



ADA American Dental Association



Supplemental material is available online.

Parent perceptions of dental care providers' role in human papillomavirus prevention and vaccine advocacy

Cynthia Stull, MDH; Rebecca Freese, MS; Elise Sarvas, DDS, MSD, MPH

ABSTRACT

Background. Human papillomavirus (HPV) is the most common sexually transmitted infection and is responsible for most anogenital and oropharyngeal cancers. Dental care providers can be advocates for vaccine uptake, yet little is known about patients' perceptions of the role of dental care providers in HPV education and prevention.

Methods. Parents of adolescents aged 9 through 17 years were recruited from the Minnesota State Fair to survey their awareness and knowledge of the HPV vaccine. Parents were also surveyed about their attitudes toward and comfort in receiving HPV vaccination recommendations and counseling from oral health care providers.

Results. The authors interviewed 208 parents, most of whom felt that dentists were qualified to counsel about HPV (66.4%) and its vaccination (72.6%). A lower proportion felt similarly regarding dental hygienists. Parent age and sex were not correlated with comfort levels, but education levels ($P = .021$) and child vaccination statuses ($P > .001$) were.

Conclusions. Parents are comfortable having discussions about HPV and the vaccine in the dental setting, especially with dentists. This may represent an additional setting where strong recommendations increase vaccine uptake.

Practical Implications. Our findings emphasize an opportunity for the dental care team to improve the patient perspective on the role of dental care providers in HPV prevention. Continuing dental education can increase providers' knowledge, comfort, and confidence in discussing HPV with parents. Parents perceiving provider comfort and confidence might be more comfortable with HPV conversations. Training in collaborative, patient-focused communication techniques, such as motivational interviewing, can improve both providers' and patients' comfort and confidence in HPV counseling from oral health care providers.

Key Words. Human papillomavirus; patient education; public health/community dentistry; professional role; preventive dentistry.

JADA 2020;151(8):560-567

<https://doi.org/10.1016/j.adaj.2020.05.004>


This article has an accompanying online continuing education activity available at:
<http://jada.ada.org/ce/home>.

Copyright © 2020
 American Dental Association. All rights reserved.

Human papillomavirus (HPV) is the most common sexually transmitted infection and is responsible for most cervical, anogenital, and oropharyngeal cancers.¹ Oncogenic types (that is, HPV-16, HPV-18, HPV-31, and HPV-33) have been implicated as a causal factor in more than 70% of all oropharyngeal cancers that occur on tonsils and the base of the tongue.² Most HPV-associated cancers are preventable. In the decade since its introduction, the HPV vaccine has been highly effective in preventing cervical precancer, particularly for lesions associated with HPV-16 and HPV-18.³ Vaccination may also prevent HPV oropharyngeal cancers. A vaccine effective against 9 types of HPV is available and administered in a series of 2 or 3 doses, depending on the patient's age when he or she started the series. Vaccination is recommended for people aged 9 through 26 years and is available up to age 45 years.⁴ However, uptake of the vaccine has been slow. In 2017, 58.8% of eligible Minnesota adolescents aged 13 through 17 years were up to date on the HPV vaccine series, slightly above the national rate of 51.1%.⁵ These vaccination rates fall short of the Healthy People 2020 target of 80%.⁶

Determinants of vaccine hesitancy include lack of knowledge and awareness of HPV and the vaccine, risk perception, fear of risk compensation (increase in risky behavior when risk is perceived to be reduced), parental concerns regarding vaccine safety and efficacy in preventing HPV infections and related cancers, public- and school-based policies, financial barriers, and lack of timely, strong health care provider recommendations, particularly for males.⁷ The most influential predictor of vaccine uptake is quality of health care provider recommendation; health care provider communication is a mediating factor between awareness of the HPV vaccine and vaccine uptake.⁸ Furthermore, investigators from 1 study reported that 45% of parents who initially declined the vaccine eventually decided to accept it.⁹ Among the reasons for secondary acceptance were increased knowledge about the HPV vaccine (34%) and health care provider recommendation (33%), suggesting health care providers play an important role in HPV vaccine uptake. However, most parents report either never receiving or having received a weak recommendation from a health care provider.¹⁰ Higher-quality HPV messages are timely, consistent, focus on cancer prevention, and include a strong vaccine endorsement.^{8,10} Yet, health care provider behaviors also present barriers to HPV vaccination, including discomfort in discussing a sexually transmitted infection, perception of parental hesitancy, personal lack of HPV knowledge, risk stratification, and low self-efficacy in HPV communication.⁷

Researchers have found that receiving HPV prevention messages from multiple sources contributes to increased HPV vaccine uptake.¹¹ Most children in the United States (82.3%) have had at least 1 preventive dental examination in the past year, as reported by a caregiver; Minnesota mirrors this trend with a reported 77.9%.^{12,13} Therefore, dental care providers are poised to collaborate with other health care professionals in responding to the HPV epidemic and can play a key role in primary, secondary, and tertiary prevention, beginning with vaccine advocacy. Traditionally, oral cancer prevention in the dental setting included visual and tactile screening, along with tobacco- and alcohol-use cessation education. Although rates of oral cancers associated with tobacco and alcohol use have declined from 1988 through 2004, during those same years HPV-associated oropharyngeal cancer incidence has increased more than 200%.¹⁴ Furthermore, detecting oropharyngeal cancer during routine oral cancer screenings is difficult, given limited visibility in the pharyngeal region.

Dentistry is often the missing profession on health care teams. Yet, dental care providers routinely collect patient data that are important to overall health.¹⁵ Fried¹⁶ proposed an interprofessional model of care, with dental examinations serving as the entry into the health care system. In this model, dental care providers educate patients about HPV prevention, screen for oral and pharyngeal cancers, and refer patients to other health care providers as appropriate. In 2018, the American Dental Association and in 2017, the American Academy of Pediatric Dentistry issued guidelines urging dental care providers to support HPV vaccination and educate patients about preventing HPV-related infections with the types associated with oropharyngeal cancer.^{17,18}

Given these facts, the role of oral health care professionals in the prevention of oral and oropharyngeal cancer should begin with patient education about HPV's role in oropharyngeal cancer and vaccine availability. However, discussion of a sexually transmitted infection is uncomfortable for oral health care providers, who report concern about patient and parental perceptions regarding HPV discussions by dental care providers.^{2,19} Little is known about parental perceptions of the role of dental care providers in prevention of HPV infection. McRee and colleagues²⁰ examined parent attitudes toward HPV vaccination in alternative settings. Their findings suggested that adolescent boys and their parents are comfortable with receiving the vaccine in settings outside of the traditional medical office. Conversely, Lazalde and colleagues²¹ suggested that although few parents were comfortable with their children receiving the HPV vaccine from a dentist, the same parents may be more comfortable with dental care providers delivering education on HPV prevention. Additional research is needed to investigate the perceptions of parents of adolescent patients about dental care providers' role in HPV prevention. Understanding the perceptions of parents toward HPV communication in dental settings may help dental care providers develop effective HPV messaging strategies in the future.

Research is necessary to assess effective HPV communication strategies and vaccine advocacy by nonmedical health care providers. This includes assessing the perceptions and comfort of parents of adolescents about receiving HPV communication by dental care providers. The aims of our study

ABBREVIATION KEY

- D2D:** Driven to Discover.
- HPV:** Human papillomavirus.
- NA:** Not applicable.

were to assess the attitudes of Minnesota parents of adolescents aged 9 through 17 years regarding the role of dental care providers in HPV prevention and explore correlates of Minnesota parents' comfort having HPV conversations with dental care providers. Our study was approved as exempt by the University of Minnesota Institutional Review Board (STUDY00006370).

METHODS

Recruitment

A cross-sectional survey was conducted using a convenience sample of parents of adolescents aged 9 through 17 years attending the 2019 Minnesota State Fair. Inclusion criteria included parents who were able to read English and had at least 1 adolescent aged 9 through 17 years, as 9 years is the earliest recommended age to start the HPV vaccine. Exclusion criteria included parents from the same immediate family, those without adolescents aged 9 through 17 years, and those unable to read English. The sample was recruited from the 2019 Minnesota State Fair at the University of Minnesota Driven to Discover (D2D) research facility, which housed more than 50 studies during the fair. Our study was advertised on the D2D Web site and on the Minnesota State Fair mobile application with a description of our study and participant criteria. The D2D facility attracts more than 60,000 fairgoers interested in participating in research each year. In addition, trained research staff promoted our study to fairgoers as they walked by the facility.

Data collection

Data were collected on iPads (Apple) using Qualtrics, a secure, Health Insurance Portability and Accountability Act–compliant web application managed by the University of Minnesota Office of Information Technology. Optional identifiable information, such as participants' e-mail addresses and identifiable contact information submitted for the gift card raffle, was stored on secure university servers. Use of electronic surveys at D2D ensured rapid, secure data collection with immediate deposition on secure servers. Participation was voluntary. The purpose of the research and background information on HPV and vaccination were provided to the participant before participation. Protection of confidentiality and voluntary participation were explained to participants before the survey. Informed consent was obtained from participants on the iPads as a required precursor to beginning the questionnaire and documented within Qualtrics. Each participant received a toothbrush and dental floss and was given the opportunity to be entered in a drawing for a \$25 gift card. Information sheets about the HPV vaccine from the Centers for Disease Control and Prevention were available to participants after completing the survey. Data were gathered by 5 trained and calibrated researchers using a standardized script during 3 5-hour shifts in the D2D facility. At least 1 principal investigator was present during all shifts.

Instrument

An adaptation of a questionnaire used to examine parents' perceptions regarding vaccine delivery by dentists developed by Lazalde and colleagues²¹ was used. Parents were asked to report on their oldest child aged 9 through 17 years. Demographic data were collected. In the adapted survey, questions were asked in the following domains: parents' knowledge and awareness of HPV infection and vaccination, their perceptions of dental care providers' role in HPV prevention, and their comfort in having HPV discussions with their children's dental care providers. Answers were reported in a forced 4-point Likert scale format. The survey was pilot-tested by 3 School of Dentistry faculty members to identify issues with clarity and understanding.

Statistical analysis

Demographic characteristics were summarized using means (standard deviations) for continuous and count (percentages) for categorical variables. Responses to comfort and agreement questions were collapsed into the following categories: comfortable/uncomfortable and agree/disagree. The associations among parent awareness, knowledge, and attitudes toward HPV vaccination were assessed using *t* tests for continuous variables and Fisher exact test for categorical variables. Corrections for multiple comparisons were not made in our exploratory study. *P* values were 2-sided and evaluated at the .05 level for statistical significance. All analysis was conducted in R, Version 3.6.1 (R Foundation for Statistical Computing).

Table 1. Parent and child demographic characteristics (n = 208).*

CHARACTERISTIC	DATA
Child	
Has regular dental clinic, no. (%)	194 (98.0)
No. of examinations/prophylaxes in past 12 mo, no. (%)	
None	1 (0.5)
1	37 (18.7)
≥ 2 times	160 (80.8)
Started HPV [†] vaccine series, no. (%)	
Don't know	16 (8.2)
No	76 (38.8)
Yes	104 (53.1)
Completed HPV vaccine series, no. (%)	
Don't know	24 (12.2)
No	102 (52.0)
Yes	70 (35.7)
No. aged 9-17 y, mean (SD) [‡]	1.73 (0.83)
No. who started HPV vaccination series, mean (SD)	0.79 (1.00)
No. who completed HPV vaccination series, no. (%)	95 (48.5)
Has a dentist ever talked with you about HPV or the HPV vaccine? no. (%)	
I don't know	13 (6.6)
No	176 (89.8)
Yes	7 (3.6)
Have you received the HPV vaccination series? no. (%)	
No	151 (77.4)
Unsure	26 (13.3)
Yes	18 (9.2)
Parent	
Age, y, mean (SD)	45.3 (6.87)
Highest education level, no. (%)	
High school degree/General Educational Development credential	10 (5.1)
Some college, no degree	25 (12.8)
Associate's degree	18 (9.2)
Bachelor's degree	85 (43.6)
Graduate or professional degree	55 (28.2)
Other	2 (1.0)
Ethnicity, Hispanic or Latino, no. (%)	5 (2.6)
Race, white, no. (%)	165 (85.9)
Sex, female, no. (%)	155 (80.3)
Home ZIP code, urban, no. (%)	173 (88.3)
Marital status, no. (%)	
Divorced (or separated)	22 (11.4)
Married (or domestic partnership)	160 (82.9)
Single (never married)	9 (4.7)
Widowed	2 (1.0)

* Mean number of missing responses for each question was 14. † HPV: Human papillomavirus. ‡ SD: Standard deviation.

Table 2. Overall frequency of agreement in parental responses to the survey statements and questions.

VARIABLE	DATA
Overall, No.	208
Disagreement, No. (% [No. of Missing Data Points])	
I do NOT plan to vaccinate my child against HPV*	151 (78.2) [15]
Dentists are NOT qualified to counsel me or my child about HPV	128 (66.3) [15]
Dentists are NOT qualified to counsel me or my child about HPV vaccination	141 (72.7) [14]
Dental hygienists are NOT qualified to counsel me or my child about HPV	117 (60.9) [16]
Dental hygienists are NOT qualified to counsel me or my child about HPV vaccination	113 (58.5) [15]
Agreement, No. (% [No. of Missing Data Points])	
I would expect my child's dentist to talk to me about the relationship between HPV and mouth and throat cancer	167 (86.1) [14]
I would expect my child's dentist to talk to my child about the relationship between HPV and mouth and throat cancer	143 (73.3) [13]
I would expect my child's dentist to be interested in the HPV vaccination status of my child	158 (81.4) [14]
I would expect my child's dentist to send HPV vaccination reminders	118 (60.8) [14]
Dentists can help patients prevent HPV-related mouth and throat cancer	174 (89.7) [14]
I would find a new dentist for my child if he or she talked to my child about his or her HPV vaccination status	20 (10.3) [13]

* HPV: Human papillomavirus.

RESULTS

Sample characteristics

Surveys were returned from 208 parents. Demographic characteristics of parents and children are shown in Table 1. Mean age of parents was 45.3 years (range, 29-64 years). Most respondents were married (n = 160 [82.9%]), white (n = 165 [85.9%]), female (n = 155 [80.3%]), and had a bachelor's degree (n = 85 [43.6%]) or higher (n = 55 [28.2%]). Most parents had not received the HPV vaccination (n = 151 [77.4%]). Most of the children had a regularly seen dentist (n = 194 [98.0%]) and had 2 or more dental examinations in the past 12 months (n = 160 [80.8%]). More than one-half of the children had started the HPV vaccination series (n = 104 [53.1%]), and 70 (35.7%) children had completed the series, which was administered by their medical provider. Three questions were asked regarding the parents' other children aged 9 through 17 years. More than one-half of parents (n = 118 [60.4%]) reported their other vaccine-eligible children had started the HPV vaccine series, and 45.4% (n = 89) reported other vaccine-eligible children had completed the HPV vaccine series. Most of the parents (n = 173 [88.3%]) were from urban areas compared with rural areas (n = 23 [11.7%]), as categorized by the US Office of Management and Budget.²²

Parent attitudes regarding HPV communication by dentists and dental hygienists

Most parents thought dentists were qualified to counsel about HPV and its vaccine; 128 parents disagreed with the statement, "Dentists are NOT qualified to counsel me or my child about HPV" (66.4%), and 141 parents disagreed with the statement "Dentists are NOT qualified to counsel me or my child about HPV vaccination" (72.6%). Similarly, most of the parents disagreed with statements expressing dental hygienists' lack of qualifications to counsel patients about HPV (n = 117 [60.9%]) or its vaccine (n = 113 [58.5%]) (Table 2).

Few parents (10.3%) agreed with the statement, "I would find a new dentist for my child if he or she talked to me about his or her HPV vaccination status" (Table 2). In addition, more than one-half of parents (62.9%) reported comfort with their child's hypothetically receiving the vaccine during a routine dental examination (Table 3).

Although most parents (89.8%) reported never receiving HPV information from their or their children's dentist, most parents were comfortable with dentists providing written (78.4%) or verbal (80.0%) information about the HPV vaccine to them. Alternatively, fewer parents (69.6%)

Table 3. Frequency of parental comfort overall and by child HPV* vaccination status[†] with the survey questions.

VARIABLE	OVERALL, NO. (%) [‡]	CHILD STARTED HPV SERIES [§]			
		No, No. (%) [‡]	Yes, No. (%) [‡]	Odds Ratio (95% Confidence Interval)	P Value [¶]
Overall	208	76 (38.8)	104 (53.1)	NA [#]	NA
Comfortable With Receiving Written Information About the HPV Vaccine From Your Child's Dentist?	152 (78.4) [14]	59 (77.6)	84 (81.6) [1]	0.79 (0.35 to 1.76)	.57
Comfortable With Your Child's Dentist Talking to You About the HPV Vaccine?	156 (80.0) [13]	54 (71.1)	90 (87.4) [1]	0.36 (0.15 to 0.81)	.01
Comfortable With Other Dental Staff, Such as a Hygienist or Assistant, Talking to You About HPV?	135 (69.6)[14]	48 (63.2)	77 (74.8) [1]	0.58 (0.29 to 1.16)	.10
Comfortable With Your Child's Dentist Talking to Your Child About the HPV Vaccine?	109 (57.1) [17]	35 (46.7) [1]	62 (61.4) [3]	0.55 (0.29 to 1.05)	.07
Comfortable With Your Child's Dentist Recommending That He or She Get the HPV Vaccine From His or Her Regular Doctor?	161 (83.4) [15]	53 (69.7)	94 (92.2) [2]	0.20 (0.07 to 0.50)	< .001
Comfortable With Your Child Receiving the Vaccine During a Routine Dental Examination?	122 (62.9) [14]	42 (55.3)	69 (67.0) [1]	0.61 (0.32 to 1.17)	.12

* HPV: Human papillomavirus. † Parents who did not know their child's HPV vaccination status were excluded. ‡ Values in brackets represent number of missing data. § Starting the HPV vaccination series refers to receiving at least 1 dose. ¶ P value from Fisher exact test. # NA: Not applicable.

reported comfort in receiving HPV information from other dental staff members and reported even less comfort in their children's dentists talking to their children about HPV (57.1%) (Table 3).

Correlates of comfort and agreement with HPV communication with dental care providers

We used Fisher exact tests to test the associations between parent HPV vaccination status and comfort level. Few parents had received the vaccine. No statistically significant differences were found at the .05 level. In addition, no statistically significant associations were found between parents' sexes and comfort levels. The *t* tests were carried out, and we found no significant differences in parents' ages between those comfortable and uncomfortable with each situation.

Fisher exact tests were used to determine whether there was an association between comfort question responses and child HPV vaccination status. Parents whose children had not started the HPV vaccine series were less comfortable with the child's dentist (odds ratio [OR], 0.36; 95% confidence interval, 0.15 to 0.81; *P* = .01) talking to them about HPV vaccination and with the dentist recommending vaccination (OR, 0.20; 95% confidence interval, 0.07 to 0.50; *P* ≤ .001) than those whose children had started the vaccine series (Table 3).

Fisher exact tests were carried out to examine associations between parent education and comfort levels. A statistically significant association was found between levels of parent education and comfort level with the child's dentist talking to them about HPV. Most parents (62.9%) with up to high school or some college were comfortable, while 82.4% with an associate's or bachelor's degree and 85.5% with a graduate or professional degree were comfortable with the same question (*P* = .021).

The percentages of children who started the HPV vaccination series in urban (*n* = 12 [52.2%]) and rural (*n* = 91 [53.2%]) areas were similar. One statistically significant association was found between rural and urban parent's comfort levels with HPV communication with dental care providers. A greater proportion of parents living in urban areas (85.9%) reported comfort in the child's dentist recommending the HPV vaccination than parents living in rural areas (65.2%) (OR, 3.22; 95% confidence interval, 1.06 to 9.12; *P* = .03).

DISCUSSION

Minnesota HPV vaccination rates mirror national trends and fall well below Healthy People 2020 goals. Dental care providers can contribute to increased HPV vaccination rates through education, recommendation, and advocacy. Conceptually, this could also include HPV vaccine delivery. However, dental care providers have reported barriers to HPV discussions with patients.^{1,2,23} Dental care providers report concerns about patients' or parents' perceptions of HPV discussions in the dental office.^{2,23} Little is known about patients' perceptions or expectations of receiving HPV information and vaccine recommendations from dental care providers.

Parents and adolescents have reported comfort in receiving vaccine delivery in alternative settings, including pharmacies and schools.²⁰ Conversely, parents have reported low comfort levels in receiving the vaccine from dentists. Lazalde and colleagues²¹ surveyed a national sample of parents of adolescents to assess their perceptions of the roles of dental care providers in HPV prevention. They found 77% of parents were not comfortable with their adolescent children receiving the vaccination in a dental setting, citing a lack of trust in dentist and dental staff member training and qualifications in vaccine delivery. Parents in their sample reported feeling more comfortable with dentists providing HPV education.²¹

Use of Lazalde and colleagues'²¹ validated survey to assess our population is a strength of our study. Conversely, our study found 62.9% (n = 122) of parents were comfortable with their adolescent children's receiving the vaccine from their dentist. As might be expected, this theme was evident throughout parents' responses. Those parents who had started or intended to start the vaccination series for their adolescent children reported a higher level of comfort and expectation in HPV communication with dental care providers. A total of 78.2% of parents reported that they intended to vaccinate their children. This conflicts with current statistics showing 56.8% of Minnesota adolescents aged 13 through 17 years have received 1 or more doses of the HPV vaccine.²⁴ This may suggest the growing national attention given to HPV vaccination has improved parental attitudes and knowledge of the importance of the vaccine. It may also be that parents who took the survey felt pressured to be up to date with recommendations in front of survey staff, although the survey was taken anonymously.

Similar to Lazalde and colleagues,²¹ parents in our study reported comfort with receiving both written and spoken HPV information from dental care providers. Parents were asked to answer a series of questions after being given the following information: "Some types of HPV can cause mouth and throat cancer. The HPV vaccine can protect against some of these types. Based on this information, please answer the following questions." Most parents reported an expectation that dental care providers would talk to them or their children about HPV and cancer. Nearly three-quarters of the parents reported confidence in dentists' qualifications to counsel them about HPV vaccination. They also expected dentists to be interested in their adolescents' vaccination statuses, and more than one-half of parents reported they would expect dentists to send vaccination reminders. Compared with parents living in urban areas, parents from rural areas reported feeling less comfortable with receiving HPV information or vaccination from dental care providers. Differences in comfort with vaccination counseling or receiving vaccination from dental care providers was significantly lower for parents in rural areas, where vaccination rates were lower. For parents who expressed discomfort, it would not lead parents to find a new dental office for their children if they received HPV information from their dental care provider.

Comfort levels differed with the source of information. Although comfort levels were positive overall, parents reported less comfort with and confidence in dental hygienists and other dental staff members in HPV communication than with the child's dentist. This finding is concerning. A primary role of dental hygienists is counseling and prevention. Compared with dentists, dental hygienists spend more time in patient education and prevention, particularly with children and their parents. However, this finding supports Fico and Lagoe,²⁵ who found that patients reported messages provided by dentists had a greater impact on their oral health than messages provided by dental hygienists.²⁵ Patients may view dentists as having more knowledge and expertise than dental hygienists. It may also be the dental hygienists' communication style. Patients who have experienced negative communication with dental hygienists have reported feeling judged.²⁵

Study limitations

There are several limitations of cross-sectional studies, including response bias related to nonresponse and self-report. Participation was voluntary. Those who participated may have had different

perceptions than those who did not participate. Most participants were white, however, this reflects the racial makeup of Minnesota, which is 80% non-Hispanic white. Most respondents were also female, which is common in studies relying on caregiver report. In addition, a convenience sample can lead to sampling bias. Although the sample size was small, our study provides information that may strengthen the role of dental care providers in advocating for the HPV vaccine.

CONCLUSIONS

Dental care providers have the opportunity to play a key role in increased uptake of the HPV vaccine through increased patient communication. However, dentists and hygienists report fear of adverse patient perceptions. Our study revealed the following: parents are comfortable with HPV communication and vaccine advocacy in dental settings; parents expect their dentists to discuss HPV and recommend vaccination, given the knowledge of the role of HPV in oropharyngeal cancer; and parents reported feeling comfortable with their children receiving the vaccine during routine dental examinations, if given the opportunity. Results of our study show that parents of adolescents in Minnesota are comfortable with HPV counseling by dental care providers. ■

SUPPLEMENTAL DATA

Supplemental data related to this article can be found at: <https://doi.org/10.1016/j.adaj.2020.05.004>.

Ms. Stull is a clinical associate professor, Division of Dental Hygiene, Department of Primary Dental Care, University of Minnesota School of Dentistry, 9-372 Moos Tower, 515 Delaware St SE, Minneapolis, MN 55455, e-mail stul0045@umn.edu. Address correspondence to Ms. Stull.

Ms. Freese is a biostatistician, Clinical and Translational Sciences Institute, University of Minnesota, Minneapolis, MN.

Dr. Sarvas is a clinical assistant professor, Department of Developmental and Surgical Sciences, University of Minnesota School of Dentistry, Minneapolis, MN.

Disclosure. None of the authors reported any disclosures.

ORCID Numbers. Cynthia Stull: <https://orcid.org/0000-0002-3657-5610>; Rebecca Freese: <https://orcid.org/0000-0001-9477-4231>; Elise Sarvas: <https://orcid.org/0000-0002-0454-078X>. For information regarding ORCID numbers, go to <http://orcid.org>.

This research was supported by grant UL1TR002494 from the National Center for Advancing Translational Sciences, National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Center for Advancing Translational Sciences, National Institutes of Health.

1. Walker KK, Jackson RD, Sommariva S, Neelamegam M, Desch J. USA dental health providers' role in HPV vaccine communication and HPV-OPC protection: a systematic review. *Hum Vaccin Immunother*. 2019;15(7-8):1863-1869.

2. Daley EM, Vamos CA, Thompson E, et al. The role of dental providers in preventing HPV-related diseases: a systems perspective. *J Dent Educ*. 2019;83(2):161-172.

3. Arbyn M, Xu L, Simoons C, Martin-Hirsch PP. Prophylactic vaccination against human papillomaviruses to prevent cervical cancer and its precursors. *Cochrane Database Syst Rev*. 2018 May 9;5:CD009069.

4. Centers for Disease Control and Prevention. Human papillomavirus: HPV vaccine scheduling and dosing. Available at: https://www.cdc.gov/hpv/hcp/schedules-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fhpv%2Fhcp%2Fclinician-factsheet.html. Accessed January 26, 2020.

5. Centers for Disease Control and Prevention. 2018 Adolescent human papillomavirus (HPV) vaccination coverage report. Available at: <https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/hpv/reports/2018.html>. Accessed January 26, 2020.

6. Office of Disease Prevention and Health Promotion. Immunization and infectious diseases. Available at: <https://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases/objectives>. Accessed January 26, 2020.

7. Vollrath K, Thul S, Holcombe J. Meaningful methods for increasing human papillomavirus vaccination rates: an integrative literature review. *J Pediatr Health Care*. 2018;32(2):119-132.

8. Head KJ, Biederman E, Sturm LA, Zimet GD. A retrospective and prospective look at strategies to

increase adolescent HPV vaccine uptake in the United States. *Hum Vaccin Immunother*. 2018;14(7):1626-1635.

9. Kornides ML, McRee AL, Gilkey MB. Parents who decline HPV vaccination: who later accepts and why? *Acad Pediatr*. 2018;18(2S):S37-S43.

10. Moss JL, Gilkey MB, Rimer BK, Brewer NT. Disparities in collaborative patient-provider communication about human papillomavirus (HPV) vaccination. *Hum Vaccin Immunother*. 2016;12(6):1476-1483.

11. Fontenot HB, Kornides ML, McRee AL, Gilkey MB. Importance of a team approach to recommending the human papillomavirus vaccination. *J Am Assoc Nurse Pract*. 2018;30(7):368-372.

12. Minnesota Department of Health. Oral health in Minnesota. Available at: <https://www.health.state.mn.us/people/oralhealth/data/oralhealthmn.html>. Accessed April 23, 2020.

13. Lebrun-Harris LA, Canto MT, Vodicka P. Preventive oral health care use and oral health status among US children: 2016 National Survey of Children's Health. *JADA*. 2019;150(4):246-258.

14. Pyrnyia KB, Dahlstrom KR, Sturgis EM. Epidemiology of HPV-associated oropharyngeal cancer. *Oral Oncol*. 2014;50(5):380-386.

15. Luebbers J, Gurenlian J, Freudenthal J. Physicians' perceptions of the role of the dental hygienist in inter-professional collaboration: a pilot study. *J Interprof Care*. 2020 Mar;4:1-4.

16. Fried JL. Confronting human papilloma virus/oropharyngeal cancer: a model for interprofessional collaboration. *J Evid Based Dent Pract*. 2014;14:136-146.

17. American Dental Association. Cancer (head and neck). ADA policy on HPV vaccination. Available at:

<https://www.ada.org/en/member-center/oral-health-topics/cancer-head-and-neck>. Accessed January 26, 2020.

18. American Academy of Pediatric Dentistry. Policy on human papilloma virus vaccinations. Available at: https://www.aapd.org/media/Policies_Guidelines/P_HPV_Vaccinations.pdf. Accessed January 26, 2020.

19. Stull CL, Lunos S. Knowledge, attitudes and practices regarding human papilloma virus communication and vaccine advocacy among Minnesota dentists and dental hygienists. *J Dent Hyg*. 2019;93(1):33-42.

20. McRee AL, Reiter PL, Pepper JK, Brewer NT. Correlates of comfort with alternative settings for HPV vaccine delivery. *Hum Vaccin Immunother*. 2013;9(2):306-313.

21. Lazalde G, Gilkey M, Kornides M, McRee A-L. Parent perceptions of dentists' role in HPV vaccination. *Vaccine*. 2018;36(4):461-466.

22. US Department of Commerce. Metropolitan and micropolitan. Available at: <https://www.census.gov/programs-surveys/metro-micro.html>. Accessed January 26, 2020.

23. Naleway AL, Henninger ML, Waiwaiola LA, Mosen DM, Leo MC, Pihlstrom DJ. Dental provider practices and perceptions regarding adolescent vaccination. *J Public Health Dent*. 2018;78(2):159-164.

24. Minnesota Department of Health. Adolescent immunization coverage in Minnesota. Available at: <https://www.health.state.mn.us/people/immunize/stats/adol/coverdata.html>. Accessed April 23, 2020.

25. Fico AE, Lagoe C. Patients' perspectives of oral healthcare providers' communication: considering the impact of message source and content. *Health Commun*. 2018;33(8):1035-1044.