



# Economic Analyses of GSK MenABCWY Vaccinations among Adolescents in the United States

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ACIP Meeting

October 24, 2024

Disclaimers: The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

# Conflict of Interest

- **Authors have no known conflict of interests**

# Acronyms

- Q=MenACWY (Quadrivalent)
- B=MenB
- P=MenABCWY (Pentavalent)
- QALY=Quality-adjusted life year
- ICER=Incremental cost-effectiveness ratio (\$/QALY)
- IMD=Invasive meningococcal disease
- VE=Vaccine effectiveness
- PICO= Population intervention comparator outcome

# Outline

- **Research Question**
- **Methods**
- **Model Inputs**
- **Results**
- **Sensitivity Analyses**
- **Comparison to GSK's Model**
- **Limitations**
- **Summary**

# Research Question

- **What is the cost-effectiveness of vaccinating adolescents with the GSK pentavalent vaccine (MenABCWY) compared to the current recommendation of MenACWY/ MenB vaccine?**

# Overview

- **Current Recommendation**

- MenACWY vaccine (Q): 1<sup>st</sup> dose at 11–12 yrs; 2<sup>nd</sup> dose at 16 yrs.
- MenB vaccine (B): 1<sup>st</sup> and 2<sup>nd</sup> dose at 16–23 yrs (preferred 16–18 yrs), based on shared clinical decision-making.

⇒ Q-QB-B

- **Policy Question (PICO):**

- PICO 1: Should the pentavalent vaccine (P, MenABCWY) be included as an option for MenACWY/MenB vaccination in people currently recommended to receive both vaccines at the same visit? → Q-P-B
- PICO 2: Should the pentavalent vaccine be included as an option for people currently recommended to receive MenACWY only? → P-P
- PICO 3: Should the pentavalent vaccine be included as an option for people currently recommended to receive MenB only? → Q-P-P<sup>a</sup>

<sup>a</sup> For PICO 3 in this model, the P-P doses are given at the same coverage rate currently experienced by B-B.

## Methods

# Economic Analysis

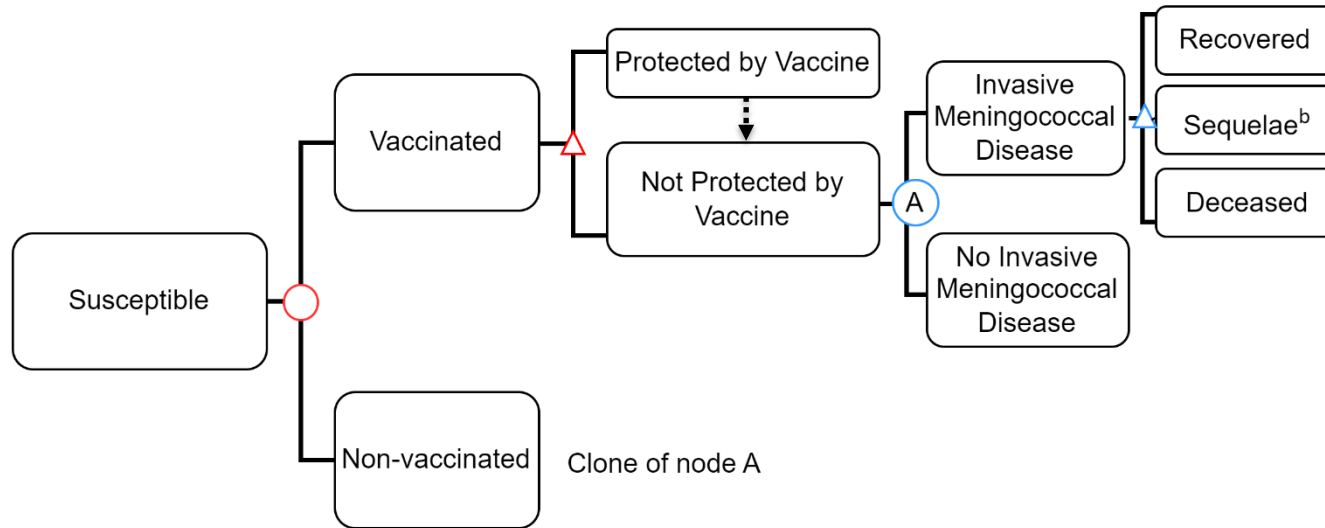
PICO	Interventions	Comparators
1	Q-P-B	Q-QB-B
2	P-P	Q-Q
3	Q-P-P	Q-QB-B / Q-P-B
For reference	<i>Q-P-B / Q-QB-B / P-P / Q-Q / Q-P-P</i>	No vaccination

$$\frac{\text{Costs}_{\text{Intervention}} - \text{Costs}_{\text{Comparator}}}{\text{Outcomes}_{\text{Intervention}} - \text{Outcomes}_{\text{Comparator}}} = \frac{\text{Change in costs}}{\text{Change in outcomes}} = \$/\text{Outcome}$$

Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Polysaccharide (MenABCWY) vaccine.



# Model Diagram<sup>a</sup>



<sup>a</sup> Notes: 1/ This figure illustrates any type of vaccine administration at specific ages, for example "Q dose 1 at 11 years old" or "B dose 2 at 17 years old." 2/ Over time, the portion of the population "protected by vaccine" will decrease as vaccine effectiveness wanes, shifting these individuals to the "not protected by vaccine" compartment. 3/ Age-based background mortality rates were applied to all individuals in the model but are not represented in the diagram.

<sup>b</sup> Potential sequelae include hearing loss, skin scarring, neurological disabilities, and amputations. See slide 15 for more details.

# Economic Model

- **Population-based Model**

- Single age cohort, cohort starts at 11 years old (initial population size: 4,068,564)

- **Analytic Horizon:**

- Vaccination costs and meningococcal cases are assessed for 19 years (age 11 through 29)
- Costs and health outcomes of meningococcal cases are assessed from age 11 through the entire lifetime

- **Discount Rate:** 3%

- **Currency Year:** 2024\$US

- **Perspective:** Societal

- **Time Step:** 0.5 year

- Outcomes are calculated every 6 months in the model

# Inputs and Outputs

- **Inputs**

- Population and Epidemiology
- Vaccine Characteristics
- Costs (2024\$)
- Quality of Life Impacts of IMD (Invasive Meningococcal Disease) and Sequelae

- **Outputs**

- Health Outcomes: episodes of IMD, and deaths
- Costs Outcomes: direct medical costs, productivity costs, and vaccination costs
- Incremental Cost-effectiveness Ratio (ICER): \$/QALY saved

## Model Inputs

# Population and Epidemiological Inputs

- **Population Size, and Background Mortality Rate By Age<sup>a</sup>**
- **IMD Incidence Rate by Age<sup>b</sup>:**
  - Serogroups ACWY<sup>c</sup>:
    - Unvaccinated individuals experience pre-vaccine era incidence (2003-2005)
  - Serogroup B:
    - Unvaccinated individuals experience pre-vaccine era incidence (2012-2014)
- **Case Fatality Rate<sup>c,d</sup>**
- **Probability of Sequelae Given IMD Episode<sup>e</sup>**

IMD=Invasive meningococcal disease.

<sup>a</sup> [CDC WONDER](#)

<sup>b</sup> [Active Bacterial Core Surveillance](#) and [NNDSS](#) data

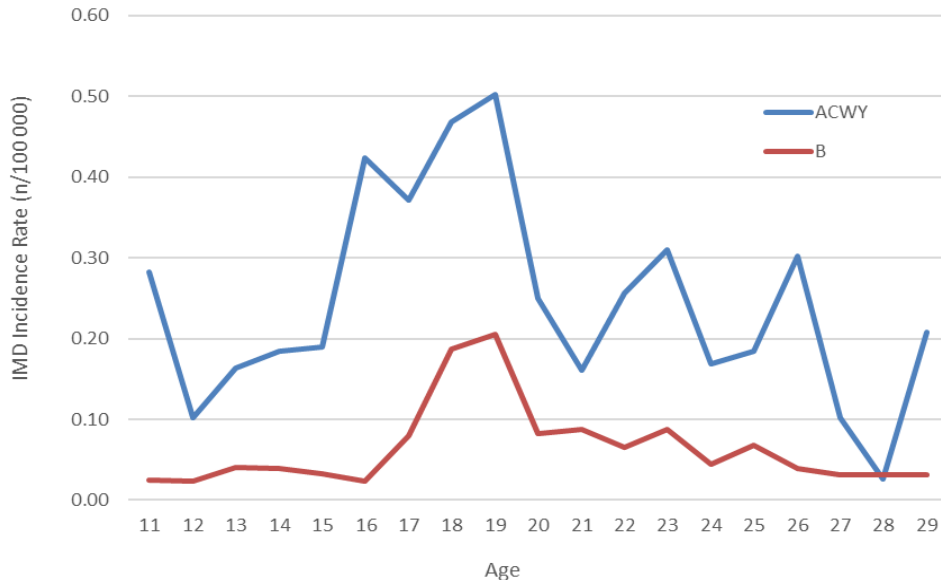
<sup>c</sup> Surveillance data primarily captures serogroup CWY because there is minimal serogroup A disease in the US.

<sup>d</sup> [Enhanced Meningococcal Disease Surveillance Report 2020-23](#)

<sup>e</sup> [Ortega-Sanchez IR, ACIP presentation, June 2023](#)

# Population and Epidemiological Inputs

## IMD Incidence Rates among Unvaccinated by Age<sup>a,b</sup>



## Case Fatality Rates<sup>b,c</sup>

Serogroup	Base	Low	High
ACWY	15.4%	9.2%	19.4%
B	9.4%	6.6%	10.9%

IMD=Invasive meningococcal disease.

<sup>a</sup> [Active Bacterial Core surveillance](#) and [NNDSS](#) data; pre-vaccine era: 2003-05 for serogroups ACWY, and 2012-14 for serogroup B.

<sup>b</sup> Surveillance data primarily captures serogroup CWY because there is minimal serogroup A disease in the US.

<sup>c</sup> [Enhanced Meningococcal Disease Surveillance Report 2020-23](#)

# Population and Epidemiological Inputs

- Percentage of IMD Cases Developing Sequelae<sup>a</sup>

Type of Condition	Base	Low	High
Hearing Loss	8.8%	2.0%	20.0%
Skin Scarring	7.6%	0.00%	19.0%
Neurologic Disability	2.1%	0.02%	11.0%
Single Amputation	1.9%	0.5%	10.0%
Multiple Amputation	1.2%	0.02%	6.0%

IMD=Invasive meningococcal disease.

<sup>a</sup> [Ortega-Sanchez IR, ACIP presentation, June 2023](#)

# Vaccine Inputs

- Initial Vaccine Effectiveness (VE) by Serogroups<sup>a</sup> and Doses of Vaccine

	MenACWY (Q)	MenB (B)
1 <sup>st</sup> Dose	79% (49%-91%) <sup>c</sup>	64% (54%-85%) <sup>e</sup>
2 <sup>nd</sup> + Dose <sup>b</sup>	99% (95%-100%) <sup>d</sup>	79% (63%-85%) <sup>f</sup>

<sup>a</sup> The VE for the first dose of MenACWY is based on observed clinical effectiveness, whereas all other VE values are derived from immunogenicity data.

<sup>b</sup> For the Q-P-P strategy, we assume that the last dose of P (i.e., the 3<sup>rd</sup> dose with serogroup ACWY protection) provides the same initial VE and rate of waning for serogroup ACWY as the 2<sup>nd</sup> dose MenACWY.

<sup>c</sup> [Cohn AC \*et al.\* Pediatrics. 2017](#)

<sup>d</sup> [Tipton M \*et al.\* Vaccine. 2019](#); [Baxter R \*et al.\* Pediatr Infect Dis J. 2014](#); [Germán Áñez G \*et al.\* Hum Vaccin Immunother. 2020](#).

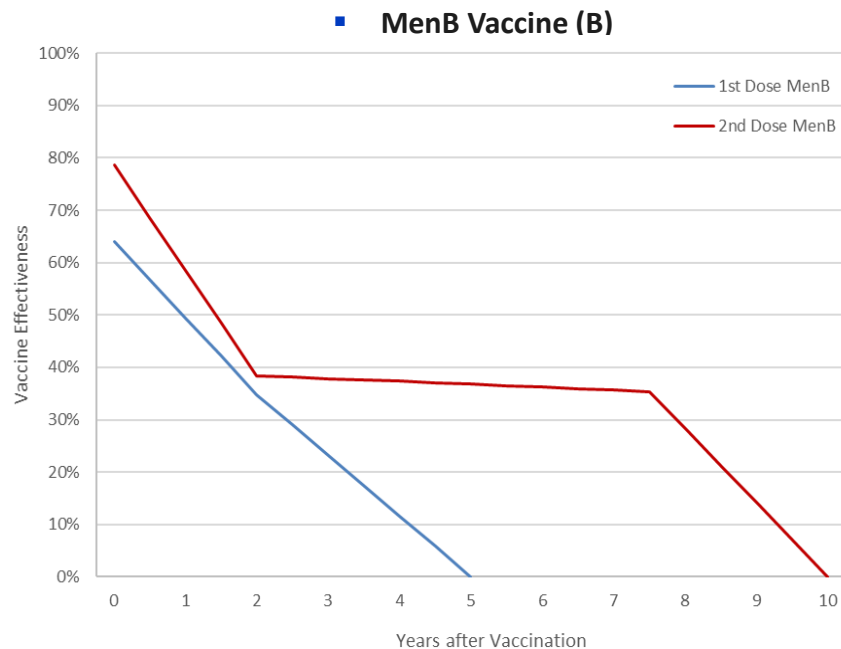
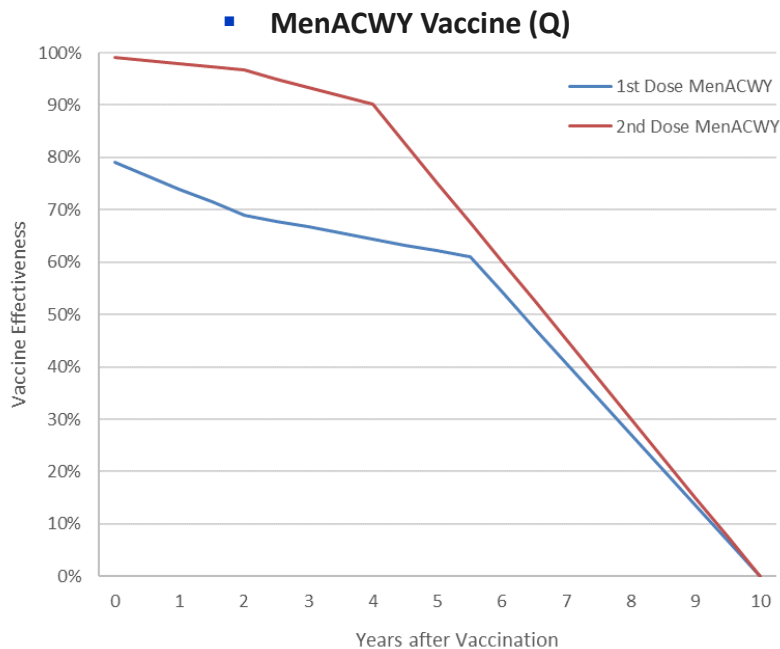
<sup>e</sup> [Santolaya ME \*et al.\* Human Vaccines & Immunotherapeutics. 2013](#); [Watson PS \*et al.\* Expert Review of Vaccines, 2019](#); [Castilla \*et al.\* N Engl J Med, 2023](#)

<sup>f</sup> [Watson PS \*et al.\* Expert Review of Vaccines, 2019](#); [Vesikari T \*et al.\* Hum Vaccin Immunother, 2021](#).



# Vaccine Inputs


- Initial and Duration of Vaccine Effectiveness (VE) by Serogroups and Doses<sup>a</sup>



<sup>a</sup> [Cohn AC et al. Pediatrics. 2017](#); [Baxter R et al. Pediatr Infect Dis J. 2014](#); [Mbaeyi SA et al. MMWR Recomm Rep. 2020](#); [Santolaya ME et al. Human Vaccines & Immunotherapeutics. 2013](#); [Watson PS et al. Expert Review of Vaccines, 2019](#); [Vesikari T et al. Hum Vaccin Immunother, 2021](#).

# Vaccine Inputs

- Vaccination Coverage by Strategy and Vaccine Type (Q, B, P)


		Age at Vaccination		
		12y	16.5y	17y
PICO 1 	Current Rec: Q-QB-B <sup>a</sup>	Q (88.4%)	Q (59.7%) B (32.4%)	B (12.8%)
	Intervention: Q-P-B	Q (88.4%)	Q (27.3%) P (32.4%)	B (12.8%)

Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine.

<sup>a</sup> National Immunization Survey Data, 2023, [https://www.cdc.gov/mmwr/volumes/73/wr/mm7333a1.htm#T1\\_down](https://www.cdc.gov/mmwr/volumes/73/wr/mm7333a1.htm#T1_down).

# Vaccine Inputs

- Vaccination Coverage by Strategy and Vaccine Type (Q, B, P)

		Age at Vaccination		
		12y	16.5y	17y
PICO 2 	Current Rec: Q-QB-B <sup>a</sup>	Q (88.4%)	Q (59.7%)	B (12.8%)
	Q-P-B	Q (88.4%)	Q (27.3%)	B (12.8%)
	Intervention: P-P	P (88.4%)	P (59.7%)	
	Q-Q	Q (88.4%)	Q (59.7%)	

Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine.

<sup>a</sup> National Immunization Survey Data, 2023, [https://www.cdc.gov/mmwr/volumes/73/wr/mm7333a1.htm#T1\\_down](https://www.cdc.gov/mmwr/volumes/73/wr/mm7333a1.htm#T1_down).

# Vaccine Inputs

- Vaccination Coverage by Strategy and Vaccine Type (Q, B, P)

PICO 3

	Age at Vaccination			
	12y	16.5y		17y
<b>Current Rec: Q-QB-B<sup>a</sup></b>	Q (88.4%)	Q (59.7%)	B (32.4%)	B (12.8%)
Q-P-B	Q (88.4%)	Q (27.3%)	P (32.4%)	B (12.8%)
P-P	P (88.4%)	P (59.7%)		
Q-Q	Q (88.4%)	Q (59.7%)		
<b>Intervention: Q-P-P</b>	Q (88.4%)	Q (27.3%)	P (32.4%)	P (12.8%)

Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine.

<sup>a</sup> National Immunization Survey Data, 2023, [https://www.cdc.gov/mmwr/volumes/73/wr/mm7333a1.htm#T1\\_down](https://www.cdc.gov/mmwr/volumes/73/wr/mm7333a1.htm#T1_down).

# Vaccine Inputs

- Vaccine Cost per Dose (2024\$)

	Q (MenACWY)		B (MenB)		P (MenABCWY)	Admin Cost <sup>a</sup>
	Menveo	MenQuadfi	Bexsero	Trumenba	GSK Vaccine <sup>b</sup>	
<b>Public<sup>c</sup></b>	\$109	\$111	\$150	\$136	\$181	\$34
<b>Private<sup>c</sup></b>	\$168	\$184	\$243	\$206	\$241	\$34
<b>Market Share<sup>d</sup></b>	50%	50%	75%	25%	100%	
<b>Weighted Cost+ Admin</b>	<b>\$177</b>		<b>\$224</b>		<b>\$245</b>	

<sup>a</sup> [Tsai Y et al. Preventive Medicine Reports. 2019](#)

<sup>b</sup> GSK presentation to the CDC.

<sup>c</sup> 2024 public and private sector cost per dose by CDC; the private sector price has been further adjusted by the estimates from the MarketScan Claims Database; the percentages of vaccines purchased, and vaccinations administered are assumed to be 50% private sector and 50% public sector.

<sup>d</sup> Market share data are obtained from the MarketScan Claims Database and Vaccine for Children (VFC) data.

# Cost Inputs

	Direct Cost <sup>a</sup>			Indirect Cost <sup>a</sup> (Productivity Loss <sup>b</sup> )
	Base	Low	High	
<b>IMD</b>	\$68,544	\$31,255	\$110,959	
<b>Hearing Loss</b>	\$7,643	\$7,039	\$11,463	33% Productivity <sup>a-c</sup>
<b>Skin Scarring</b>	\$92,055	\$26,918	\$116,594	
<b>Neurologic Disability</b>	\$2,989,564	\$1,075,447	\$3,631,592	100% Productivity <sup>a-c</sup>
<b>Single Amputation</b>	\$209,152	\$104,575	\$313,727	15% Productivity <sup>b-d</sup>
<b>Multiple Amputation</b>	\$250,984	\$125,491	\$376,474	30% Productivity <sup>a-c</sup>
<b>Premature death, 11-17</b>				\$1,750,511
<b>Premature death, 18-29</b>				\$1,832,198

IMD=Invasive meningococcal disease.

<sup>a</sup> [Ortega-Sanchez IR, ACIP presentation, June 2023](#); All costs have been converted to 2024\$.

<sup>b</sup> [Grosse SD et al. J Med Econ. 2019](#)

<sup>c</sup> The productivity loss from an occurrence of permanent sequelae depends on the age at which the sequelae occurred and the percentage productivity that is impacted by the sequelae.

<sup>d</sup> Assumes that a single amputation episode experiences half the productivity loss of a multiple amputation episode.

# QALY Inputs: Relative Quality of Life (0-1 scale) with and without IMD and Sequelae

	Base	Low	High	Duration
<b>Background Utility<sup>a-c</sup></b>	<b>0.92</b>	<b>0.89</b>	<b>0.94</b>	
<b>IMD without Sequelae<sup>b</sup></b>	0.91	0.88	0.94	6 months
<b>Hearing Loss<sup>b</sup></b>	0.72	0.64	0.82	Lifetime <sup>a,c</sup>
<b>Skin Scarring<sup>b</sup></b>	0.95	0.80	1.00	Lifetime <sup>a,c</sup>
<b>Neurologic Disability<sup>b</sup></b>	0.06	0.00	0.39	Lifetime <sup>a,c</sup>
<b>Single Amputation<sup>b</sup></b>	0.70	0.31	0.80	Lifetime <sup>a,c</sup>
<b>Multiple Amputation<sup>b</sup></b>	0.61	0.31	0.71	Lifetime <sup>a,c</sup>
<b>Death</b>	0	0	0	

QALY=Quality-adjusted life year; IMD=Invasive meningococcal disease.

<sup>a</sup> QALY impacts for sequelae are included in the model as multiplicative weights that are combined with the background utility, so the QALY value for skin scarring during the years after the IMD episode is equal to  $0.874 = 0.95 * 0.92$ .

<sup>b</sup> [Ortega-Sanchez IR, ACIP presentation, June 2023](#)

<sup>c</sup> [Jiang R et al. Qual Life Res. 2021](#)

## Results



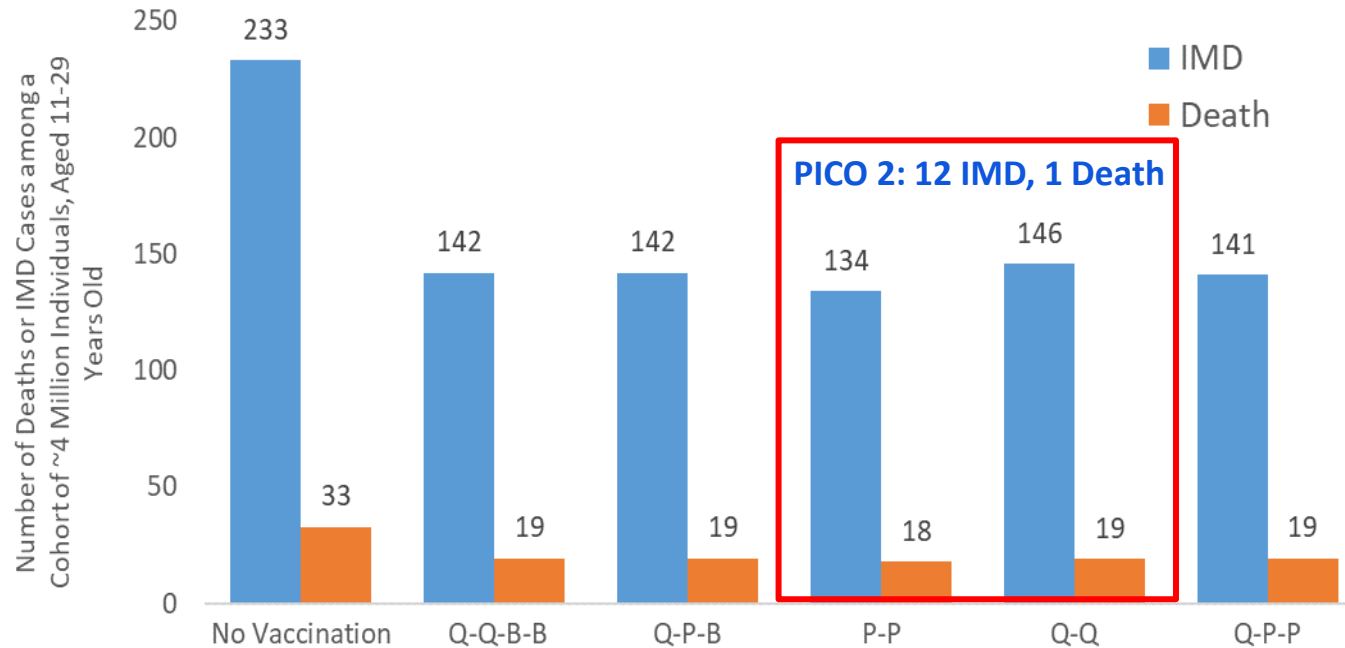
# Health Outcomes<sup>a</sup>: Cumulative Number of IMD Cases and Deaths for a Single Birth Cohort from Ages 11 through 29 Years



Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine; IMD=Invasive meningococcal disease.

<sup>a</sup> All numbers are cumulative over the analytical horizon of the model for a single cohort of 11-year-olds. For example, in the “No Vaccination” strategy, there were a total of 233 undiscounted episodes of IMD among about 4 million individuals, who started in the model at 11 years old and aged to 29 years old.

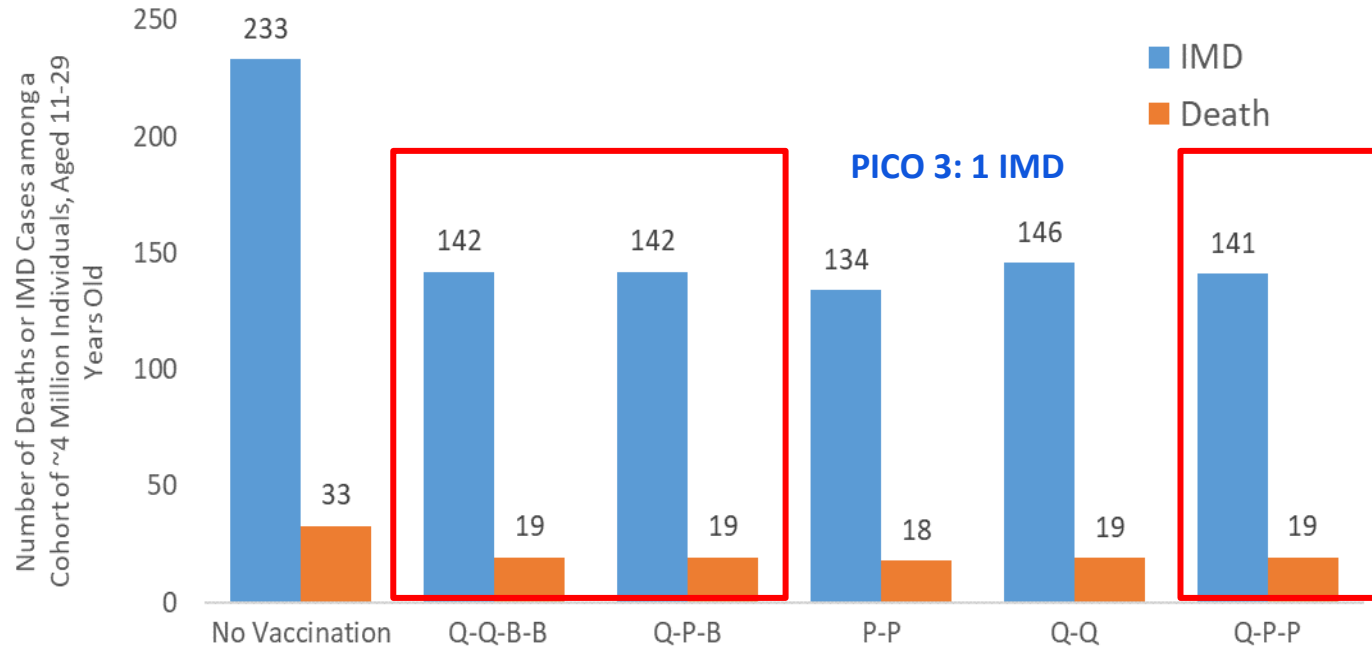
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# Health Outcomes<sup>a</sup>: Cumulative Number of IMD Cases and Deaths for a Single Birth Cohort from Ages 11 through 29 Years



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# Cost Outcomes<sup>a,b</sup>: Cumulative Costs for a Single Birth Cohort from Ages 11 through 29 Years

	Direct Medical Costs + Productivity Costs (\$Millions)	Vaccination Costs (\$Millions)	Total Costs (\$Millions)
<b>No Vaccination</b>	\$93	0	\$93
<b>Current Rec: Q-QB-B</b>	\$52	\$1,331	\$1,383
<b>Q-P-B</b>	\$52	\$1,156	\$1,208
<b>P-P</b>	\$50	\$1,360	\$1,410
<b>Q-Q</b>	\$54	\$983	\$1,036
<b>Q-P-P</b>	\$52	\$1,165	\$1,217

Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine.

<sup>a</sup> Annual discount rate is 3%.

<sup>b</sup> All costs have been converted to 2024\$.

# Cost-effectiveness of Intervention Strategy vs. Comparator Strategy for 3 PICO Questions

PICO	Intervention	Comparator	Diff. in QALYs <sup>a</sup>	Diff. in Cost <sup>a</sup>	ICER (\$/QALY)
1	Q-P-B	Q-QB-B	0	-\$175 million	<b>Cost-saving<sup>b</sup></b>
2	P-P	Q-Q	33	\$373 million	\$11,332,778
3	Q-P-P	Q-QB-B	2	-\$166 million	<b>Cost-saving</b>
		Q-P-B	2	\$9 million	\$4,510,830

- Cost per QALY Gained for Each Vaccination Strategy vs. No Vaccination**

	Q-QB-B	Q-P-B	P-P	Q-Q	Q-P-P
<b>No Vaccination</b>	\$3,572,475	\$3,090,247	\$3,439,068	\$2,697,932	\$3,097,938

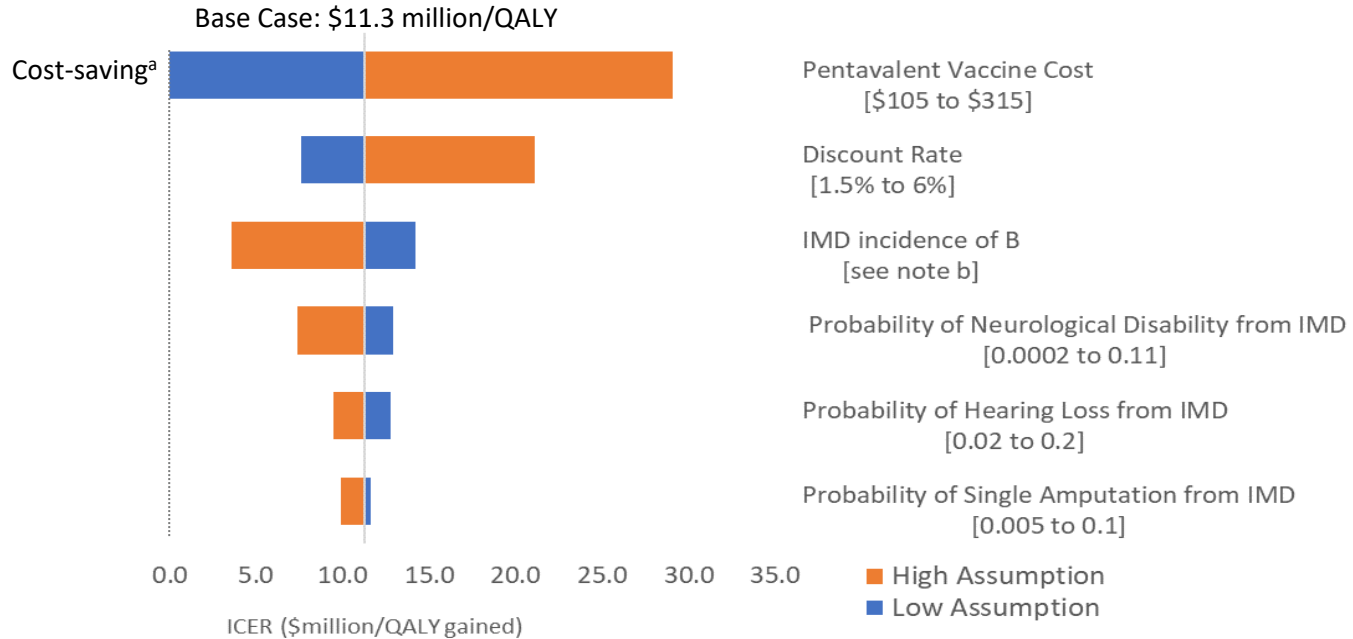
Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine; QALY=Quality-adjusted life year.

<sup>a</sup> Annual discount is 3%; 2024\$.

<sup>b</sup> In this comparison, costs are reduced, but health outcomes remain the same when comparing Q-P-B to Q-QB-B.

## Sensitivity Analyses

# Sensitivity Analysis 1: P-P vs. Q-Q<sup>a</sup>

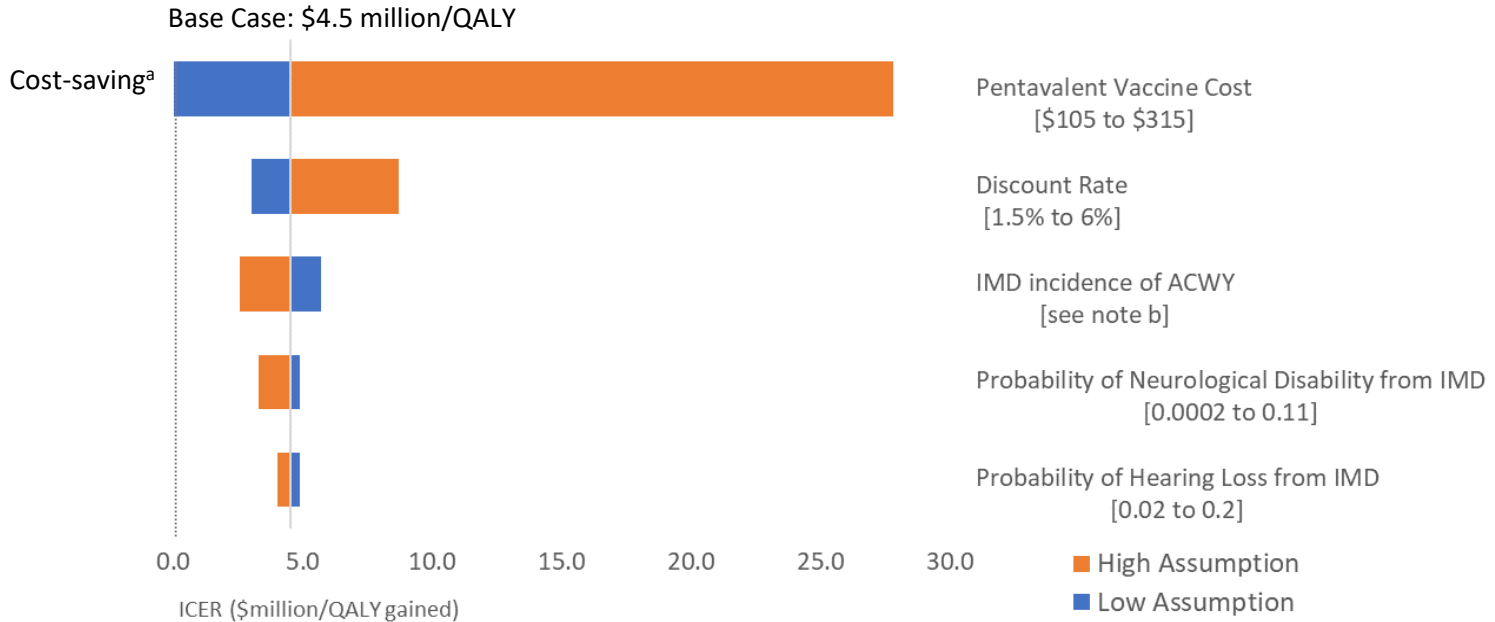


Q=Quadrivalent (MenACWY) vaccine; P=Pentavalent (MenABCWY) vaccine; IMD=Invasive meningococcal disease; QALY=Quality-adjusted life year.

<sup>a</sup>This figure presents the six most impactful inputs. Other inputs that were assessed but not included above because they were less impactful: QALYs for each category (background, IMD, and sequelae), costs for each category (IMD, sequelae, and death), case fatality ratios for serogroups ACWY and B, rate of skin scarring and multiple amputation from IMD, and IMD incidence of serogroups ACWY. At the lower value of P vaccine cost, the ICER was cost-saving, meaning that P-P improves health with less costs relative to Q-Q.

<sup>b</sup>For the high assumption, we use pre-vaccine era data going back to 1996 to estimate incidence rates among the unvaccinated; for the lower assumption, we assume that the incidence rates are 80% of the base case values.

# Sensitivity Analysis 2: Q-P-P vs. Q-P-B<sup>a</sup>



Q=Quadrivalent (MenACWY) vaccine; P=Pentavalent (MenABCWY) vaccine; IMD=Invasive meningococcal disease; QALY=Quality-adjusted life year.

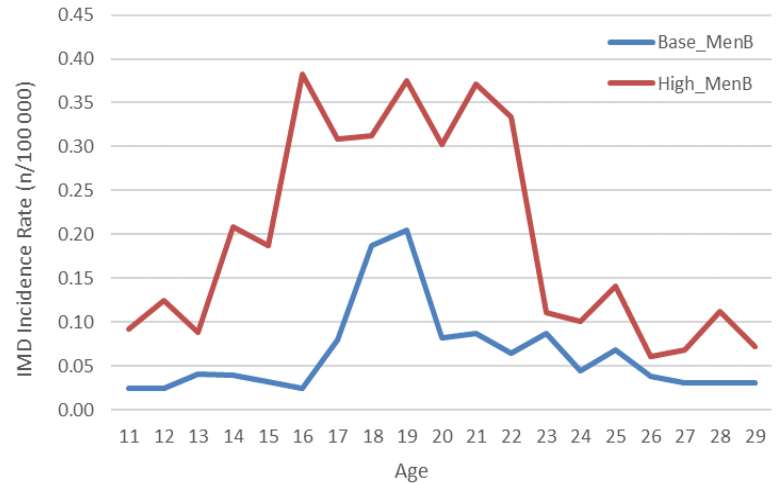
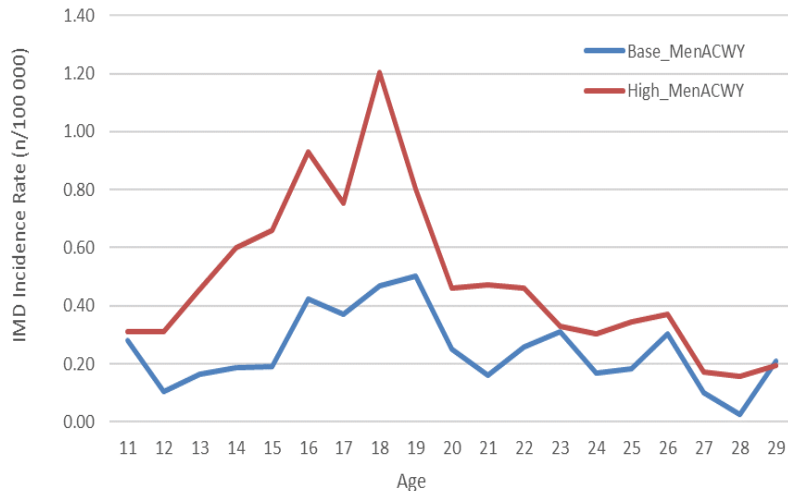
<sup>a</sup> This figure presents the six most impactful inputs. Other inputs that were assessed but not included above because they were less impactful: QALYs for each category (background, IMD, and sequelae), costs for each category (IMD, sequelae, and death), case fatality ratios for serogroups ACWY and B, rate of skin scarring and multiple amputation from IMD, and IMD incidence of serogroup B. At the lower value of P vaccine cost, the ICER was cost-saving, meaning that Q-P-P improves health with less costs relative to Q-P-B.

<sup>b</sup> For the high assumption, we use pre-vaccine era data going back to 1996 to estimate incidence rates among the unvaccinated; for the lower assumption, we assume that the incidence rates are 80% of the base case values.



# Sensitivity Analysis 3: Higher IMD Incidence Rate for both MenACWY and MenB

- Incidence among unvaccinated uses pre-vaccine era data going back to 1996:
  - Serogroups ACWY<sup>a</sup>: 1996-2005 (compared to 2003-05 in the base case)
  - Serogroup B: 1996-2013 (compared to 2012-14 in the base case)



<sup>a</sup> Surveillance data primarily captures serogroup CWY because there is minimal serogroup A disease in the US.

# Sensitivity Analysis 3: Higher IMD Incidence Rate for both MenACWY and MenB

- **Cost-effectiveness of Intervention Strategy vs. Comparator Strategy for 3 PICO Questions**

PICO	Intervention	Comparator	ICER (\$/QALY) Higher Incidence	ICER (\$/QALY) Base Case
1	Q-P-B	Q-QB-B	Cost-saving <sup>a</sup>	Cost-saving <sup>a</sup>
2	P-P	Q-Q	\$3,623,638	\$11,332,778
3	Q-P-P	Q-QB-B	Cost-saving	Cost-saving
		Q-P-B	\$2,690,624	\$4,510,830

- **Cost per QALY Gained for Each Vaccination Strategy vs. No Vaccination**

	Q-QB-B	Q-P-B	P-P	Q-Q	Q-P-P
<b>No Vaccination</b>	\$1,522,460	\$1,309,296	\$1,420,918	\$1,140,061	\$1,314,758

Q=Quadrivalent (MenACWY) vaccine; P=Pentavalent (MenABCWY) vaccine; IMD=Invasive meningococcal disease; QALY=Quality-adjusted life year.

<sup>a</sup> In this comparison, costs are reduced, but health outcomes remain the same when comparing Q-P-B to Q-QB-B.

# Sensitivity Analysis 4: Higher IMD Incidence Rate for MenB among 18-24 Years Old

- **Cost-effectiveness of Intervention Strategy vs. Comparator Strategy for 3 PICO Questions**

PICO	Intervention	Comparator	ICER (\$/QALY) Higher Incidence	ICER (\$/QALY) Base Case
1	Q-P-B	Q-QB-B	Cost-saving <sup>a</sup>	Cost-saving <sup>a</sup>
2	P-P	Q-Q	\$4,369,184	\$11,332,778
3	Q-P-P	Q-QB-B	Cost-saving	Cost-saving
		Q-P-B	\$4,510,830	\$4,510,830

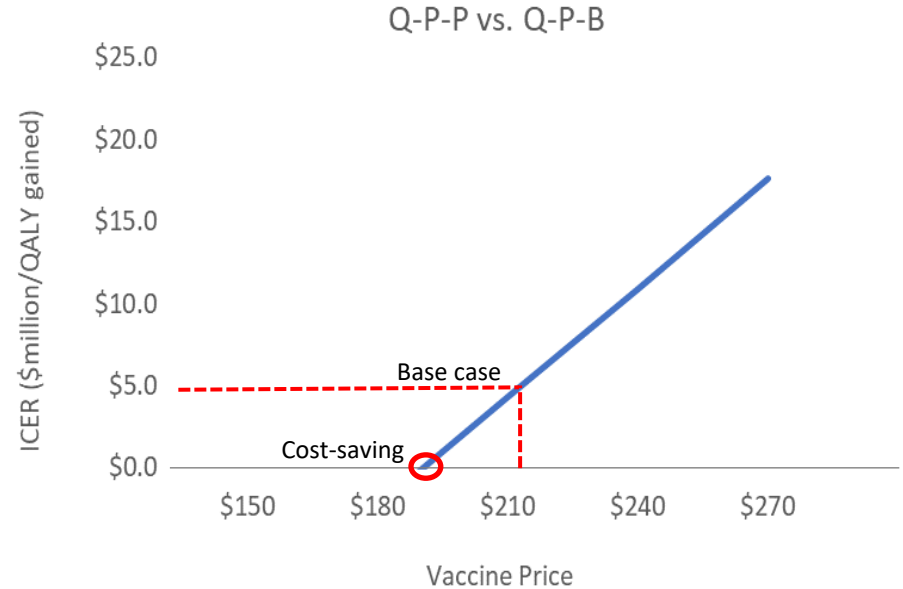
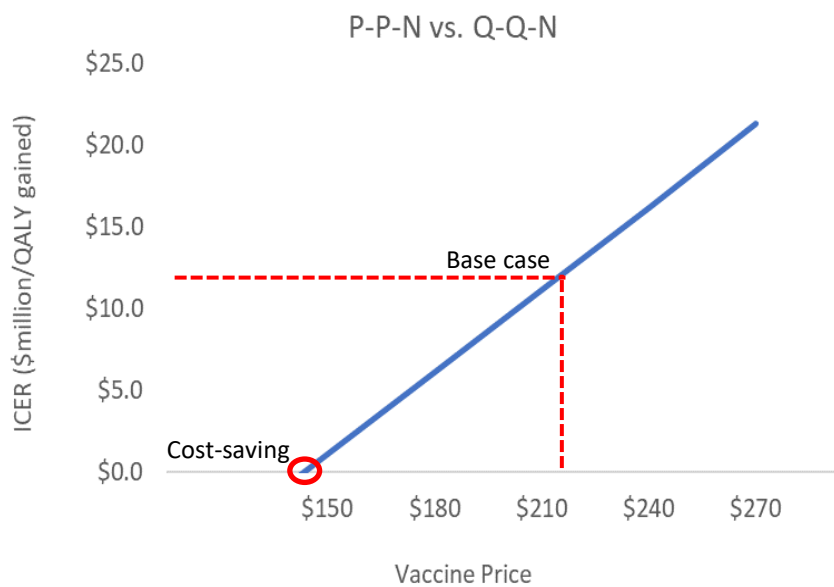
- **Cost per QALY Gained for Each Vaccination Strategy vs. No Vaccination**

	Q-QB-B	Q-P-B	P-P	Q-Q	Q-P-P
<b>No Vaccination</b>	\$3,359,810	\$2,905,375	\$3,020,948	\$2,697,932	\$2,913,568

Q=Quadrivalent (MenACWY) vaccine; P=Pentavalent (MenABCWY) vaccine; IMD=Invasive meningococcal disease; QALY=Quality-adjusted life year.

<sup>a</sup> In this comparison, costs are reduced, but health remains the same when comparing Q-P-B to Q-QB-B.

# Sensitivity Analysis 5<sup>a</sup>: Pentavalent Vaccine Price



Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine.

<sup>a</sup> Note: 1/ The red arrow and dotted lines in each figure indicate the base case input and results, with the pentavalent vaccine priced at \$211 per dose, resulting in ICERs of \$11 million/QALY and \$4.5 million/QALY for each comparison, respectively. 2/ P-P is cost-saving compared to Q-Q when the vaccine price is below \$143.

3/ Q-P-P is cost-saving compared to Q-P-B when the vaccine price is below \$190.

## Comparison to GSK's Model

# CDC Model vs. GSK's<sup>a</sup>: Differences in Model & Inputs

- **Incidence Rate:**
  - Higher in GSK<sup>b</sup> for MenACWY and MenB.
- **Coverage Rate:**
  - Our model: Based on current coverage rates.
  - GSK: Assumes 89% across vaccines and doses.

Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine.

<sup>a</sup> Note on conflict of interests: GSK manufacturers the GSK MenABCWY vaccine and the GSK MenB vaccine.

<sup>b</sup> Same as [Ortega-Sanchez IR, ACIP presentation, June 2023](#), using a longer pre-vaccine era.

# CDC Model vs. GSK's: Differences in Model & Inputs

- **Vaccine Effectiveness (VE):**
  - Initial VE for 1st dose MenB: 64% (current model) vs. 33.5% (GSK<sup>a</sup>).
  - Duration of vaccine protection:
    - In our model, VE declines to 0% in 5-10 years.
    - In GSK's model, VE declines to 0% after more than 20 years (both vaccines maintain >20% effectiveness at 10 years and ~5% at 20 years).
    - Years of protection<sup>b</sup> conferred from MenACWY vaccination is 6.5 in our model and 6.8 in the GSK model<sup>c</sup>.
    - Years of protection<sup>b</sup> conferred from MenB vaccination is 3.6 years in our model and 6.3 years in the GSK model<sup>d</sup>.
- **Sequelae:**
  - Current Model: 5 outcomes, aggregate probability per IMD case = 22%.
  - GSK<sup>e</sup>: 16 outcomes, aggregate probability per IMD case = 55%.

Q=Quadrivalent (MenACWY) vaccine; P=Pentavalent (MenABCWY) vaccine; IMD=Invasive meningococcal disease.

<sup>a</sup> [Argante et al. BMC Infectious Diseases. 2021](#)

<sup>c</sup> [Cohn AC et al. Pediatrics. 2017](#)

<sup>e</sup> [Marshall GS et al. Infect Dis Ther. 2024](#)

<sup>b</sup> Years of protection applies to those who were protected following 2 doses.

<sup>d</sup> Kuylen et al. Presented at National Immunization Conference, Atlanta GA, 2024

# CDC Model vs. GSK's: Differences in Outputs

- **Cost-effectiveness of Intervention Strategy vs. Comparator Strategy for 3 PICO Questions**

PICO	Intervention	Comparator	ICER (\$/QALY)	
			CDC Model	GSK Model
1	Q-P-B	Q-QB-B	Cost-saving <sup>a</sup>	Cost-saving <sup>a</sup>
2	P-P	Q-Q	\$11.3 million	\$15.6 million
3	Q-P-P	Q-QB-B	Cost-saving	Cost-saving
		Q-P-B	\$4.5 million	\$1.5 million

Q=Quadrivalent (MenACWY) vaccine; P=Pentavalent (MenABCWY) vaccine; QALY=Quality-adjusted life year.

<sup>a</sup> In this comparison, costs are reduced, but health outcome remains the same when comparing Q-P-B to Q-QB-B.



# Limitations

- There are limited VE data, especially for the 2<sup>nd</sup> dose Q, and both doses of B. Input values used in the model are based on immunogenicity data.
- The effectiveness of the 3rd dose of MenACWY (e.g., Q-P-P) is assumed to be the same as the 2nd dose.
- Incidence rate in the absence of vaccination is unknown, we used the most recent pre-vaccine era data in our study.
- The market price of GSK's pentavalent vaccine is not known with certainty; our model used the same market cost as the GSK model.

Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine.

# Limitations

- Not accounting for additional benefits of potential protection against gonorrhoea.
  - Possible benefits arise from changing from Q-Q to P-P, and from no vaccination vs. vaccination strategies.
- Not including potential increases in vaccine uptake, and fewer adverse events due to fewer vaccine injections (i.e., P replacement of QB).
- Vaccine coverage inputs in this version of the model are consistent with current recommendations, age-based use of Q vaccines and shared clinical decision-making (SCDM) use of B-component vaccines. Therefore, potential changes to the SCDM/routine status of B-component vaccines were not incorporated into this version of the model.

Q=Quadrivalent (MenACWY) vaccine; B=MenB vaccine; P=Pentavalent (MenABCWY) vaccine.

# Summary

- **PICO 1:**
  - Q-P-B was found to be cost-saving relative to the current recommendation (vs. Q-QB-B).
- **PICO 2:**
  - P-P could improve health outcomes, but costs \$11.3 million per QALY saved (vs. Q-Q).
- **PICO 3:**
  - Q-P-P could improve health outcomes, but estimated economic value varied depending on the comparator:
    - Q-P-P is cost-saving compared to Q-QB-B.
    - Q-P-P costs \$4.5 million per QALY gained more than Q-P-B.

# Thank you!

For more information, contact CDC/ATSDR

1-800-CDC-INFO (232-4636)

TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov) [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry.



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