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ORIGINAL PAPER

HPV vaccination coverage and factors among American Indians in Cherokee Nation

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Abstract

Purpose We estimated human papillomavirus (HPV) vaccine initiation coverage among American Indian adolescents and identified factors associated with HPV vaccination among parents of these adolescents.

Methods We developed, tested, and disseminated a survey to a random sample of 2,000 parents of American Indian adolescents aged 9–17 years who had accessed Cherokee Nation Health Services from January 2019 to August 2020. We used log-binomial regression to estimate the unadjusted and adjusted weighted prevalence proportion ratios (PPR) and 95% confidence intervals (CI) for adolescent HPV vaccine initiation.

Results HPV vaccine initiation coverage (≥ 1 dose) was 70.7% among adolescents aged 13–17 years. The prevalence of HPV vaccine initiation was higher among American Indian adolescents whose parents were aware of the HPV vaccine (adjusted weighted PPR 3.41; 95% CI 2.80, 4.15) and whose parents received a recommendation from their provider (adjusted weighted PPR 2.70; 95% CI 2.56, 2.84). The most common reasons reported by parents to vaccinate their children were to protect them against HPV-associated cancers (25.7%) and receiving a recommendation from a healthcare provider (25.0%). Parents cited vaccine safety concerns as the main reason for not getting their children vaccinated (33.2%).

Conclusions HPV vaccine initiation coverage among American Indian adolescents in Cherokee Nation was consistent with the national survey estimates. However, allaying parental concerns about vaccine safety and encouraging providers to recommend the HPV vaccine could improve coverage.

Keywords American Indians · Adolescents · HPV vaccination · Vaccination coverage · Vaccination barriers · Vaccination factors

Introduction

Persistent infection with high-risk human papillomavirus (HPV) is a necessary cause of cervical cancer and is linked with other cancers. The burden of these HPV-associated cancers is disproportionately higher among American Indian and Alaska Native persons. Nationally, the incidence of HPV-associated cancers was 1.2 times higher among American Indian and Alaska Native women (15.9 per 100,000 women) than among non-Hispanic White women (13.7 per 100,000 women) [1]. In Oklahoma, cervical cancer incidence was highest among American Indian and Alaska Native women (14.8 per 100,000 women), and rates were 1.6 times higher than among White women and 1.5 times higher than among Black women [2]. In the Southern Plains region, which includes Oklahoma, the incidence of oropharyngeal cancers among American Indian and Alaska Native men (12.2 per 100,000 men) was the highest relative to other regions and was approximately 1.3 times higher than the incidence among non-Hispanic White men (9.7 per 100,000 men) [1].

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To prevent HPV-associated cancers, routine vaccination against HPV has been recommended since 2006 for females and since 2011 for males in the United States (US). Routine vaccination is recommended at age 11 or 12 years but can be given as early as 9 years since vaccination is most effective before exposure to HPV through sexual activity [3]. Data on HPV vaccination coverage is needed for some tribal communities, including Cherokee Nation, to measure and monitor progress and identify unvaccinated and undervaccinated groups [4].

To improve vaccination coverage, data on HPV vaccination factors and barriers are needed to inform and tailor interventions. However, fewer studies have assessed HPV vaccination factors and barriers among American Indian and Alaska Native persons than among other racial and ethnic groups. Of these limited studies, some were conducted before 2010, some had methodological issues related to survey sampling and bias, and some did not adequately report ethical concerns or describe how tribal communities were engaged as partners in the research processes [5]. Additionally, American Indian and Alaska Native persons have unique factors and barriers to HPV vaccination receipt that differ from other populations in the US. For example, HPV vaccine-related costs [6, 7] and lack of insurance coverage [8, 9], which have been reported as a barrier to HPV vaccination in the US, may not be directly applicable as tribal citizens have access to health care services because of the treaty rights between the tribes and federal government.

To address these limitations and gaps in the literature, we aimed to: (i) estimate HPV vaccine initiation among American Indian adolescents aged 9 to 17 years accessing Cherokee Nation Health Services in Oklahoma, and (ii) identify factors associated with HPV vaccine acceptance or refusal by parents of American Indian adolescents aged 9 to 17 years accessing Cherokee Nation Health Services. We also assessed HPV vaccine awareness, intentions, and beliefs. In this study, we followed the CONSIDER (Consolidated criteria for strengthening the reporting of health research involving Indigenous Peoples) guidelines [10].

Material and methods

Study population

Cherokee Nation is one of the largest federally recognized tribes in the US, with over 400,000 citizens. Approximately 33% of the tribal population lives on the reservation spanning 14 counties in northeastern Oklahoma. The Cherokee Nation Health Services serves over 100,000 patients through two inpatient facilities and nine outpatient health facilities throughout the reservation [11].

As parents and guardians play a prominent role in the vaccine uptake and vaccination behaviors of their children [12], the target population for this survey was parents or guardians of American Indian adolescents aged 9–17 years who accessed the Cherokee Nation Health Services from January 1, 2018 to August 31, 2020.

Survey measures

Information on survey development, testing, and measures has been provided previously [13]. To inform the development of survey measures, we undertook a literature review to identify and examine adolescent- and adult-directed surveys with questions on HPV vaccination. We also reviewed the Cherokee Nation Comprehensive Cancer Prevention and Control Plan 2018–2022 [14] to ensure that the survey measures aligned with tribal priorities.

HPV vaccine initiation

One of the main study outcomes, HPV vaccine initiation, was defined as the reported receipt of at least one dose of the HPV vaccine. We estimated HPV vaccine initiation through the question: “Has your child ever received an HPV shot or vaccine?”.

HPV vaccination refusal or acceptance

We ascertained the main reasons that parents or guardians refused or accepted the HPV vaccination for their children. We assessed HPV vaccination refusal through the following question: “If your child has NOT received any shots of the HPV vaccine, what is the MAIN reason that your child has NOT received the HPV shot or vaccine? (select ONE response only).” Similarly, we assessed HPV vaccination receipt by asking: “If your child has received any shots of the HPV vaccine, what is the MAIN reason that your child DID receive the HPV shot or vaccine? (select ONE response only).”

Other survey measures

We assessed strong predictors of HPV vaccination in our survey, such as awareness of HPV, awareness of the HPV vaccine, and HPV vaccine recommendation from a health care provider. To compare HPV vaccination coverage with other recommended vaccines for adolescents, we included questions about meningitis and tetanus booster shots in the survey. We also assessed HPV vaccine beliefs, including HPV vaccine importance, intent, and safety.

Survey testing

We undertook expert- and respondent-driven testing of the survey questions through stakeholder meetings, testing, and cognitive interviews.

We tested questions on the primary outcomes and HPV vaccine beliefs at the American Indian Data Community of Practice (AIDCoP) meeting. AIDCoP includes over 80 members from 12 tribal nations and 10 sectors of community, state, tribal, and federal entities across Oklahoma.

We also conducted cognitive interviews to assess whether the respondents understood the survey questions. We enrolled seven participants from Cherokee Nation through an e-mail message sent out to all Cherokee Nation employees. We employed the think-aloud and verbal probing methods to assess question comprehension and identify any issues with interpretation or response [15].

From the AIDCoP meeting and cognitive interviews, we received feedback on the survey measures, content, structure, terminology, and format. Based on this feedback, we revised the survey. The final survey contained 37 questions across ten content areas.

Survey mode and administration

In April 2021, we mailed paper surveys, which also contained a weblink to an online version, offering participants the opportunity to take the survey either on paper or online through REDCap (Research Electronic Data Capture) (version 10.0.1; Vanderbilt University, Nashville, TN). In mixed-mode surveys, inconsistencies in the survey presentation may lead to inconsistencies in measurement. To reduce the potential for this measurement error, we adhered to the guidelines with the underlying principle of *universal presentation* developed by the U.S. Census Bureau, which states that all respondents should be presented with the same question and response categories, regardless of mode [16].

Cherokee Nation Public Health sent an advance letter to inform prospective participants about the survey. As the letter came from a recognized organization in the community, participants may be more likely to respond to the survey, thereby potentially reducing nonresponse error. Furthermore, we sent a round of reminder letters with the survey to a subset of nonrespondents in June 2021 to improve response and reduce nonresponse error.

Analysis

Sampling frame and sample

We used electronic health records (EHR) from Cherokee Nation Health Services as the sampling frame. Using the EHR as the sampling frame reduced the potential for coverage error, which is the bias that occurs when the sampling frame does not cover the target population [17]. From January 1, 2018 to August 31, 2020, 15,803 adolescents aged 9–17 years were seen at the Cherokee Nation Health Services. Using this frame, we drew a probability sample with sample size of 2,000 through a simple random sampling without replacement design using SAS (version 9.4; SAS Institute, Cary, NC).

Sampling weight and raking

We calculated the base weight as the reciprocal of a respondent's inclusion probability. To account for nonresponse and improve the statistical efficiency of the estimates, we used a weighting technique, raking or iterative proportional fitting. Using raking, we matched the marginal distributions from our weighted sample to the marginal distributions from the sampling frame (Cherokee Nation Health Services EHR) for age groups and sex. The resulting adjusted sample weights provided a closer match between our sample and the target population. We used the adjusted sample weights in our regression models.

Sample size

Based on the HPV vaccination coverage of approximately 70% for at least one dose among American Indian and Alaska Native teens nationally [18], we estimated the needed sample size to be 257 with a $\pm 4\%$ margin of sampling error.

Statistical analysis

We calculated the weighted prevalence and 95% confidence interval (CI) for adolescent HPV vaccine initiation. Using PROC GENMOD, we fit log-binomial regression models to estimate unadjusted and adjusted weighted PPR and 95% CI for adolescent HPV vaccine initiation [19].

To assess for confounding, we identified relationships between the variables and outcome through a systematic review and evaluated them in a causal diagram using a directed acyclic graph (DAG) [20]. The search criteria, relationship justifications, model code, and DAG are provided in Supplementary File 1. We evaluated each model in the analysis through the DAG. Based on the minimal sufficient adjustment set obtained through our DAG, we adjusted HPV vaccine awareness (for parent age and parent education), provider recommendation (for HPV vaccine awareness, parent age, and parent education), and adolescent meningococcal vaccination (for provider recommendation) in our model. The use of DAG allows us to avoid mutual adjustment or Table 2 fallacy, where mutually adjusted coefficients are mistakenly treated to have an equivalent interpretation [21].

We used R (version 4.1.0) for raking and SAS (version 9.4; SAS Institute, Cary, NC) for sampling and analysis.

Ethics

The study was approved by the Institutional Review Boards (IRB) of Cherokee Nation and the University of Oklahoma Health Sciences Center (IRB Number 12246) and was conducted in compliance with their requirements.

Results

Overall, 260 eligible parents of American Indian adolescents participated in our survey, for a response rate of approximately 13%. Of these parents, 95.2% were female, 68.9% were married or in a domestic relationship, 50.8% were aged 35–44 years, and 38.1% were college graduates (Table 1). The HPV vaccine initiation coverage (≥ 1 dose) was 70.7% among adolescents aged 13–17 years, 63.2% among adolescents aged 11–17 years, and 51.8% among adolescents aged 9–17 years (Table 2). Among adolescents aged 13–17 years,

Table 1 Demographic characteristics of adolescents and parents or guardians, Cherokee Nation ($n = 260$)

Characteristic [number (%) with available information][a]	Number[b]	Weighted %
Adolescent		
Sex (259 [99.6%])		
Male	126	50.4
Female	133	49.4
Age (260 [100%])		
9–11 years	108	32.2
12–14 years	92	22.7
15–17 years	60	45.1
Ethnicity (259 [99.6%])		
Hispanic or Latino	18	5.9
Not Hispanic or Latino	241	93.8
Parent or guardian		
Sex (259 [99.6%])		
Male	15	4.5
Female	244	95.2
Age (247 [95%])		
≤ 34 years	37	12.0
35–44 years	138	50.8
≥ 45 years	72	37.2
Ethnicity (258 [99.2%])		
Hispanic or Latino	7	1.8
Not Hispanic or Latino	251	97.6
Marital status (255 [98.1%])		
Never married	22	7.9
Married or in a domestic relationship	180	68.9
Other[c]	53	21.6
Parent or guardian education (256 [98.5%])		
High school graduate or less	63	26.7
Some college credit	80	30.1
College graduate or higher	98	38.1
Other[d]	15	5.1

CI confidence interval

[a]Available information does not include missing values and "don't know" response to the survey questions

[b]Unweighted counts represent the actual number of respondents in the survey sample

[c]Other marital status includes widowed, divorced, separated, and unknown marital status

[d]Other education status includes associate's degree, nursing degree, trade and technical schools

Table 2 Estimated HPV vaccine initiation coverage among American Indian adolescents by age groups and sex, Cherokee Nation ($n = 260$)

Characteristic [number (%) with available information][b]	HPV vaccine initiation[a]			
	Yes		No	
	Number[c]	Weighted % (95% CI)	Number[c]	Weighted % (95% CI)
Age				
13–17 years [120 (95.2%)]	82	70.7 (61.6, 79.9)	38	29.3 (20.1, 38.5)
11–17 years [170 (94.4%)]	99	63.2 (55.1, 71.3)	71	36.8 (28.7, 44.9)
9–17 years [246 (94.6%)]	111	51.8 (44.7, 58.9)	135	48.2 (41.1, 55.3)
Sex[d]				
Female [60 (92.3%)]	45	76.4 (64.0, 88.9)	15	23.6 (11.1, 36.0)
Male [59 (98.3%)]	37	66.4 (52.9, 80.0)	22	33.6 (20.0, 47.1)

CI confidence interval, *HPV* human papillomavirus

[a]HPV vaccine initiation is defined as American Indian adolescents who have received at least one dose of the HPV vaccine

[b]Available information does not include missing values and "don't know" response to the question: "Has your child ever received an HPV shot or vaccine?"

[c]Unweighted counts represent the actual number of respondents in the survey sample

[d]Among adolescents aged 13–17 years

initiation coverage was higher among female adolescents (76.4%) compared to male adolescents (66.4%).

Factors associated with HPV vaccine initiation are presented in Table 3. The prevalence of HPV vaccine initiation was higher among American Indian adolescents whose parents were aware of the HPV vaccine (adjusted weighted PPR 3.41; 95% CI 2.80, 4.15) and whose parents received a recommendation from their provider (adjusted weighted PPR 2.70; 95% CI 2.56, 2.84). Also, the prevalence of HPV vaccine initiation was approximately three times higher among adolescents whose parents disagreed that the HPV vaccine causes lasting health problems than among adolescents whose parents who agreed with the statement (weighted PPR 3.32; 95% CI 3.04, 3.63). Furthermore, adolescents who had received a meningococcal vaccine were more likely to receive at least one dose of the HPV vaccine (adjusted weighted PPR 1.41; 95% CI 1.34, 1.48).

The most common reason reported by parents to vaccinate their children was to protect them against HPV-associated cancers (25.7%), followed by receiving a recommendation from a healthcare provider (25.0%) (Table 4). Parents cited HPV vaccine safety concerns as the main reason for not getting their children vaccinated (33.2%). Also, 12% of parents reported that a healthcare provider did not recommend the HPV vaccine.

Discussion

Our survey results revealed that 70.7% of American Indian adolescents aged 13–17 years who had accessed the Cherokee Nation Health Services from January 2019 to August 2020 reported receiving at least one dose of the HPV vaccine. This HPV vaccine initiation coverage among American Indian adolescents in our study is consistent with the national survey estimates for adolescents (71.5%) [4]. Increasing HPV vaccination coverage can prevent HPV-associated cancers in Cherokee Nation. Such improvements are possible, as seen with the coverage of other routinely recommended adolescent vaccines in our study, such as the Tdap booster (85.4%). However, approximately seven percent of the parents in our survey indicated that the COVID-19 pandemic had made it difficult to get the HPV vaccine for their child.

The main reasons provided by parents for vaccinating their children were protecting against HPV-associated cancers and infections and receiving a recommendation from a healthcare provider. Parents viewing cancer prevention as the main reason for HPV vaccination was consistent with a national study that surveyed a diverse group of over 1,100 parents and found cancer prevention the most compelling reason to get their child vaccinated [22]. Similarly, parents ranking protection against HPV infections highly in our survey was also consistent with the national study of diverse parents [22]. Provider recommendation is a crucial determinant for HPV vaccine uptake [23]. In a meta-analysis of 59 studies in the US, provider recommendation was strongly associated with HPV vaccine initiation [24]. In our regression model, the adjusted prevalence of HPV vaccine initiation was 2.7 times higher among those who had received a healthcare provider's recommendation than those who did not receive any recommendation. On the other hand, the lack of a recommendation from a healthcare provider was one of the barriers reported in our survey for non-vaccination. The lack of provider recommendation and weak or inconsistent provider recommendations have been identified as barriers

Table 3 Factors associated with HPV vaccine initiation (receipt of at least one dose) among American Indian adolescents aged 9–17 years, Cherokee Nation ($n = 260$)

Characteristic	Weighted prevalence proportion ratio	
	Unadjusted	Adjusted
	Estimate (95% CI)	Estimate (95% CI)
Parent or guardian age[a]		
≤ 34 years	Reference	–
35–44 years	1.39 (1.29, 1.50)	–
≥ 45 years	1.90 (1.76, 2.04)	–
Parent or guardian education[a]		
High school graduate or less	Reference	–
Some college credit	0.77 (0.75, 0.80)	–
College graduate or higher	0.70 (0.67, 0.73)	–
HPV vaccine awareness[b]		
No	Reference	Reference
Yes	1.81 (1.61, 2.03)	3.41 (2.80, 4.15)
Provider recommendation[c,d]		
No	Reference	Reference
Yes	3.18 (3.02, 3.35)	2.70 (2.56, 2.84)
Adolescent meningococcal vaccination[e]		
No	Reference	Reference
Yes	1.72 (1.64, 1.81)	1.41 (1.34, 1.48)
HPV vaccine can cause side effects[a]		
Strongly agree or somewhat agree	Reference	–
Neither disagree or agree	2.01 (1.93, 2.09)	–
Strongly disagree or somewhat disagree	1.22 (1.17, 1.26)	–
HPV vaccine can cause lasting health problems[a]		
Strongly agree or somewhat agree	Reference	–
Neither disagree or agree	5.05 (4.63, 5.51)	–
Strongly disagree or somewhat disagree	3.32 (3.04, 3.63)	–

CI confidence interval, *HPV* human papillomavirus

[a]Based on the directed acyclic graph (DAG), no adjustment was necessary. Therefore, only unadjusted estimates are presented

[b]Based on the directed acyclic graph (DAG), HPV vaccine awareness was adjusted for parent age and parent education

[c]Provider includes doctor, nurse, or other healthcare provider

[d]Based on the directed acyclic graph (DAG), provider recommendation was adjusted for HPV vaccine awareness, parent age, and parent education

[e]Based on the directed acyclic graph (DAG), adolescent meningococcal vaccination was adjusted for provider recommendation

to vaccination by American Indian parents in previous studies [25, 26].

Adolescents who received the meningococcal vaccine were more likely to initiate the HPV vaccination. While we did not ask participants if they received the HPV and meningococcal vaccines together, concomitant administration of the HPV vaccination with other recommended adolescent vaccinations may produce less stigma around the HPV vaccine and potentially increase HPV vaccine uptake.

Despite the HPV vaccine being safe [27, 28], the main reason reported by parents for not vaccinating their child was concerns about the safety or side effects of the HPV vaccine. In several studies, safety concerns have been reported as a barrier to HPV vaccination by American Indian and Alaska Native parents [26, 29, 30]. Furthermore, safety concerns are among the most common reasons for the lack of HPV vaccine initiation among adolescents, according to studies analyzing data from NIS-Teen [31, 32]. To reassure parents and allay their concerns, interventions should focus on the strong safety profile of the HPV vaccine, as demonstrated by data from the prelicensure trials and post-licensure safety surveillance and monitoring. If safety concerns are adequately addressed by healthcare providers and public health professionals, parents may be more likely to vaccinate

Table 4 Main reasons reported by parents or guardians for vaccinating or not vaccinating American Indian adolescents aged 9–17 years with the HPV vaccine, Cherokee Nation

Reasons[a]	Number[b]	Weighted %	Weighted 95% CI
Vaccination[c] ($n=111$)			
1. Protect child against HPV-associated cancers	30	25.7	(16.5, 34.8)
2. Vaccine recommended by provider[d]	25	25.0	(15.6, 34.4)
3. Protect child against HPV infections	18	12.7	(6.2, 19.2)
No vaccination[e] ($n=135$)			
1. Safety concerns	47	33.2	(24.5, 41.9)
2. Vaccine not recommended by provider[d]	17	12.0	(6.1, 17.8)
3. Child is not sexually active	13	10.1	(4.2, 16.0)

CI confidence interval, *HPV* human papillomavirus

[a]Participants selected one response only

[b]Unweighted counts represent the actual number of respondents in the survey sample

[c]Excludes parents who responded "my child has not received the HPV vaccine" and missing values

[d]Includes doctor, nurse, or other healthcare provider

[e]Excludes parents who responded "my child has received the HPV vaccine" and missing values

their children. For instance, in our study, the prevalence of HPV vaccine initiation was over three times higher among adolescents whose parents disagreed that the HPV vaccine causes lasting health problems when compared with parents who agreed. In addition, the prevalence of vaccine initiation was approximately 20% higher in adolescents whose parents disagreed compared with those whose parents agreed that the HPV vaccine causes side effects.

Our survey has several limitations that merit consideration. First, we estimated HPV vaccination coverage for American Indian adolescents based on self-reported data provided by their parents. Parental reports may under- or over-estimate the number of doses or shots received. However, previous studies have shown high concordance, indicating that parental reports of HPV vaccination status may be reasonably accurate [33, 34]. Future work could compare the HPV vaccination coverage estimated in this survey with the administrative coverage in the Oklahoma State Immunization Information System. Second, and closely related, we relied on parental recall for HPV vaccination factors, which may vary depending on the time elapsed and information regarding the adolescents' immunization, among other factors; however, the impact was somewhat mitigated by surveying parents of age-eligible adolescents. Third, self-reported responses are prone to social desirability bias and may not correlate with actual or future behaviors, such as the intention to receive the HPV vaccine. However, we tried to minimize any resulting bias by assuring the participants in the consent letter that their responses were confidential. Fourth, despite taking several steps, including providing an incentive for participation, sending an advance letter, and mailing a reminder letter to mitigate nonresponse, our response rate was low. However, we used the raking procedure to minimize the impact of nonresponse in our analysis. In addition, the response rate in this survey is comparable to another health system population survey conducted within Cherokee Nation [35]. Fifth, unmeasured confounders, such as mistrust of the medical system and mistrust of the HPV vaccine, were evaluated in the DAG but were not included in the analysis, as we did not measure mistrust in our survey. However, mistrust of the medical system and the HPV vaccine were not identified as confounders for adjustment in the minimally sufficient adjustment sets obtained from the DAG. Sixth, the participants of the cognitive interview to test the survey questions were Cherokee Nation employees, who may differ from our target population in levels of education and comprehension. Nonetheless, the reading difficulty of the final survey ranged from standard to fairly easy based on the Flesch Reading Ease scores. Seventh, although we employed a simple random sampling design, differences in characteristics, such as educational attainment, between the survey and target population may limit the generalizability of our findings. Eighth, we asked parents to select only the main reason for vaccinating or not vaccinating their child. Some parents may have had multiple reasons; however, capturing the main reasons allowed us to identify the most important reasons. Lastly, we did not assess the proportion of adolescents up-to-date with HPV vaccination due to the potential for misclassification stemming from the changes in the number of doses needed by age. HPV vaccines were first recommended as a three-dose series. Currently, two doses are recommended in some age groups; however, recent trials suggest that a single dose provides protection against HPV [36, 37].

Despite these limitations, this survey is the first to elucidate HPV vaccination coverage and HPV vaccination barriers and factors in Cherokee Nation, one of the largest federally recognized tribes in the US. In this survey,

we conducted expert- and respondent-driven testing of the survey questions in multiple ways, including stakeholder meetings, testing, and cognitive interviews. In addition, we undertook probability sampling and used Cherokee Nation Health Services EHR as the sampling frame, reducing the potential for coverage error (that occurs when the sampling frame does not cover the target population). Furthermore, our analysis accounted for nonresponse using a post-stratification weighting technique, raking, which adjusted the sample weights to provide a closer match to our target population. Lastly, to assess for confounding, we identified relationships between the variables and outcome through a systematic review and evaluated them in a causal diagram using a DAG.

Increasing HPV vaccination rates is a crucial step for cancer prevention efforts. It is a tribal priority affirmed in the Cherokee Nation Comprehensive Cancer Prevention and Control Plan 2018–2022. Our findings signal the need to allay concerns about HPV vaccine safety and encourage health care providers to discuss and recommend the HPV vaccine, among other interventions, to improve vaccination coverage in Cherokee Nation.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10552-022-01662-y.

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Data availability The survey data are not publicly available. The data belong to Cherokee Nation.

Declarations

Competing interests The authors have no relevant financial or non-financial interests to disclose.

Ethical approval The project was approved by the Institutional Review Boards (IRB) of Cherokee Nation (approved on 27 July 2020) and the University of Oklahoma Health Sciences Center (IRB Number 12246; approved on 30 July 2020) and was conducted in compliance with their requirements. The Cherokee Nation IRB reviewed and approved this paper before submission to the journal.

Informed consent For cognitive interviews, we obtained verbal consent from participants using an information sheet. For the survey, we obtained a waiver of signed informed consent and added the following statement at the end of the consent form: "by taking the survey, you are agreeing to participate in this study."

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