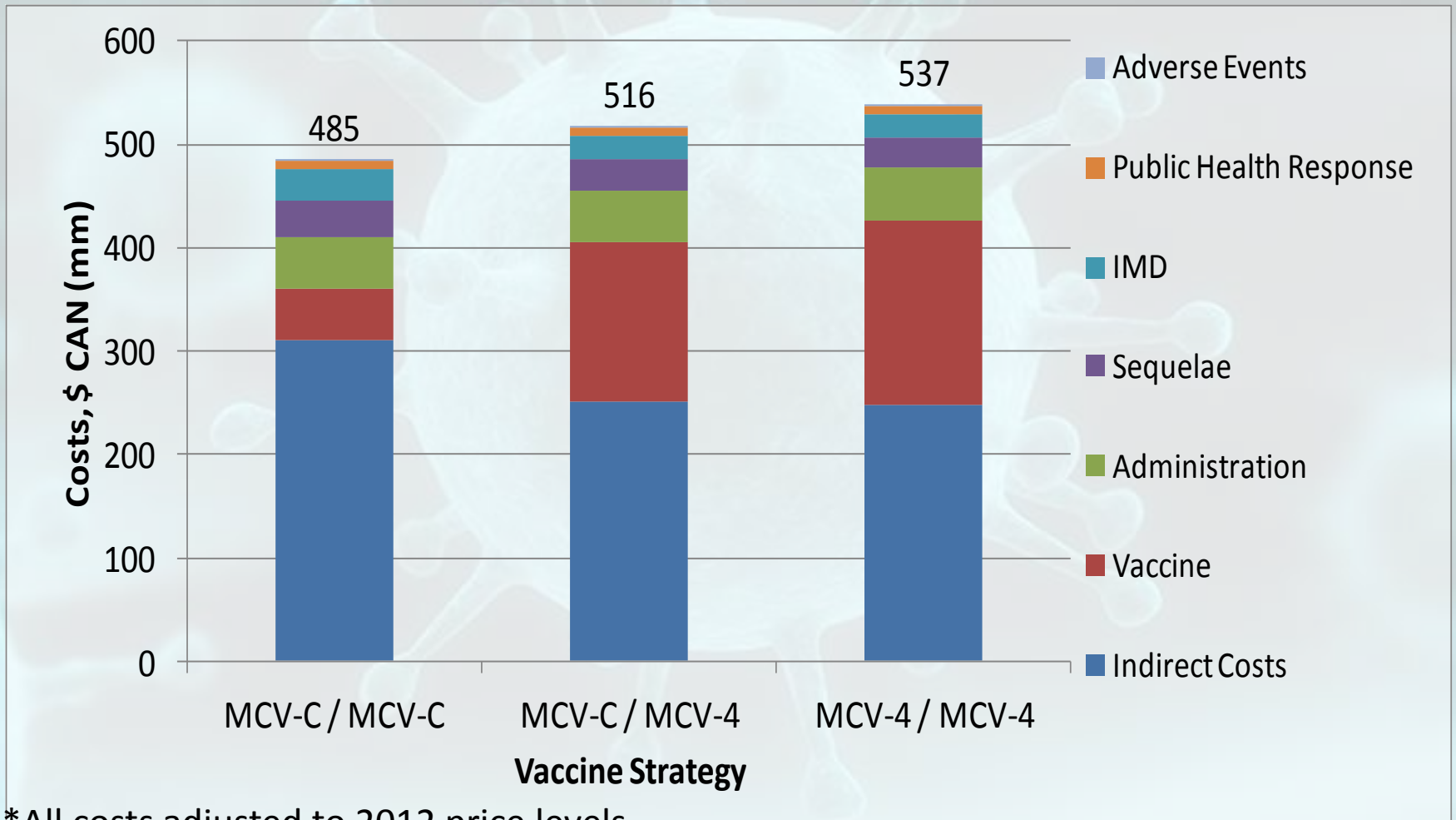
# Results – IMD Cases & Deaths



# Results – QALYs Lost to IMD



# Results – Costs



\*All costs adjusted to 2012 price levels



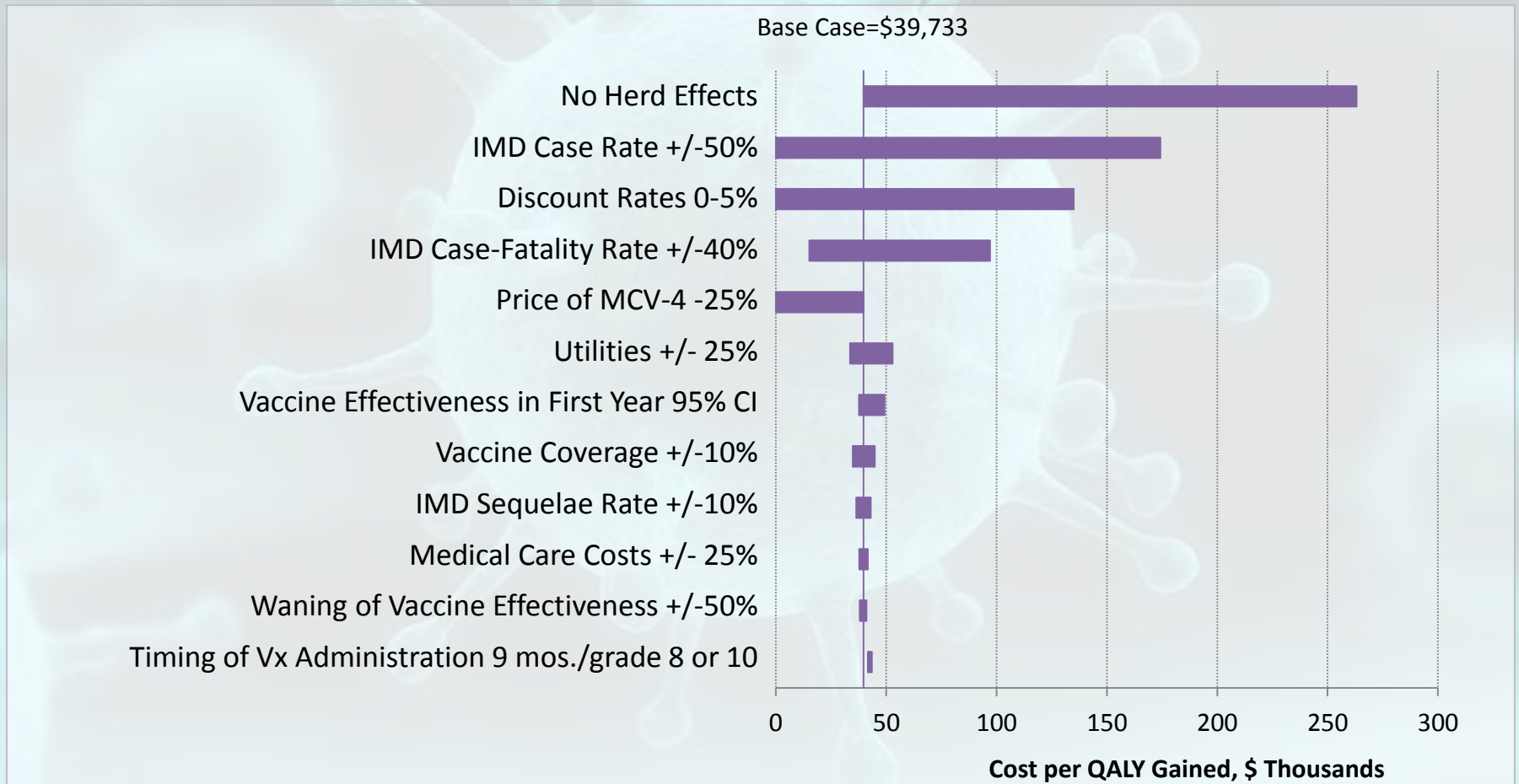
# Results – Incremental Cost-Effectiveness

Comparator	Measure	Vaccination Strategy	
		MCV-C/ MCV-4	MCV-4/ MCV-4
MCV-C/ MCV-C	$\Delta$ Costs, CAN\$ (mm)	30.4	43.3
	$\Delta$ QALYs	765	800
	ICER-QALY, CAN\$	39,700	54,100
MCV-C/ MCV-4	$\Delta$ Costs, CAN\$ (mm)	---	12.9
	$\Delta$ QALYs	---	34.8
	ICER-QALY, CAN\$	---	369,300

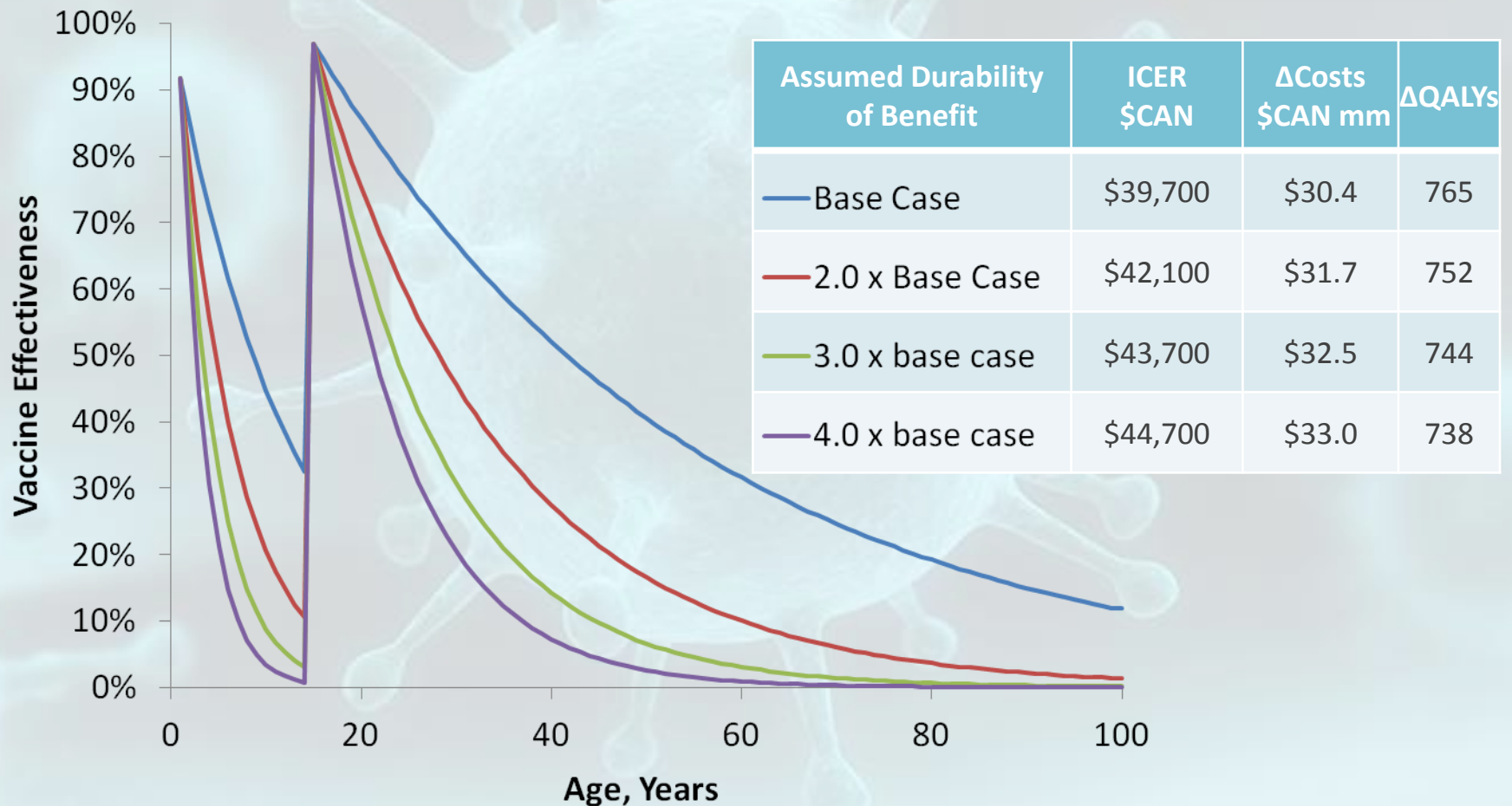
\*All costs adjusted to 2012 price levels. Costs and QALYs are discounted at 5%

# Results –Tornado Diagram

## MCV-C/MCV-4 vs. MCV-C/MCV-C



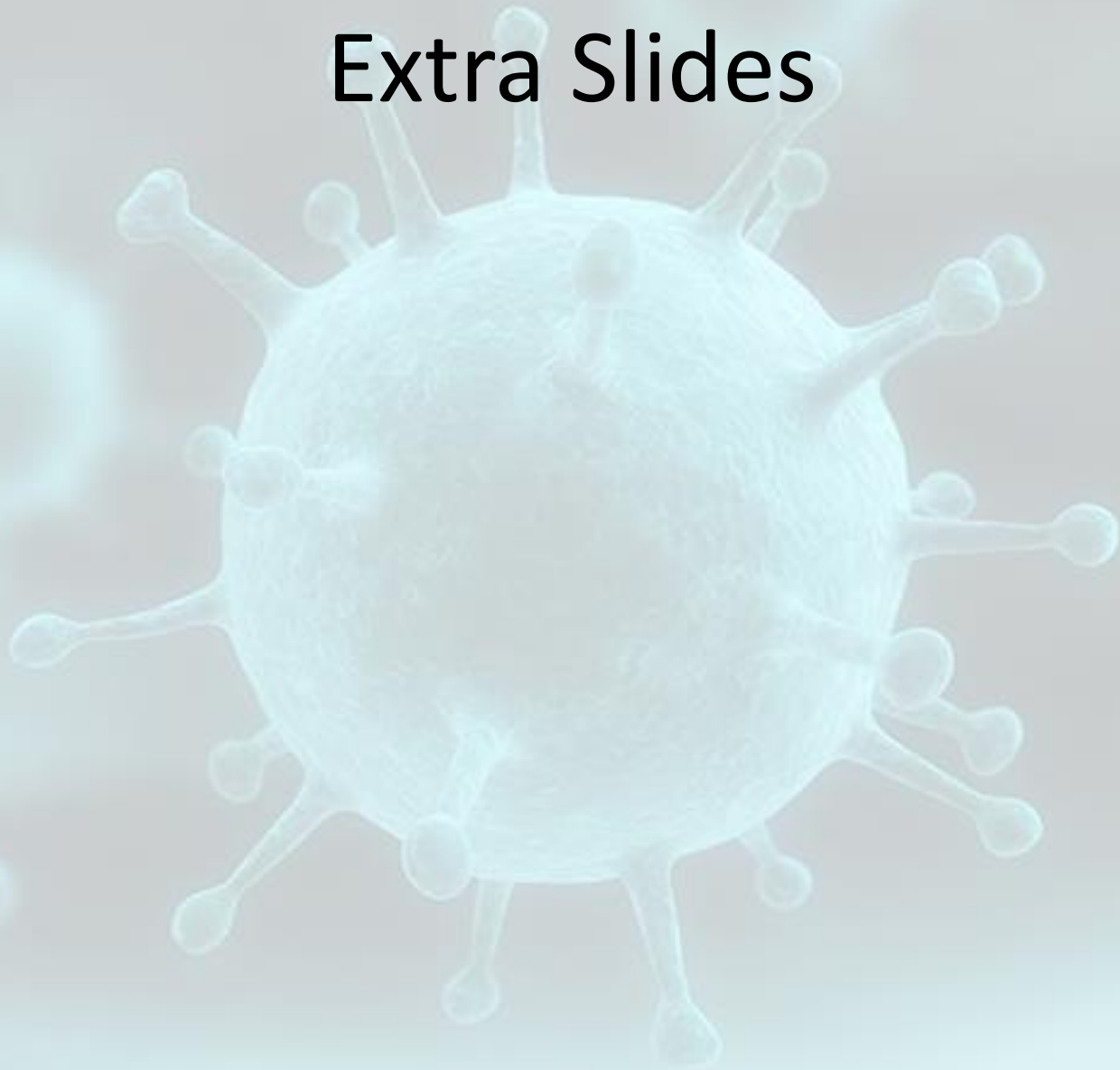
# Results - Sensitivity Analysis on Durability of Benefit for MCV-4/MCV-4 vs. MCV-C/MCV-C



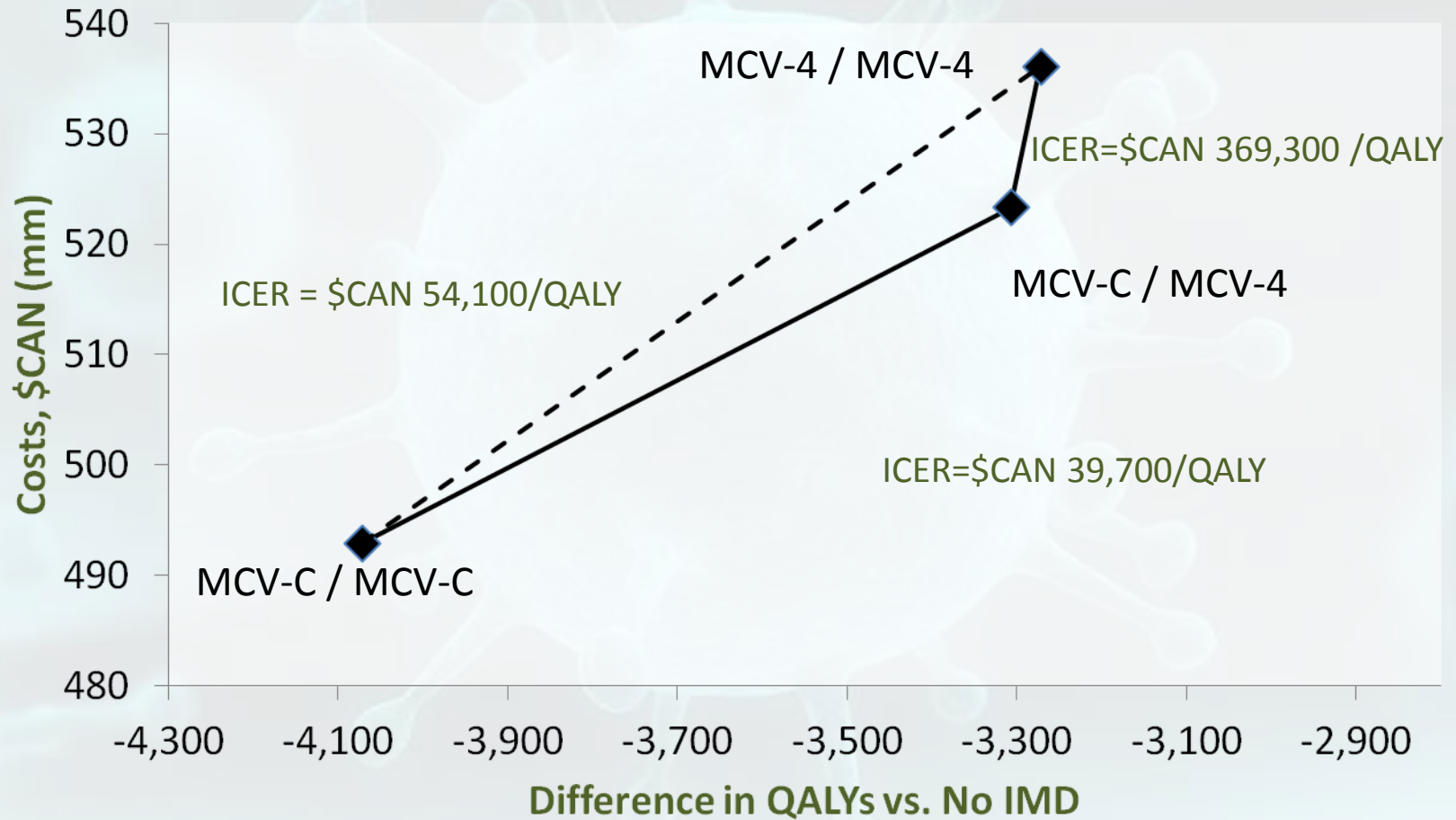
# Conclusions

- Infant MCV-4 is not likely to be cost-effective
- Adolescent MCV-4 may be cost-effective, but depends on assumption of herd effects
- Analyses to be updated
  - Using actual vaccine prices over time provided generously by PHAC
  - Accounting for new birth cohorts in addition to prevalent cohort

# Extra Slides



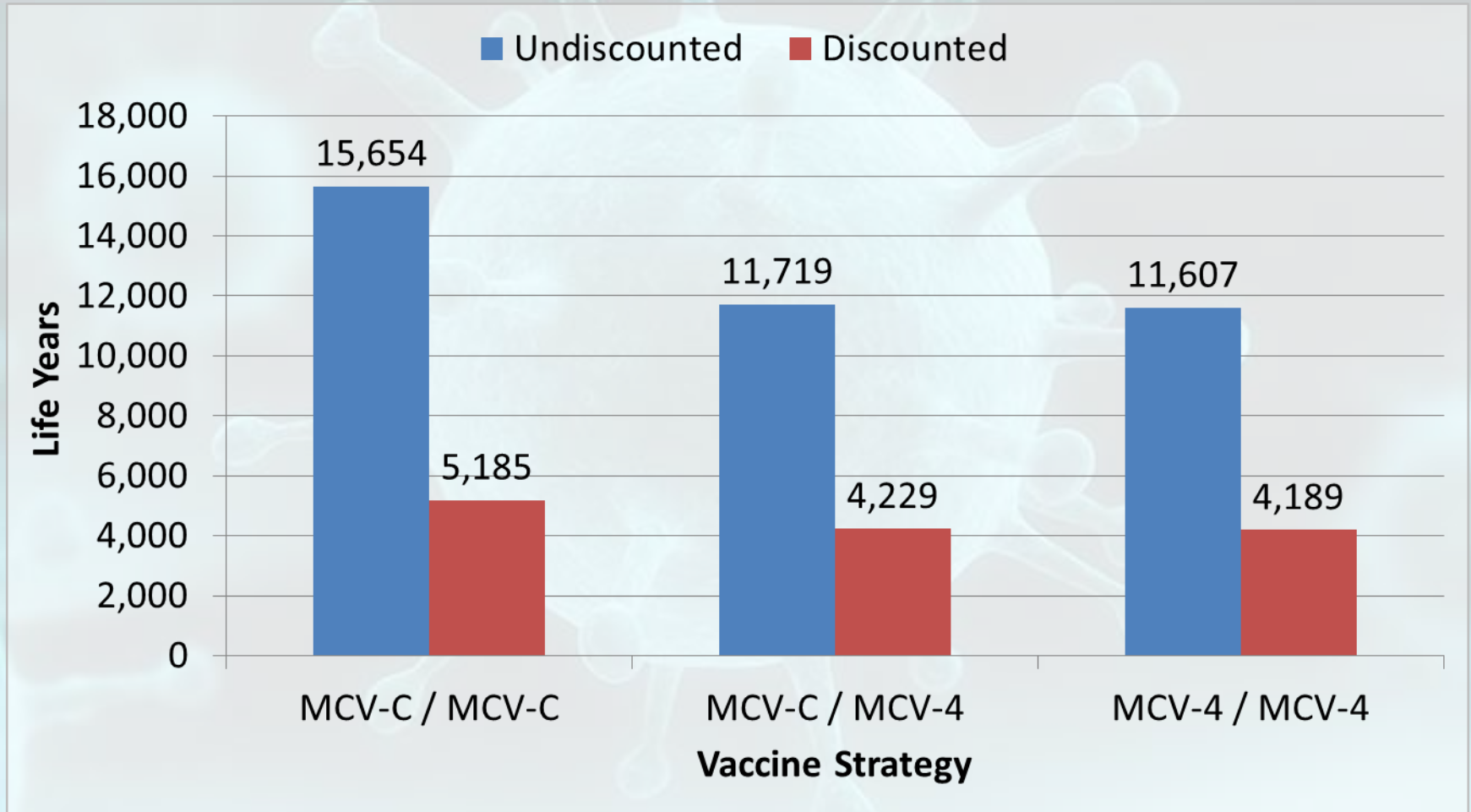
# Results – Cost-Effectiveness Plane



# Results – Incremental Cost-Effectiveness Prevalent and Successive Birth Cohorts

Comparator	Measure	Vaccination Strategy	
		MCV-C/ MCV-4	MCV-4/ MCV-4
MCV-C/ MCV-C	ΔCosts, CAN\$ (mm)	12.3	79.9
	ΔQALYs	925	1,072
	ICER-QALY, CAN\$	13,300	74,500
MCV-C/ MCV-4	ΔCosts, CAN\$ (mm)	---	67.6
	ΔQALYs	---	148
	ICER-QALY, CAN\$	---	458,300

# Results – LYs Lost to IMD





# Results – Incremental Cost-Effectiveness

Comparator	Measure	Vaccination Strategy	
		MCV-C/MCV-4	MCV-4/MCV-4
MCV-C/MCV-C	$\Delta$ Costs, CAN\$ (mm)	30.4	43.3
	$\Delta$ LYs	956	996
	$\Delta$ QALYs	765	800
	ICER-QALY, CAN\$	39,700	54,100
MCV-C/MCV-4	$\Delta$ Costs, CAN\$ (mm)	---	12.9
	$\Delta$ LYs	---	40.2
	$\Delta$ QALYs	---	34.8
	ICER-QALY, CAN\$	---	369,300