



Short communication

Geographic variation in human papillomavirus vaccination uptake among 13–17 year old adolescent girls in the United States



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ABSTRACT

Geographic variation in provider-verified human papillomavirus (HPV) vaccine uptake among adolescent girls in the US has not been examined. To investigate this, we analyzed 2011 National Immunization Survey-Teen data. Among 13–17 year old girls ($n = 11,236$), weighted vaccine initiation (48.4%) and completion rates (30.6%) were the lowest in the South when compared to the Northeast (53.4% and 39.9%), Midwest (51.1% and 33.5%) and West (61.6% and 38.7%) ($P < .001$, both for initiation and completion). Multivariable log-binomial regression analysis indicated that 13–17 year old girls living in the South were less likely to initiate [adjusted prevalence ratio (aPR) = 0.86, 95% confidence interval (CI) 0.75–0.97] and complete (aPR = 0.83, 95% CI, 0.74–0.93) the HPV vaccine series compared to girls living in the Northeast. Similar differences were observed when the uptake rates in the South were compared to other regions in the US. Intervention programs to increase HPV vaccine uptake and reduce regional disparities are warranted.

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1. Introduction

About one-quarter of US men and women are infected with human papillomavirus (HPV) which is responsible for 99.8% of cervical cancer cases and 90% of genital warts as well as cancer of the anogenital and head and neck regions [1–6]. Two vaccines (bivalent and quadrivalent) are now available and protect against 70% of cervical cancer cases, while the quadrivalent vaccine also protects against 90% of genital warts cases [4,7]. However, vaccine initiation at a young age is critical as prevalence of HPV infection increases every year between 14 and 24 years of age [1]. One objective of Healthy People 2020 is to increase 3-dose HPV vaccine coverage to 80% among 13–15 year old adolescent females [10]. Although HPV vaccine uptake (3 doses) among 13–17 year old adolescent girls increased to 34.8% in 2011 [8], it is still far below the 75–94% level that is usually needed for herd immunity [9].

Geographic location has been observed as a significant correlate of HPV vaccine uptake among 18–26 year old women [12,13], but not among 11–17 year old adolescent girls [11,14] in the US. In addition, another study also observed variation in HPV vaccine uptake among 13–17 year old girls by individual states based on

data collected from 6 US states [15]. However, these estimates were based on self-reported vaccination status and not confirmed by health care providers. Studies are needed to examine whether similar regional disparities exist based on provider-confirmed vaccination information. The objective of this study was to examine the association between geographic region of the US and HPV vaccine initiation and completion rates among 13–17 year old adolescent girls using data from the National Immunization Survey-Teen (NIS-Teen) 2011.

2. Methods

2.1. Study population

The NIS-Teen study is a yearly cross-sectional survey conducted by the Centers for Disease Control and Prevention (CDC) using two phases of data collection to obtain vaccination information from parents or household members of 13–17 year old adolescents. The survey is based on a stratified national probability sample of households in the United States and uses: (1) a random-digit-dialed telephone survey with parents/guardians of 13–17 year old adolescents and (2) a mailed survey to adolescents' immunization providers identified by the parents/guardians during the telephone survey. Unlike data collected in earlier years, the 2011 NIS-Teen data included interviews collected both by landline telephones

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and cellphones in order to address the rapid rise of cellphone only households [16]. Details of NIS-Teen methodology have been reported elsewhere [17].

A total of approximately 4.9 million telephone numbers (4.3 million landline and 0.6 million cellphone) yielded household interviews for 39,839 teens (34,863 landline and 4976 cell-phone); of whom 24,049 (21,333 landline and 2716 cell-phone) had provider-verified HPV vaccination information. After excluding 485 observations originating from the US Virgin Islands, the number of adolescents became 23,564. We limited our study to 11,236 adolescent girls after excluding 12,328 adolescent boys. The response rate was 57.2% for households with a landline and 22.4% for households with a cellphone [8]. Data collection for the NIS-Teen was approved by the National Center for Health Statistics Research Ethics Review

Board. This study was exempt from review by the University of Texas Medical Branch Institutional Review Board as we used a publicly available de-identified database.

2.2. Measures

We considered provider-verified HPV vaccine initiation (receipt of at least one dose of HPV vaccine) and completion (completed 3-dose HPV vaccine series) among adolescent girls as the primary outcome variables. The main exposure of interest in this study was region of residence. Data from all states were categorized into four distinct regions: Northeast, Midwest, West and South after excluding observations from the US Virgin Islands [18]. *Socio-demographic characteristics included information about the daughter, mother, and*

Table 1
Characteristics of 13–17 year old adolescent girls by region of residence in the US (n = 11,236).

Characteristics	Region of residence				P Value
	Northeast	Midwest	South	West	
Age, year, n (%)					
13	422 (18.6)	490 (20.5)	849 (20.6)	478 (19.5)	.098
14	432 (19.1)	491 (20.5)	857 (20.8)	502 (20.5)	
15	480 (21.2)	467 (19.5)	835 (20.2)	547 (22.3)	
16	468 (20.7)	469 (19.6)	814 (19.7)	501 (20.4)	
17	462 (20.4)	474 (19.8)	771 (18.7)	427 (17.4)	
Respondent's age, year, n (%)					
≤34	125 (5.5)	157 (6.6)	380 (9.2)	180 (7.3)	<.001
35–44	775 (34.2)	1016 (42.6)	1738 (42.1)	1018 (41.5)	
≥45	1364 (60.3)	1218 (50.9)	2008 (48.7)	1257 (51.2)	
Race/ethnicity					
Non-Hispanic white	1669 (73.7)	1851 (77.4)	2461 (59.7)	1574 (64.1)	<.001
Non-Hispanic black	204 (9.0)	197 (8.2)	693 (16.8)	60 (2.4)	
Hispanic	235 (10.4)	184 (7.7)	698 (16.9)	470 (19.1)	
Non-Hispanic other ^a	156 (6.9)	159 (6.7)	274 (6.6)	351 (14.3)	
Marital Status of mother, n (%)					
Married	1678 (74.1)	1827 (76.4)	2977 (72.2)	1891 (77.0)	<.001
Never married/divorced, Widowed/separated/deceased	586 (25.9)	564 (23.6)	1149 (27.9)	564 (23.0)	
Education, n (%)					
<HS	150 (6.6)	173 (7.2)	501 (12.1)	270 (11.0)	<.001
HS graduate	407 (18.0)	427 (17.9)	856 (20.8)	455 (18.5)	
Some college hours	554 (24.5)	733 (30.7)	1050 (25.5)	746 (30.4)	
College graduate	1153 (50.9)	1058 (44.3)	1719 (41.7)	984 (40.1)	
Family income (% of the federal poverty line), n (%)					
<100%	250 (11.8)	298 (13.2)	764 (19.9)	328 (14.2)	<.001
100% to <200%	328 (15.5)	371 (16.4)	663 (17.2)	429 (18.6)	
≥200%	1537 (72.7)	1598 (70.5)	2421 (62.9)	1549 (67.2)	
Eligible for VFC program, n (%)	587 (26.0)	691 (29.1)	1404 (34.1)	799 (32.7)	<.001
Have healthcare coverage, n (%)	2157 (95.3)	2294 (95.9)	3830 (92.8)	2294 (93.4)	<.001
Relationship of respondent to the teen, n (%)					
Mother	1810 (80.0)	1918 (80.3)	3290 (79.8)	1907 (77.7)	.097
Father, grandparent, other	454 (20.1)	471 (19.7)	835 (20.2)	548 (22.3)	
Provider-confirmed seasonal influenza vaccination in past 3 years by age 13, n (%)	408 (18.0)	410 (17.2)	648 (15.7)	376 (15.3)	.031
Provider facility, n (%)					
Public	150 (7.1)	391 (17.6)	730 (19.1)	449 (19.8)	<.001
Private	1432 (67.6)	939 (42.3)	2022 (53.0)	988 (43.6)	
Hospital/mixed/clinics	535 (25.3)	891 (40.1)	1066 (27.9)	831 (36.6)	
Moved from different state, n (%)					
No	1812 (80.0)	2–18 (84.4)	3081 (74.7)	1831 (74.6)	<.001
Yes	452 (20.0)	373 (15.6)	1045 (25.3)	624 (25.4)	
HPV initiation, weighted % (95% CI)	53.4 (50.1–56.6)	51.1 (48.0–54.2)	48.4 (45.8–51.1)	61.6 (57.5–65.5)	<.001
HPV completion, weighted % (95% CI)	39.9 (36.7–43.1)	33.5 (30.6–36.6)	30.6 (28.1–33.2)	38.7 (34.6–43.0)	<.001
HPV vaccine awareness					.042
No	119 (5.3)	170 (7.2)	281 (6.8)	168 (6.9)	
Yes	2129 (94.7)	2204 (92.8)	3825 (93.2)	2260 (93.1)	

HS = High School; VFC = Vaccine for Children program.

^a Also included multiracial.

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