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**2459. Meningococcal ACWY (MenACWY) Vaccination of Adolescents in the United States: How Compliant Are We With the Advisory Committee on Immunization Practices (ACIP) Recommendations?**

Wendy Cheng, MPH, MPhil<sup>1</sup>; Rose Chang, MSPH, MS, ScD<sup>1</sup>; Patricia Novy, PhD<sup>2</sup>; Cristi O'Connor, MHS<sup>3</sup>; Mei Sheng Duh, MPH, ScD<sup>1</sup> and Cosmina Hoge, PhD<sup>2</sup>; <sup>1</sup>Analysis Group, Inc., Boston, Massachusetts, <sup>2</sup>GSK, Philadelphia, Pennsylvania

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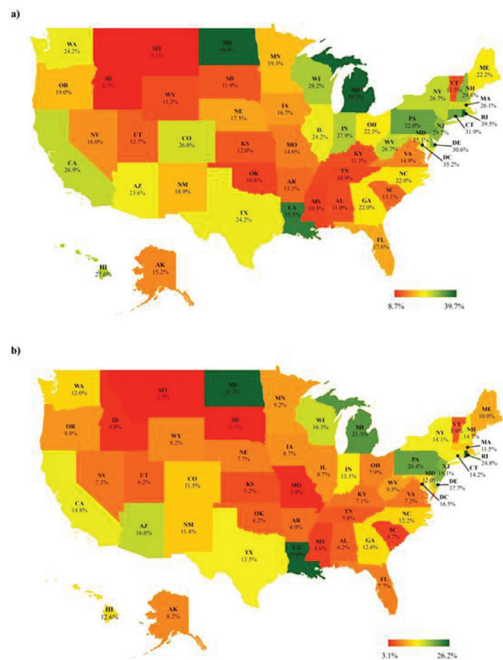
**Background.** Since 2011, ACIP guidelines for routine meningococcal ACWY vaccination (MenACWY) include a primary dose before age 16 (preferably at ages 11–12) and a booster dose (preferred age 16). Data on rates and drivers of meningococcal vaccination completion and compliance with ACIP recommendations down to state level are limited.

**Methods.** The 2011–2016 US National Immunization Survey-Teen data among adolescents aged 17 were used (GSK study identifier: HO-17-18202). National and state prevalence were estimated for MenACWY completion (receipt of primary dose at ages 11–15 and booster dose at age 16 or older) and compliance (receipt of primary dose at ages 11–12 and booster dose at age 16). Determinants such as state of residence, demographics, clinical/provider characteristics, vaccine mandates were assessed using multivariable logistic regression. Survey sampling weights were used to obtain population-based estimates.

**Results.** The estimated national average prevalence based on 2011–2016 data were 23.2% for MenACWY vaccine completion and 12.1% for compliance in US adolescents. Across states, prevalence varied from 8.7–39.7% for completion and 3.1–26.2% for compliance (Figure 1). Beyond state of residence, factors significantly associated with higher likelihood of both completion and compliance included being male, being up-to-date on other routine vaccines, having private or hospital-based vaccine providers (vs. public), and having >1 child in the household. Factors associated only with completion included having an 11- to 12-year-old well-child examination (OR [95% CI]: 1.5 [1.0–2.2]), >1 annual healthcare visit (2–5 vs. none) (1.4 [1.1–1.8]), and an existing state booster dose vaccine mandate (2.0 [1.5–2.8]) while factors associated with only compliance included history of asthma (1.3 [1.1–1.6]) and high-risk health conditions (1.4 [1.0–2.0]).

**Conclusion.** Adolescent completion and compliance rates for MenACWY vaccination in the United States are suboptimal, with significant variability across states. Determinants of completion and compliance with ACIP recommendations identified in this study may help guide clinical, policy, and educational interventions to promote healthcare access/utilization among adolescents in order to increase vaccine uptake.

**Figure 1:** MenACWY vaccination completion (a) and compliance (b). States with lowest and highest vaccination completion rates were Idaho and Michigan, respectively. States with lowest and highest vaccination compliance rates were South Dakota and North Dakota, respectively.



MenACWY, meningococcal vaccination against serogroups A, C, W and Y

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**2460. Factors Associated With Uptake of Meningococcus B Vaccination After an ACIP Category B Recommendation**

Emily Watkins, MD<sup>1</sup> and Kristen Feemster, MD, MPH, MSH<sup>2,3</sup>; <sup>1</sup>Internal Medicine/Pediatrics, Children's Hospital of Philadelphia/Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania, <sup>2</sup>Division of Infectious Diseases, Department of Pediatrics, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, <sup>3</sup>Immunization and Acute Communicable Disease Programs, Philadelphia Department of Public Health Division of Disease Control, Philadelphia, Pennsylvania

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**Background.** Two meningococcal vaccines (MenB) were licensed for 10–25 year olds in 2015 and given a Category B recommendation with a preferred window of 16–18 years old without high-risk comorbidity. Little is known about uptake of MenB after a Category B recommendation.

**Methods.** We conducted a retrospective cohort study of 16–23 year olds presenting to 31 primary care sites in a pediatric care network October 23, 2015–April 30, 2017. Using pivot tables and chi square analysis, we examined EHR data for associations between MenB receipt and patient/provider demographics (patient age, sex, race, insurance; provider years in practice), vaccinations, care site (urban vs. suburban), and high-risk comorbidity (asplenia, sickle cell, complement deficiency).

**Results.** Of 45,428 patients, 51% were female, 68% were 16–18 years old, and 21% received ≥1 MenB. 43% of those patients completed the 2-dose series. Rates of MenACWY booster receipt (32%) exceeded MenB, and 28% received both vaccines. A higher proportion of patients with ≥1 MenB were Asian, older, and privately insured (Table 1). More privately insured patients completed the series (48% vs. 26% Medicaid,  $P < 0.001$ ). 22% of high-risk patients received MenB, similar to their peers. MenB receipt increased with provider years in practice but declined in those practicing >30 years (Table 1). MenB initiation varied widely between sites (1–45%).

**Conclusion.** MenB uptake in this cohort was low. Variation by site, provider years in practice, and potential sociodemographic disparity suggests that advice and acceptance in the setting of a Category B recommendation is not uniform. Further study is needed to clarify how these factors influence MenB receipt in teens.

**Table 1:** % 16–23 Year Olds With ≥1 MenB by Patient and Provider Characteristics

		Total (%) N = 45,428	% with ≥1 MenB N = 9,393	P-value
Sex	Female	23,167 (51)	21	0.31
	Male	22,261 (49)	21	
Age	16–18	31,307 (69)	18	<0.001
	19–23	14,121 (31)	28	
Race	White	26,280 (58)	27	<0.001
	Black	13,186 (29)	18	
	Asian	1,237 (27)	22	
Insurance	Medicaid	10,507 (23)	17	<0.001
	Private	34,854 (77)	22	
Vaccinations	MenACWY	14,753 (33)	28	
	HPV	10,007 (22)	21	
	Tdap	619 (1.4)	23	
Comorbidities	Sickle cell	543 (1.2)	22	
	Complement deficiency	3 (0.007)	33	
	Asplenia	19 (0.04)	42	
Prov. years in practice	≤10	7,564 (24)	16	<0.001
	11–20	9,205 (29)	18	
	21–30	9,330 (29)	19	
	>30	5,939 (17)	12	
Care site	Urban	9,845 (22)	21	0.09
	Suburban	35,583 (78)	20	

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**2461. Safety of Quadrivalent Meningococcal Polysaccharide Diphtheria Toxoid-Conjugate Vaccine in Adolescents**

Tanya Myers, PhD, MSc<sup>1</sup>; Eric Weintraub, MPH<sup>2</sup>; Michael McNeil, MD, MPH<sup>3</sup>; Lakshmi Sukumaran, MD, MPH<sup>3</sup>; Jonathan Duffy, MD<sup>2</sup>; Roger Baxter, MD, FIDSA<sup>4</sup>;

Nicola P. Klein, MD, PhD<sup>4</sup>; Matthew F. Daley, MD<sup>5</sup>; James Donahue, DVM, PhD<sup>6</sup>; Hung Fu Tseng, PhD, MPH<sup>7</sup>; Stephanie Irving, MHS<sup>8</sup>; Michael L. Jackson, PhD, MPH<sup>9</sup> and Saad Omer, MBBS, MPH, PhD, FIDSA<sup>10</sup>; <sup>1</sup>Centers for Disease Control & Prevention, Atlanta, Georgia, <sup>2</sup>Immunization Safety Office, Centers for Disease Control and Prevention, Atlanta, Georgia, <sup>3</sup>Immunization Safety Office, CDC, Atlanta, Georgia, <sup>4</sup>Kaiser Permanente Vaccine Study Center, Oakland, California, <sup>5</sup>Institute for Health Research, Kaiser Permanente Colorado, Denver, Colorado, <sup>6</sup>Center for Clinical Epidemiology and Population Health, Marshfield Clinic Research Foundation, Marshfield, Wisconsin, <sup>7</sup>Research and Evaluation, Kaiser Permanente Southern California, Pasadena, California, <sup>8</sup>Kaiser Permanente Center for Health Research, Portland, Oregon, <sup>9</sup>Kaiser Permanente Washington Health Research Institute, Seattle, Washington, <sup>10</sup>Global Health, Rollins School of Public Health, Emory University, Atlanta, Georgia

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**Background.** The first quadrivalent meningococcal conjugate vaccine (MenACWY-D) was recommended for use in adolescents in 2005. Soon after, case reports of Guillain-Barre syndrome (GBS) following vaccination prompted subsequent studies, with a meta-analysis concluding that the attributable risk of GBS after MenACWY-D is unlikely to exceed 1 case per million vaccinations. We conducted a retrospective cohort study in the Vaccine Safety Datalink to assess the risk of 10 outcomes, including GBS, following MenACWY-D.

**Methods.** We included adolescents (aged 11–18 years) vaccinated with MenACWY-D during the years 2005–2014. We identified pre-specified outcomes using ICD-9 (International Classification of Disease, version 9) codes. We used automated data only for Bell's palsy, fever, seizure and syncope, and we confirmed incident cases by medical record review for acute disseminated encephalomyelitis (ADEM), acute transverse myelitis (ATM), anaphylaxis, chronic inflammatory demyelinating polyneuropathy (CIPD), GBS and Henoch-Schönlein purpura (HSP). We used a self-controlled risk interval design to estimate relative risk (RR).

**Results.** Following 1.4 million doses of MenACWY-D, we detected increased risks for fever in the 1–6 days following vaccination (RR 1.5, 95% confidence interval [CI] 1.3–1.7) and syncope on the day of vaccination (RR 5.8, 95% CI 4.1–8.3), but not for seizures (RR 1.1, 95% CI 0.7–1.9) or Bell's palsy (RR 1.1, 95% CI 0.8–1.5). We detected no cases in the post-vaccination risk intervals for CIPD, ADEM or ATM. We detected few cases of the other outcomes resulting in relatively unstable RR estimates: anaphylaxis (RR 1.9, 95% CI 0.5–7.1), GBS (RR 2.5, 95% CI 0.6–10.0) and HSP (RR 1.6, 95% CI 0.7–3.3). We estimated that the attributable risk of GBS was 1.5 cases per million vaccinations (upper bound of one-sided 95% CI, 4.9).

**Conclusion.** In a large retrospective cohort, we detected increased risks for syncope and fever, but not seizures or Bell's palsy, following vaccination with MenACWY-D. Other outcomes were rare. Our findings, consistent with previous studies, suggest that the increased risk of GBS, if any, is likely small (<5 excess cases of GBS per million vaccinations).

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**2462. Immunogenicity and Safety of a Quadrivalent Meningococcal Conjugate Vaccine (MenACYW-TT) Administered in Individuals 56 Years of Age and Older**  
Robert Jeanfreau, MD<sup>1</sup>; Alejandra Esteves-Jaramillo, MD, MPH<sup>2</sup>; David Neveu, Pharmacist<sup>3</sup>; Emilia Jordanov, MD<sup>4</sup> and Mandeep S Dhingra, MD<sup>5</sup>; <sup>1</sup>MedPharmics, LLC, Metairie, Louisiana, <sup>2</sup>Global Clinical Sciences, Sanofi Pasteur, Swiftwater, Pennsylvania, <sup>3</sup>Global Pharmacovigilance, Sanofi Pasteur, Swiftwater, Pennsylvania, <sup>4</sup>Sanofi Pasteur, Swiftwater, Pennsylvania

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**Background.** The MenACYW-TT conjugate vaccine is a quadrivalent meningococcal vaccine candidate intended for global use in all age groups. This Phase III study evaluated the safety and immunogenicity of the vaccine when compared with a licensed quadrivalent meningococcal polysaccharide vaccine (MPSV4) in adults  $\geq 56$  years of age.

**Methods.** A randomized, modified double-blind, multicenter study (NCT02842866) was conducted in 907 healthy adults in the United States. Participants were randomized to receive a single dose of either MenACYW-TT conjugate vaccine or MPSV4, stratified according to age into 2 subsets: 56 to 64 and  $\geq 65$  years. Descriptive analyses were also planned for age subsets 65–74 years and  $\geq 75$  years. Serum bactericidal assay with human (hSBA) and baby rabbit (rSBA) complement was used to measure antibodies against serogroups A, C, Y, and W test strains at baseline and 30 days after vaccination. Safety data were collected up to six months post-vaccination.

**Results.** Non-inferiority of immune responses was demonstrated between MenACYW-TT conjugate vaccine and MPSV4 based on percentages of subjects achieving hSBA vaccine seroresponse for serogroups A, C, Y, and W at Day 30 compared with baseline. The proportions of individuals with hSBA  $\geq 1:8$  obtained after MenACYW-TT conjugate vaccine were higher than those after MPSV4 for all four serogroups (A: 89.4% vs. 84.2%; C: 90.1% vs. 70.9%; W: 77.4% vs. 63.0%; Y: 91.7% vs. 67.7%). Overall, the results were similar in the three age substrata. Percentages of participants with post vaccination rSBA  $\geq 1:128$  were numerically higher for all serogroups in subjects vaccinated with MenACYW-TT conjugate vaccine. A difference in

the local reactogenicity profiles was observed between the two vaccine groups, possibly influenced by the different routes of administration. Most unsolicited adverse events were of Grade 1 or Grade 2 intensity. No vaccine related serious adverse events were reported.

**Conclusion.** MenACYW conjugate vaccine was immunogenic and well tolerated when administered to individuals  $\geq 56$  years of age. Such a vaccine will offer an alternative for the prevention of invasive meningococcal disease in areas of the world where only polysaccharide vaccines are currently available for immunization of older adults.

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**2463. Post-licensure Surveillance of 9-Valent Human Papillomavirus Vaccine (9vHPV) in the Vaccine Adverse Event Reporting System (VAERS), United States, 2014–2017**

Jorge Arana, MD, MPH<sup>1</sup>; John Su, MD, MPH<sup>2</sup>; Paige Lewis, MSPH<sup>3</sup>; Maria Cano, MD, MPH<sup>4</sup>; Lauri E. Markowitz, MD<sup>5</sup> and Tom Shimabukuro, MD, MPH, MBA<sup>4</sup>; <sup>1</sup>Immunization Safety Office, Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, <sup>2</sup>Centers for Disease Control and Prevention, Atlanta, Georgia, <sup>3</sup>Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, <sup>4</sup>Immunization Safety Office, CDC, Atlanta, Georgia

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**Background.** 9-valent human papillomavirus vaccine (9vHPV) was licensed in December 2014 and recommended by the Advisory Committee on Immunization Practices (ACIP) in February 2015. 9vHPV is FDA-approved for females and males aged 9–26 years; ACIP recommends routine vaccination at 11–12 years and through age 26 for women and 21 for males. About 29 million doses of 9vHPV were distributed in the United States through the end of 2017. We analyzed the first 3 years of US post-licensure safety data in the Vaccine Adverse Event Reporting System (VAERS).

**Methods.** We searched VAERS, a spontaneous reporting system, for US reports of adverse events (AEs) following 9vHPV from December 1, 2014 to December 31, 2017. We conducted descriptive analysis of reports and assessed the most common signs and symptoms of AEs. Physicians reviewed reports and available medical records for reports classified as serious (death, life-threatening illness, hospitalization, prolongation of hospitalization and permanent disability) and for selected pre-specified conditions of interest.

**Results.** VAERS received 7,244 reports following 9vHPV; 186 (2.6%) were classified as serious. In 5,411 (74.7%), 9vHPV was administered alone. The most frequently reported symptoms were dizziness (579; 8.0%), syncope (517; 7.1%), headache (418; 5.8%), nausea (361; 5.0%), and injection site pain (324; 4.5%). Median time from vaccination to symptom onset was <1 day (range 0–751 days). There were 7 (0.1%) death reports; 2 verified from autopsy report, death certificate, and/or medical records (causes of death were cardiac arrest and cerebellar aneurysm) and 5 “hearsay” reports with no verifiable medical information. Reports of selected pre-specified conditions of interest included anaphylaxis (9; 0.1%), Guillain-Barré syndrome (8; 0.1%), postural orthostatic tachycardia syndrome (17; 0.2%), primary ovarian insufficiency (3; <0.1%), and complex regional pain syndrome (1; <0.1%). No unusual clustering around onset interval was observed.

**Conclusion.** In our VAERS review, the safety profile of 9vHPV was consistent with that observed from pre-licensure clinical trials and from post-licensure safety monitoring of other HPV vaccines. We did not observe any new safety signals or unexpected patterns of AEs.

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**2464. A Significant Portion of College Students Are Not Aware of HPV Disease and HPV Vaccine Recommendations**

Jessica Leyva, Expected: Bachelor's Degree<sup>1</sup>; Elizabeth Sanchez, Expected: Bachelor's Degree<sup>2</sup>; Ayana Arroyo, Expected: Bachelor's Degree<sup>3</sup>; Kasia Wade, Expected: Bachelor's Degree<sup>4</sup>; NgocTuyen Dinh, Expected: Bachelor's Degree<sup>5</sup>; Caitlyn Kellogg, BA<sup>2</sup> and Ozlem Equils, MD<sup>6</sup>; <sup>1</sup>California State University, Long Beach, Long Beach, California, <sup>2</sup>MiOra, Los Angeles, California, <sup>3</sup>Cedars-Sinai Medical Center, UCLA School of Medicine, MiOra, Los Angeles, California

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**Background.** Although HPV vaccination has been shown to be very effective in preventing genital warts and cancers caused by the vaccine strains, immunization rates are low, especially among males and certain ethnic groups. ACIP has recommended that the HPV vaccine be administered to females through age 26 and males through age 21 (26 in MSM). Therefore, there is a significant amount of time for catch up. We assessed college students' awareness of HPV disease and ACIP-HPV vaccine recommendations in Los Angeles County.

**Methods.** A 31-question survey was developed and IRB approved (WIRB No 1920852-43973015). CSULB Health Sciences students were trained on HPV disease and prevention, and they administered the survey in-person to other students at various locations on campus and recorded the data.

**Results.** One hundred eighty individuals were surveyed from February to April 2018. The average age of the respondents was  $21 \pm 2$  years. The majority (110 out of 180; 61.1%) of the respondents were female. 75 out of 180 (41.7%) respondents were Latino/Hispanic, 62 out of 180 (34.4%) were Caucasian, 30 out of 180 (16.7%) were Asian