

HPV-Related Cancers and HPV Vaccination Rates in New York State

Introduction

Human papillomavirus (HPV) infection is the most common sexually transmitted infection in the United States. Approximately 79 million Americans are currently infected with HPV, with about 14 million new infections each year (CDC 2017). Several high-risk HPV types have been linked with cancer, specifically HPV types 16 and 18 account for most HPV-related cancers (NCI 2019). HPVs are thought to cause almost all cervical cancers, 90% of anal cancers, 70% of oropharyngeal cancers, 75% of vaginal cancers, 70% of vulvar cancers, and 60% of penile cancers (NCI 2019). Vaccination offers the hope of potentially eliminating many HPV-associated cancers in the future. At present, there are three HPV vaccines approved for use in the United States (FDA 2019). However, Gardasil 9 is the only one currently available in the United States.

The purpose of this short report is to present counts and rates for HPV-related cancers in New York State by sex, race/ethnicity, and geography for the period 2011-2015. We compare these data to national counts and rates and present data on HPV vaccination rates.

For this report, HPV-related cancers were categorized according to the criteria used by Viens et al. (2016). Cancers were restricted to cell types in which HPV DNA is frequently found. Detailed definitions of the cancers included in this report are provided in the appendix.

HPV-related cancer counts and rates

An average of 2,598 New York State residents were diagnosed with an HPV-related cancer each year between 2011 and 2015, among whom 60.7% were women (Fig. 1). Cervical cancer alone accounted for 31.1% of all HPV-related cancers and for 51.2% of the total number of HPV-related cancers among women. Cancers of the oropharynx accounted for 36.9% of all HPV-related cancers, 75.0% of those in men and 12.3% of those in women.

Among females, the rates of HPV-related cancers in New York were similar to those for the nation. For men, rates of anal cancer were about 30% higher than in the nation and oropharyngeal cancer rates about 15% lower. For all HPV-related sites combined and for penis, rates were within 10% (Table 1).

Rates of anal cancer are higher among women than among men, in New York State and nationally. Rates of oropharyngeal cancer among men are more than four times higher than among women. Factors other than HPV, such as smoking and alcohol use, are believed to account for some of the difference in oropharyngeal cancer rates.

HPV-related cancers impact racial and ethnic groups to varying degrees. These disparities have been well-documented by other researchers and are evident in the national data and are accounted for in part by differences in sexual behaviors and differences in cervical cancer screening, follow up, and

treatment of abnormal cervical lesions (Jemal et al., 2013; Brisson et al., 2013; Jeudin et al., 2014). In general, blacks tend to have higher rates of HPV-related cancers, whites and Hispanics have close to average rates, and Asians and Pacific Islanders (APIs) and American Indians/Alaska Natives have lower rates. New York follows the national patterns for women but deviates from them somewhat among men, where rates among whites were slightly higher than those for blacks and Hispanics (Table 2). (The category of American Indians/Alaska Natives was excluded from this report because of very small numbers).

Figure 1 Average annual number of new HPV-related cancers overall, and by sex, in New York State, 2011-2015.

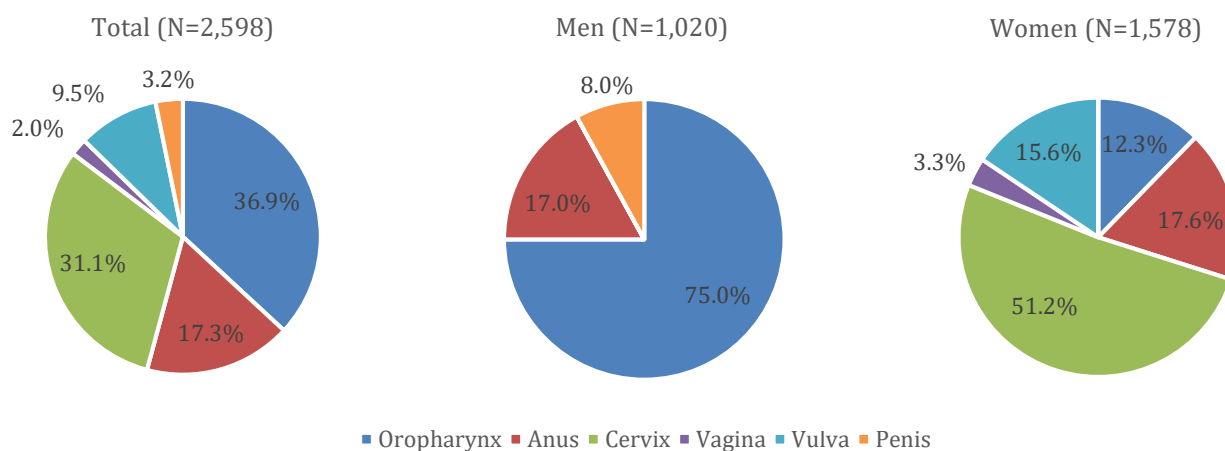


Table 1 Incidence rates for HPV-related cancers by sex, New York State and United States, 2011-2015.

Sex	Cancer Site	New York State ¹		United States ²	
		Cases ³	Rate ⁴	Cases ³	Rate ⁴
Male					
	All HPV-related cancers ⁵	1,020	9.5 (9.2 - 9.8)	18,280	10.4 (10.3 - 10.5)
	Oropharynx	765	7.0 (6.8 - 7.2)	14,814	8.3 (8.2 - 8.3)
	Anus	173	1.7 (1.6 - 1.8)	2,197	1.3 (1.3 - 1.3)
	Penis	82	0.9 (0.8 - 0.9)	1,269	0.8 (0.8 - 0.8)
Females					
	All HPV-related cancers ⁵	1,578	13.5 (13.2 - 13.9)	24,391	13.6 (13.5 - 13.7)
	Oropharynx	194	1.6 (1.5 - 1.7)	3,412	1.7 (1.7 - 1.8)
	Anus	278	2.2 (2.1 - 2.3)	4,333	2.2 (2.2 - 2.2)
	Cervix	807	7.4 (7.2 - 7.6)	11,866	7.2 (7.1 - 7.2)
	Vagina	52	0.4 (0.4 - 0.5)	846	0.4 (0.4 - 0.4)
	Vulva	246	2.0 (1.9 - 2.1)	3,934	2.1 (2.0 - 2.1)

¹Source: New York State Cancer Registry.

²Data are from population-based registries that participate in the National Program of Cancer Registries (NPCR) and/or the Surveillance, Epidemiology, and End Results (SEER) Program and meet high-quality data criteria. These registries cover approximately 99% of the U.S. population.

³Average number of new cases per year, rounded to the nearest integer.

⁴Rates are per 100,000 persons, age adjusted to the 2000 U.S. standard population, with 95% confidence intervals in parentheses.

⁵See appendix for definitions/inclusion criteria.

Table 2 Incidence of HPV-related cancers by race/ethnicity and sex, New York State, 2011-2015.

Cancer Site	Race/Ethnicity	Males		Females	
		Cases ¹	Rate ²	Cases ¹	Rate ²
All HPV-related cancers ³					
	White non-Hispanic	769	10.5 (10.2 - 10.9)	959	12.9 (12.5 - 13.3)
	Black non-Hispanic	117	9.0 (8.3 - 9.8)	284	16.7 (15.9 - 17.6)
	Hispanic	108	8.3 (7.6 - 9.1)	230	14.0 (13.2 - 14.9)
	API ⁴ non-Hispanic	21	2.8 (2.2 - 3.4)	88	9.9 (8.9 - 10.9)
Oropharynx					
	White non-Hispanic	604	8.2 (7.9 - 8.5)	146	1.8 (1.7 - 1.9)
	Black non-Hispanic	74	5.7 (5.1 - 6.3)	26	1.5 (1.2 - 1.7)
	Hispanic	70	5.4 (4.8 - 6.0)	15	0.9 (0.7 - 1.2)
	API ⁴ non-Hispanic	14	1.8 (1.4 - 2.4)	6	0.8 (0.5 - 1.1)
Anus					
	White non-Hispanic	114	1.6 (1.5 - 1.7)	191	2.3 (2.2 - 2.5)
	Black non-Hispanic	32	2.4 (2.1 - 2.9)	44	2.5 (2.2 - 2.9)
	Hispanic	22	1.6 (1.3 - 2.0)	39	2.5 (2.1 - 2.9)
	API ⁴ non-Hispanic	3	0.4 (0.2 - 0.6) *	3	0.3 (0.2 - 0.5) *
Cervix					
	White non-Hispanic			403	6.2 (5.9 - 6.5)
	Black non-Hispanic			171	10.2 (9.5 - 10.9)
	Hispanic			148	8.7 (8.1 - 9.4)
	API ⁴ non-Hispanic			74	8.2 (7.4 - 9.1)
Vagina					
	White non-Hispanic			29	0.3 (0.3 - 0.4)
	Black non-Hispanic			13	0.7 (0.6 - 1.0)
	Hispanic			7	0.5 (0.3 - 0.7)
	API ⁴ non-Hispanic			2	0.3 (0.1 - 0.5) *
Vulva					
	White non-Hispanic			190	2.2 (2.1 - 2.4)
	Black non-Hispanic			30	1.8 (1.5 - 2.1)
	Hispanic			21	1.4 (1.1 - 1.7)
	API ⁴ non-Hispanic			3	0.3 (0.2 - 0.6) *
Penis					
	White non-Hispanic	51	0.8 (0.7 - 0.9)		
	Black non-Hispanic	11	0.9 (0.7 - 1.2)		
	Hispanic	16	1.3 (1.0 - 1.6)		
	API ⁴ non-Hispanic	4	0.6 (0.3 - 0.9)		

¹ Average number of new cases per year, rounded to the nearest integer.

² Rates are per 100,000 persons, age adjusted to the 2000 U.S. standard population, with 95% confidence intervals in parentheses.

³ See appendix for definitions/inclusion criteria.

⁴ API: Asian, Pacific Islander.

* Rates based on fewer than four cases per year (i.e., fewer than 20 cases for the 5-year time period) are unstable.

There were additional racial/ethnic differences for specific HPV-related cancers among males: whites had the highest rate of oropharyngeal cancer, blacks the highest rate of anal cancer, and Hispanics the highest rate of penile cancer. Among women, whites had the highest rate of vulvar cancer. APIs had consistently lower rates across sites, though for some sites the numbers were very small.

In Table 3, the data were further stratified into New York City and the remainder of New York State.

Cancer rates in New York City are typically lower than in the rest of New York State, in part due to lower smoking rates and healthier diets that are typical of immigrants. HPV-related cancers only followed this pattern for men, however. As for specific sites, New York City had higher rates of cervical and male anal cancer, while the remainder of New York State had higher rates of vulvar and oropharyngeal cancer among both sexes.

Table 3 Incidence of HPV-related cancers by race/ethnicity and sex, New York City and New York State excluding New York City, 2011-2015.

Cancer Site Race/Ethnicity	New York City				New York State excluding New York City			
	Males		Females		Males		Females	
	Cases ¹	Rate ²	Cases ¹	Rate ²	Cases ¹	Rate ²	Cases ¹	Rate ²
All HPV-related cancers³								
All	340	8.5 (8.1-8.9)	689	14.4 (13.9-14.9)	681	10.1 (9.8-10.5)	888	13.0 (12.6-13.4)
White non-Hispanic	155	9.6 (8.9-10.3)	224	12.7 (11.9-13.5)	613	10.8 (10.4-11.2)	734	13.1 (12.6-13.5)
Black non-Hispanic	83	9.6 (8.6-10.6)	208	17.5 (16.5-18.7)	34	7.9 (6.7-9.3)	76	15.0 (13.5-16.6)
Hispanic	83	8.9 (8.0-9.9)	176	14.8 (13.8-15.8)	24	6.9 (5.6-8.3)	54	11.7 (10.3-13.2)
API ⁴ non-Hispanic	16	2.8 (2.2-3.5)	72	10.9 (9.8-12.1)	5	2.9 (1.7-4.4)	16	7.0 (5.5-8.7)
Oropharynx								
All	218	5.4 (5.0-5.7)	67	1.4 (1.2-1.5)	547	8.0 (7.7-8.3)	127	1.7 (1.6-1.8)
White non-Hispanic	106	6.5 (6.0-7.1)	30	1.6 (1.4-1.9)	498	8.6 (8.3-9.0)	115	1.8 (1.7-2.0)
Black non-Hispanic	48	5.5 (4.8-6.3)	20	1.6 (1.3-1.9)	26	5.9 (4.9-7.0)	6	1.2 (0.8-1.7)
Hispanic	53	5.6 (4.9-6.4)	13	1.0 (0.8-1.3)	17	5.1 (3.9-6.4)	3	0.6 (0.3-1.1)*
API ⁴ non-Hispanic	10	1.7 (1.3-2.3)	4	0.8 (0.5-1.2)	4	2.3 (1.3-3.7)	2	0.8 (0.4-1.6)*
Anus								
All	87	2.2 (2.0-2.4)	110	2.2 (2.0-2.4)	86	1.3 (1.2-1.5)	168	2.2 (2.1-2.4)
White non-Hispanic	39	2.4 (2.1-2.8)	41	2.1 (1.8-2.4)	75	1.4 (1.2-1.5)	150	2.4 (2.2-2.6)
Black non-Hispanic	25	2.9 (2.4-3.5)	33	2.7 (2.3-3.1)	7	1.6 (1.1-2.3)	11	2.2 (1.6-2.8)
Hispanic	19	2.0 (1.6-2.4)	33	2.8 (2.4-3.3)	3	0.9 (0.5-1.5)*	6	1.5 (1.0-2.1)
API ⁴ non-Hispanic	3	0.4 (0.2-0.8)*	2	0.3 (0.2-0.6)*	0	0.1 (0.0-0.6)*	0	0.2 (0.0-0.6)*
Cervix								
All			409	8.8 (8.4-9.2)			398	6.5 (6.2-6.8)
White non-Hispanic			107	6.7 (6.2-7.4)			296	6.1 (5.8-6.5)
Black non-Hispanic			125	10.7 (9.9-11.6)			46	9.1 (7.9-10.4)
Hispanic			109	9.0 (8.2-9.8)			39	7.9 (6.8-9.2)
API ⁴ non-Hispanic			61	9.2 (8.1-10.3)			13	5.4 (4.2-7.0)
Vagina⁵								
All			24	0.5 (0.4-0.6)			28	0.4 (0.3-0.4)
Vulva								
All			79	1.6 (1.4-1.8)			168	2.2 (2.1-2.4)
White non-Hispanic			37	1.8 (1.5-2.1)			153	2.4 (2.2-2.6)
Black non-Hispanic			22	1.9 (1.6-2.3)			8	1.6 (1.1-2.2)
Hispanic			17	1.4 (1.1-1.8)			5	1.2 (0.8-1.8)
API ⁴ non-Hispanic			2	0.3 (0.1-0.6)*			1	0.5 (0.1-1.2)*
Penis⁴								
All	35	0.9 (0.8-1.1)			47	0.8 (0.7-0.9)		

¹ Average number of new cases per year, rounded to the nearest integer.

² Rates are per 100,000 persons, age adjusted to the 2000 U.S. standard population, with 95% confidence intervals in parentheses.

³ See Appendix for definitions/inclusion criteria.

⁴ API: Asian, Pacific Islander.

⁵ Race/ethnicity specific data are not provided for cancers of the vagina and penis because of small numbers and absence of differences between NYC and the rest of the New York State.

* Rates based on fewer than four cases per year (i.e., fewer than 20 cases for the 5-year time period) are unstable.

Incidence rates for all HPV-related cancers combined are presented for all 62 counties in Table 4. Among males, the rate for Wyoming County was highest at 18.7 per 100,000 persons. Aside from Hamilton County, which had zero cases, Queens County had the lowest rate at 6.3. The highest and lowest rates among females were seen in Wayne County (22.9) and Putnam County (9.1), respectively.

Table 4 Incidence of HPV-related cancers¹ by sex and county, New York State 2011-2015.

County	Males		Females	
	Cases ²	Rate ³	Cases ²	Rate ³
Bronx	67	11.1 (9.9 - 12.4)	127	16.5 (15.2 - 17.9)
Kings	80	7.0 (6.3 - 7.7)	214	14.8 (14.0 - 15.8)
New York	95	11.7 (10.7 - 12.8)	125	12.8 (11.8 - 13.8)
Queens	75	6.3 (5.7 - 7.0)	186	14.2 (13.3 - 15.1)
Richmond	22	8.2 (6.7 - 10.0)	37	12.8 (11.0 - 14.8)
Albany	19	10.9 (8.7 - 13.4)	25	13.7 (11.3 - 16.4)
Allegany	3	11.1 (6.4 - 18.3) *	4	14.3 (8.3 - 23.0)
Broome	14	11.9 (9.2 - 15.1)	16	12.5 (9.7 - 15.9)
Cattaraugus	7	13.5 (9.2 - 19.2)	8	17.9 (12.5 - 24.7)
Cayuga	6	11.2 (7.5 - 16.4)	8	15.2 (10.6 - 21.2)
Chautauqua	9	9.9 (7.2 - 13.5)	14	17.8 (13.6 - 22.8)
Chemung	8	14.4 (10.1 - 20.0)	8	15.6 (10.7 - 21.8)
Chenango	4	10.0 (6.0 - 16.1) *	4	15.2 (9.1 - 23.8)
Clinton	6	12.1 (8.1 - 17.4)	8	17.0 (11.8 - 23.6)
Columbia	5	9.9 (6.3 - 15.3)	6	15.9 (10.4 - 23.4)
Cortland	3	10.0 (5.7 - 16.8) *	4	13.7 (8.0 - 22.1) *
Delaware	4	12.3 (7.3 - 19.8)	4	10.0 (5.8 - 16.7) *
Dutchess	17	9.5 (7.6 - 11.9)	24	13.2 (10.9 - 16.0)
Erie	61	11.3 (10.0 - 12.7)	76	13.3 (11.9 - 14.8)
Essex	4	12.2 (7.0 - 20.2) *	4	16.0 (9.6 - 25.6)
Franklin	3	10.1 (5.8 - 16.5) *	3	10.0 (5.5 - 16.9) *
Fulton	3	6.8 (3.5 - 12.1) *	5	14.4 (9.3 - 21.7)
Genesee	3	10.4 (5.9 - 16.9) *	6	14.0 (9.2 - 20.7)
Greene	4	12.5 (7.8 - 19.5)	5	16.4 (10.3 - 25.1)
Hamilton	0	0.0 (0.0 - 40.8) *	1	20.5 (3.9 - 71.6) *
Herkimer	4	9.4 (5.8 - 14.6)	5	13.7 (8.5 - 20.9)
Jefferson	7	13.1 (9.1 - 18.2)	9	16.2 (11.8 - 21.7)
Lewis	1	7.8 (3.0 - 17.0) *	3	20.2 (11.6 - 33.1) *
Livingston	4	9.1 (5.3 - 14.9) *	4	13.7 (8.2 - 21.2)
Madison	5	10.4 (6.6 - 15.8)	4	9.6 (5.6 - 15.5) *
Monroe	44	10.4 (9.1 - 11.9)	58	12.5 (11.0 - 14.1)
Montgomery	3	10.1 (5.5 - 17.2) *	5	16.1 (10.2 - 24.2)
Nassau	59	7.4 (6.6 - 8.3)	92	10.9 (9.9 - 12.0)
Niagara	18	13.6 (10.9 - 16.9)	19	14.6 (11.7 - 17.9)
Oneida	16	10.6 (8.4 - 13.3)	16	10.8 (8.5 - 13.7)
Onondaga	27	10.6 (8.9 - 12.6)	36	12.8 (10.9 - 14.9)
Ontario	8	10.8 (7.5 - 15.1)	9	13.1 (9.3 - 17.9)
Orange	22	11.1 (9.1 - 13.5)	33	16.2 (13.7 - 18.9)
Orleans	3	10.5 (5.7 - 18.2) *	4	15.9 (9.5 - 25.1)
Oswego	11	14.8 (11.1 - 19.5)	9	12.6 (9.1 - 17.2)
Otsego	5	12.5 (8.0 - 18.9)	4	12.0 (7.3 - 18.9)
Putnam	6	8.1 (5.3 - 12.1)	6	9.1 (5.9 - 13.4)
Rensselaer	10	10.3 (7.5 - 13.9)	15	14.3 (11.1 - 18.1)

County	Males		Females	
	Cases ²	Rate ³	Cases ²	Rate ³
Rockland	12	7.2 (5.5 - 9.3)	25	14.1 (11.6 - 16.9)
St. Lawrence	6	9.2 (6.1 - 13.3)	8	11.7 (8.2 - 16.2)
Saratoga	16	12.2 (9.7 - 15.3)	17	12.4 (9.8 - 15.4)
Schenectady	11	12.0 (8.9 - 15.9)	14	15.0 (11.5 - 19.2)
Schoharie	2	9.8 (5.0 - 18.2) *	2	13.2 (6.5 - 24.1) *
Schuyler	1	10.1 (3.8 - 23.2) *	2	19.1 (9.6 - 35.1) *
Seneca	2	9.3 (4.5 - 17.2) *	2	10.9 (5.3 - 20.2) *
Steuben	9	13.7 (9.9 - 18.5)	9	13.5 (9.6 - 18.4)
Suffolk	90	10.1 (9.2 - 11.1)	108	12.1 (11.1 - 13.2)
Sullivan	4	7.9 (4.8 - 12.5)	8	18.6 (13.1 - 25.8)
Tioga	3	8.4 (4.5 - 14.7) *	3	11.2 (6.3 - 18.6) *
Tompkins	6	11.6 (7.6 - 17.0)	9	16.8 (11.9 - 22.9)
Ulster	15	12.1 (9.4 - 15.4)	15	13.9 (10.7 - 17.6)
Warren	7	16.2 (11.1 - 23.2)	7	16.3 (11.1 - 23.4)
Washington	4	8.6 (5.0 - 13.9) *	6	14.5 (9.4 - 21.4)
Wayne	6	9.5 (6.2 - 14.0)	12	22.9 (17.2 - 30.0)
Westchester	44	7.9 (6.9 - 9.1)	71	11.6 (10.4 - 12.9)
Wyoming	5	18.7 (11.7 - 28.4)	4	16.1 (9.4 - 25.9) *
Yates	2	10.5 (4.7 - 21.1) *	2	16.9 (7.8 - 31.6) *

¹ See Appendix for definitions/inclusion criteria.

² Average number of new cases per year, rounded to the nearest integer.

³ Rates are per 100,000 persons, age adjusted to the 2000 U.S. standard population, with 95% confidence intervals in parentheses.

* Rates based on fewer than four cases per year (i.e., fewer than 20 cases for the 5-year time period) are unstable.

HPV vaccination rates

There are 12 strains of HPV known to cause cancer: 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58 and 59, with strains 16 and 18 causing the majority of HPV-related cancers (Saraiya et al 2015). Three HPV vaccines have been licensed for use by the Food and Drug Administration (FDA 2019): a 9-valent vaccine (Gardasil 9) that is protective against nine HPV types (6, 11, 16, 18, 31, 33, 45, 52, and 58), and two others that are protective against subsets of these types. However, Gardasil 9 is the only HPV vaccine available in the United States. Seven of the nine HPV strains covered by the 9-valent vaccine cause cancer, and together these strains cause 90% of all HPV-related cancers (Joura 2014). HPV types 6 and 11 cause genital warts and are not carcinogenic.

The Advisory Committee on Immunization Practices (ACIP) recommends a 2-dose series of HPV vaccine for girls and boys at age 11 or 12 years, although vaccination may begin as early as 9 years if indicated (Meites et al 2016). A 3-dose series is recommended for those who start the vaccine series on or after their fifteenth birthday, and for persons with certain immunocompromising conditions. ACIP recommends catch-up HPV vaccination through age 26 years for females and age 21 years for males who were not adequately vaccinated previously. Males aged 22 through 26 years with certain risk factors may also receive the HPV vaccine. Ideally, adolescents should be vaccinated before they are exposed to HPV. However, people who have already been infected with one or more HPV types can still get protection from other HPV types in the vaccine.

Since 2006, the Centers for Disease Control and Prevention (CDC) has performed an annual National Immunization Survey (NIS) for adolescents/teens between the ages of 13-17 called the NIS Teen Vaccination Coverage Survey. This survey provides estimated vaccination coverage of this population and specifically surveys for the HPV vaccine. The 2017 survey revealed that HPV vaccination coverage nationally among teens continued to steadily increase but was still far from universal (Walker 2018). Specifically, 66% of teens had received at least one dose of HPV vaccine, but only 49% were up-to-date with the ACIP recommended schedule. Vaccination rates among girls were higher, with 69% of girls and 63% of boys having received at least one dose of HPV vaccine in 2017, up from 65% and 56% in 2016. This gap continued to show a narrowing trend.

In addition, the 2017 survey found that vaccination rates in New York State were equivalent to those in the nation, with 69% of New York teens having received at least one dose of HPV vaccine. New York City had higher up-to-date coverage than the rest of New York State, 61% versus 49%. Compared to 2016, the changes in vaccination rates were not statistically significant in New York State.

HPV vaccination outreach

The New York State Department of Health (Department) is engaged in a variety of outreach activities to improve HPV vaccine awareness and uptake across the state and reduce the burden of HPV-related cancers and disease. The Department, along with the American Cancer Society, is partnering with other immunization and cancer prevention partners from across the state in the New York State HPV Coalition (<http://www.nyshpv.org/>). This Coalition promotes statewide collaboration to increase HPV vaccination rates and decrease HPV-related disease and focuses on public and provider HPV education and HPV policy.

Provider education, to promote a strong, consistent HPV vaccine recommendation, is an important component of HPV outreach. The Department works with all local health departments to conduct Assessment, Feedback, Incentives and eXchange (AFIX) quality improvement visits with healthcare providers to improve HPV immunization practices and rates. In addition, the Department has worked with the National Immunization Partnership with the APA (NIPA) to engage interested pediatric practices from across the state to participate in a comprehensive HPV quality improvement training initiative which includes expanded provider education, technical assistance and follow-up. The Department, along with three local health departments, is participating in a research project with the University of North Carolina evaluating the benefit of physician-to-physician AFIX visits compared to the traditional model. The Department, working with the Center for Public Health Continuing Education at the SUNY Albany School of Public Health, developed a live webcast and a webinar for healthcare providers to encourage them to recommend HPV vaccination. These are available on the Center for Public Health Continuing Education website at: <https://www.albany.edu/sph/cphce/vaccinateny.shtml>.

Public education is also an important component of HPV outreach. The Department has utilized a multi-media approach to educate the public about HPV vaccine to improve uptake. The Department has conducted focus groups with parents of teens to assess HPV vaccine knowledge, attitudes and beliefs as well as barriers to vaccination. Results will inform future HPV vaccine educational and promotional materials.

Conclusion

Although HPV-related cancers represent only a small percentage of the entire cancer burden among New Yorkers, over 2,000 continue to develop HPV-related cancers each year, 60% of whom are women. Among several disparities we have identified, cervical cancer among blacks and oropharyngeal cancer among whites are of particular concern. The widespread availability of the HPV vaccine offers the potential to eliminate HPV-related cancers within the next generation. New York State has historically been a leader in cancer reporting, and now has the opportunity to enhance its efforts in cancer prevention, including HPV vaccination.

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Appendix

Classification criteria used for HPV-related cancers

1. Limited to microscopically confirmed cancers;
2. Limited to site and histology codes specified below.

Cancer Site ¹	ICD-O-3 ² Site Code for included sub-sites	ICD-O-3 Histology Code
Oropharynx	C01.9 Base of tongue, NOS ³ C02.4 Lingual tonsil C02.8 Overlapping lesion of tongue C05.1 Soft palate, NOS C05.2 Uvula C09 Tonsil C10 Oropharynx C14.0 Pharynx, NOS C14.2 Waldeyer ring C14.8 Overlapping lesion of lip, oral cavity and pharynx	Squamous cell carcinomas: 8050-8084, 8120-8131
Anus	C21 Anus and anal canal C20.9 ⁴ Rectum, NOS	Squamous cell carcinomas*: 8050-8084, 8120-8131
Vulva	C51 Vulva	Squamous cell carcinomas*: 8050-8084, 8120-8131
Vagina	C52 Vagina	Squamous cell carcinomas*: 8050-8084, 8120-8131
Cervix	C53 Cervix uteri	All carcinomas: 8010-8671, 8940-8941.
Penis	C60 Penis	Squamous cell carcinomas: 8050-8084, 8120-8131

¹ Cancer site as referred to in this report.

² ICD-O-3, International Classification of Diseases for Oncology, 3rd Edition.

³ NOS, not otherwise specified.

⁴ Squamous cell carcinomas of the rectum are included. Because the rectum is made up of glandular cells and not squamous cells, we assume that microscopically confirmed rectal squamous cell carcinomas were miscoded to the rectum or were overlapping anal lesions.

* Code 8077/2 (intraepithelial neoplasia 3) is excluded for vulvar, vaginal, and anal cancers.