

# Letters

## RESEARCH LETTER

### HPV Vaccination Among Young Adults in the US

The human papillomavirus (HPV) vaccine was approved for females in 2006 and males in 2009 for the prevention of anogenital cancer and warts. The indications were expanded in 2020 to include the prevention of oropharyngeal cancer, which is more common in males.<sup>1</sup>



Multimedia

The Advisory Committee on Immunization Practices recommends routine vaccination with 2 doses at age 11 to 12 years, with catch-up vaccination at age 13 to 26 years (limited to age 13-21 years from 2011 to 2019 for males).<sup>2</sup> If the first dose occurs after age 15 years, a 3-dose series is recommended.<sup>2</sup>

HPV vaccination rates are closely tracked and monitored for adolescents (aged 13-17 years).<sup>3</sup> However, little is known about vaccination rates in young adults, who are more likely to make health care decisions for themselves but less likely to access preventive services or be insured.<sup>4</sup> Our objective was to assess HPV vaccination among young adults in the US.

**Methods** | We analyzed data from the 2010-2018 National Health Interview Survey, an annual cross-sectional household sur-

vey with face-to-face interviews and a response rate of more than 70% of eligible households.<sup>5</sup> We included respondents aged 18 to 21 years, who were asked whether and at what age they were vaccinated and how many doses they received. The primary outcomes were self-reported receipt of any HPV vaccination dose prior to age 21 years and receipt of the first dose between ages 18 and 21 years. In addition, we assessed vaccine series completion (3 doses) for those initiating vaccination between ages 18 and 21 years. Because of the differing timing of recommendations for females and males, outcomes were analyzed by sex. We also assessed trends in receipt of a vaccination dose at any age by year.

National Health Interview Survey weights were used to provide national estimates; the Kendall  $\tau$  was used to evaluate the trend. Statistical significance was defined as a 2-sided  $P < .05$ . Analysis was performed using Stata version 16.1 (StataCorp). This survey was approved by the research ethics review board of the National Center for Health Statistics, and interviewers obtained verbal consent.<sup>5</sup>

**Results** | Data on vaccination receipt were available from 93% of respondents aged 18 to 21 years in 2010-2018. The study includes unweighted data from 6606 females (52%) and 6038

Table 1. Receipt of at Least 1 Human Papillomavirus Vaccine Dose by Year Among 12 644 Young Adult Women and Men Aged 18-21 Years, 2010-2018

Year	Women		Men	
	No. vaccinated/total <sup>a</sup>	% Vaccinated (95% CI) <sup>b</sup>	No. vaccinated/total <sup>a</sup>	% Vaccinated (95% CI) <sup>b</sup>
2010	222/688	32.2 (27.9-36.7)	8/655	1.6 (0.6-4.1)
2011	350/855	42.4 (38.1-46.8)	24/788	2.8 (1.8-4.5)
2012	402/914	44.6 (40.3-49.0)	46/770	5.4 (3.6-8.1)
2013	367/839	42.6 (38.1-47.2)	84/722	11.2 (8.5-14.8)
2014	358/782	47.1 (40.9-53.5)	122/770	16.0 (12.8-19.9)
2015	323/692	43.1 (38.2-48.2)	111/626	21.1 (16.6-26.3)
2016	429/817	51.6 (46.4-56.7)	200/743	24.5 (20.4-29.2)
2017	352/620	54.4 (49.2-59.5)	191/536	34.0 (28.5-39.9)
2018	217/399	55.2 (49.4-60.9)	143/428	34.1 (28.5-40.0)

<sup>a</sup> Unweighted.

<sup>b</sup> Weighted percentage and 95% CI.

Table 2. Overall Vaccination Rate Among Young Adults Aged 18-21 Years, Those Who Initiated the Human Papillomavirus Vaccination Between Ages 18 and 21 Years, and Series Completion for Those Who Initiated Vaccination Between Ages 18 and 21 Years

	Women		Men	
	No. vaccinated/total <sup>a</sup>	% Vaccinated (95% CI) <sup>b</sup>	No. vaccinated/total <sup>a</sup>	% Vaccinated (95% CI) <sup>b</sup>
All respondents aged 18-21 y				
≥1 Vaccine dose at any age	3020/6606	41.6 (40.0-43.2)	929/6038	16.2 (14.8-17.7)
First dose at age 18-21 y	254/6606	3.8 (3.4-4.3)	162/6038	2.7 (2.3-3.1)
Respondents who initiated first dose at age 18-21 y				
Series completion (3 doses)	111/254	46.3 (37.6-55.2)	48/162	29.1 (20.4-39.7)

<sup>a</sup> Unweighted.

<sup>b</sup> Weighted percentage and 95% CI.

males (48%). After weighting, 42% (95% CI, 40%-43%) of females and 16% (95% CI, 15%-18%) of males received at least 1 dose of HPV vaccine at any age. Among females, the percentage increased from 32% (95% CI, 28%-37%) in 2010 to 55% (95% CI, 49%-61%) by 2018 ( $P = .001$ ) (Table 1). Among males, the percentage increased from 2% (95% CI, 1%-4%) in 2010 to 34% (95% CI, 29%-40%) in 2018 ( $P < .001$ ).

Among 6606 females, 254 (weighted, 4% [95% CI, 3%-4%]) received their first HPV vaccination between ages 18 and 21 years (Table 2). Among 6038 males, 162 (weighted, 3% [95% CI, 2%-3%]) received their first dose between ages 18 and 21 years. Of these, 46% (95% CI, 38%-55%) of females and 29% (95% CI, 20%-40%) of males completed the vaccination series.

**Discussion** | This study found that self-reported HPV vaccination rates for females and males, whether for receipt of a dose at any age or between ages 18 and 21 years, were low, although they increased over time. In comparison, receipt of 1 or more doses among adolescents in 2018 was 68.1%.<sup>3</sup> All rates were lower for males than for females. Limitations of the study include its cross-sectional nature, lack of data on dosage timing, and the self-report nature of vaccination data, although adult self-reported HPV vaccination status has previously been shown to be 91% sensitive.<sup>6</sup> Possible strategies to improve vaccination uptake and completion among young adults include leveraging university or community vaccination campaigns, especially targeting males, identification of the need for HPV vaccination at the time of influenza vaccination, elimination of cost barriers, and improved education of adult primary care clinicians regarding the risk of HPV-associated cancers, especially in males.

Michelle M. Chen, MD, MHS  
Nicole Mott, BS  
Sarah J. Clark, MPH  
Diane M. Harper, MD, MPH, MS  
Andrew G. Shuman, MD  
Mark E. P. Prince, MD  
Lesly A. Dossett, MD, MPH

**Author Affiliations:** Department of Otolaryngology–Head and Neck Surgery, University of Michigan, Ann Arbor (Chen, Shuman, Prince); University of Michigan Medical School, Ann Arbor (Mott); Department of Pediatrics and Communicable Diseases, University of Michigan, Ann Arbor (Clark); Department of Obstetrics and Gynecology, University of Michigan, Ann Arbor (Harper); Department of Surgery, University of Michigan, Ann Arbor (Dossett).

**Accepted for Publication:** January 19, 2021.

**Corresponding Author:** Michelle M. Chen, MD, MHS, Department of Otolaryngology–Head and Neck Surgery, 1500 E Medical Center Dr, SPC 5312, Ann Arbor, MI 48109 (mche@med.umich.edu).

**Author Contributions:** Dr Chen had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Concept and design:** Chen, Clark, Harper, Dossett.

**Acquisition, analysis, or interpretation of data:** Chen, Mott, Shuman, Prince.

**Drafting of the manuscript:** Chen, Mott.

**Critical revision of the manuscript for important intellectual content:** All authors.

**Statistical analysis:** Chen.

**Administrative, technical, or material support:** Chen, Shuman, Dossett.

**Supervision:** Harper, Shuman, Dossett.

**Conflict of Interest Disclosures:** Dr Dossett reported receiving grants from the Agency for Healthcare Research and Quality. No other disclosures were reported.

**Funding/Support:** Dr Chen is supported by the postdoctoral Ruth L. Kirschstein National Research Service Award (National Institutes of Health).

**Role of the Funder/Sponsor:** The National Institutes of Health had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

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## Out-of-Network Laboratory Test Spending, Utilization, and Prices in the US

More than 12 billion medical laboratory tests are analyzed in the US annually, making them the highest-volume health care service nationwide.<sup>1</sup> As attention toward out-of-network billing and out-of-network laboratories grows, data on out-of-network laboratory testing remain scarce.<sup>2</sup>

Such data are important because patients may unknowingly have their tests analyzed by out-of-network laboratories, leading to higher costs for insurers and patients. Moreover, the billing practices of some independent laboratories have raised concerns about the appropriateness and costs of laboratory testing, notably in the domain of addiction medicine.<sup>3,4</sup> We examined out-of-network laboratory test spending, quantity, and prices per test in the US.

**Methods** | We studied data for individuals enrolled for at least 1 year during 2008-2016 in the IBM MarketScan Commercial Claims and Encounters Database and whose employer consistently contributed data throughout this period. The overall database contains more than 43 million covered individuals from mostly large employers nationwide.<sup>5</sup> Our continuously enrolled subsample of employers eliminated changes in composition due to the entry and exit of employers. We categorized outpatient laboratory tests into blood counts, chemistries, microbiology, pathology, toxicology, and urine tests (eTable in the Supplement). A unique flag indicated whether each test was in network or out of network.

We calculated mean spending (including cost sharing, adjusted for inflation), quantity, and prices of laboratory

 [Supplemental content](#)

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