



Trends in HPV-Associated Cancers — United States, 1999–2014

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Background

- Human papillomavirus (HPV) is a known cause of cervical cancer, some oropharyngeal, vulvar, vaginal, penile, and anal cancers
- Cervical cancer is the only HPV-associated cancer with screening guidelines
- We do not expect to observe changes in HPV-associated cancers due to vaccination at this time

Objective

- Provide an update on the epidemiology and burden of HPV-associated cancers
- Examine trends of HPV-associated cancer types in the U.S. population from 1999–2014
 - Age
 - Sex
 - Race
 - Ethnicity

Case Definition for HPV-Associated Cancer

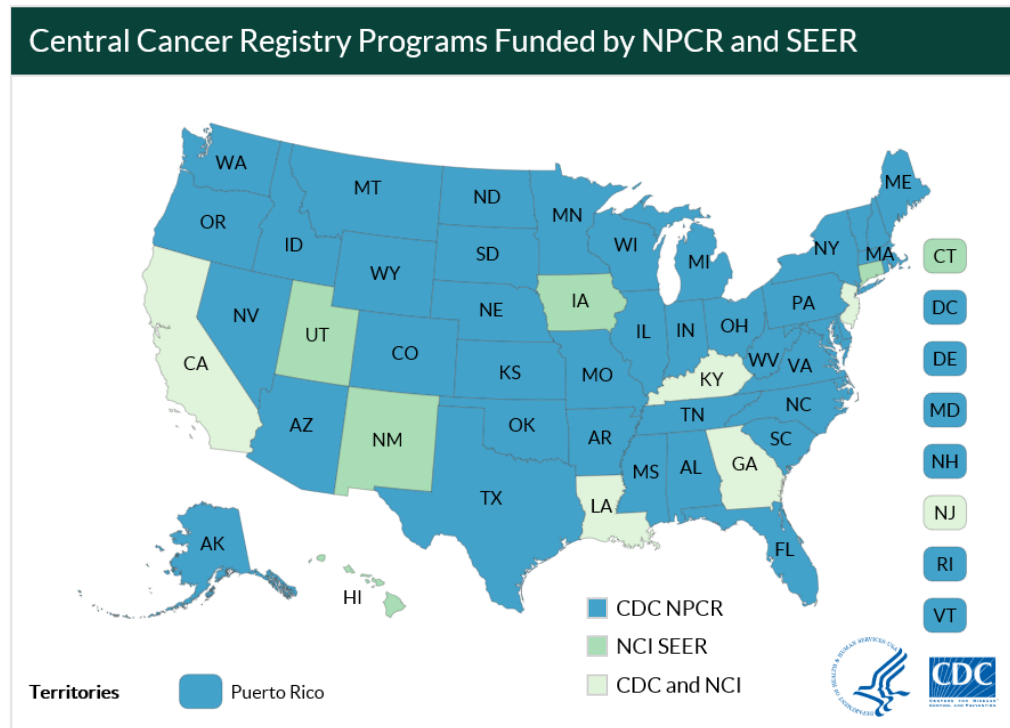
- Cancer registries do not routinely collect HPV genotyping information
- Cell types in which HPV DNA is frequently found
 - Carcinomas of the cervix:
 - Squamous cell carcinomas (SCCs)
 - Adenocarcinomas
 - Other carcinomas
 - SCCs of the:
 - Oropharynx, vulva, vagina, penis, anus*
- Malignant/invasive
- Histologically confirmed

*includes rectal SCC

Cases classified by anatomic site (topographical) and morphology using the *International Classification of Diseases for Oncology, 3rd Edition*

Data Source

- All 50 states, the District of Columbia, and Puerto Rico
- For 1999–2014, registry data that met specific quality standards covered approximately 97% of the U.S. population



CDC = Centers for Disease Control and Prevention; NPCR = National Program of Cancer Registries;
NCI = National Cancer Institute; SEER = Surveillance, Epidemiology, and End Results

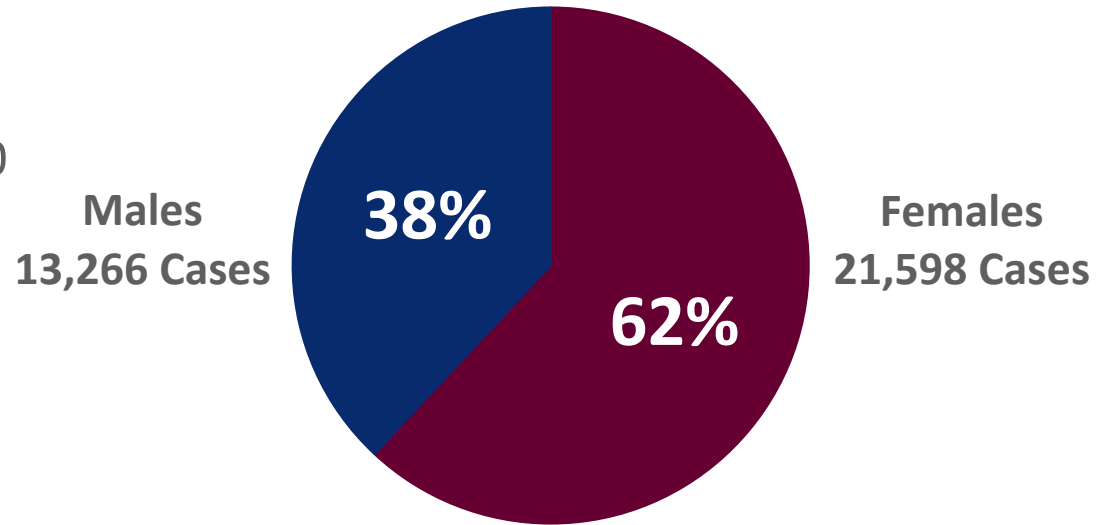


Methods and Data Analysis

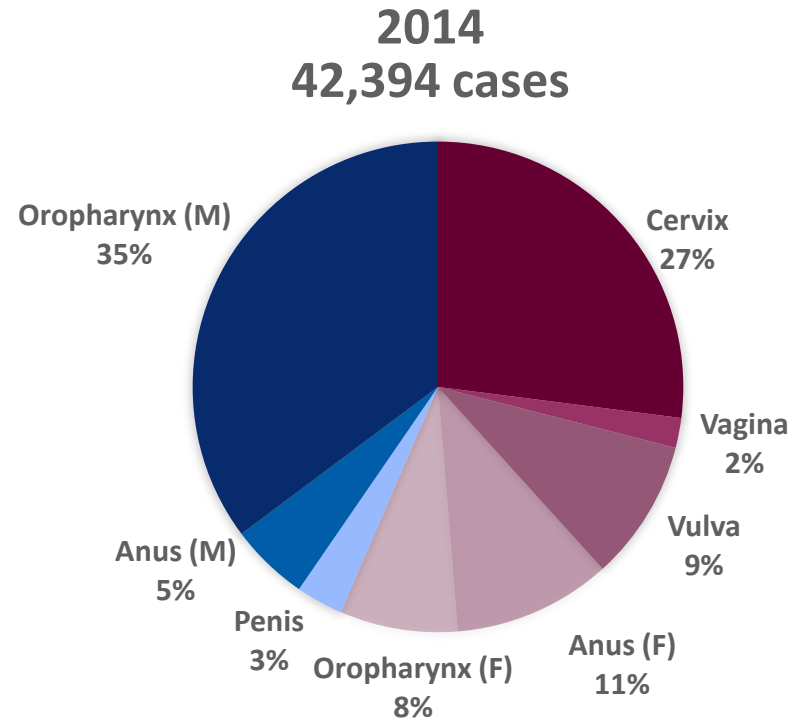
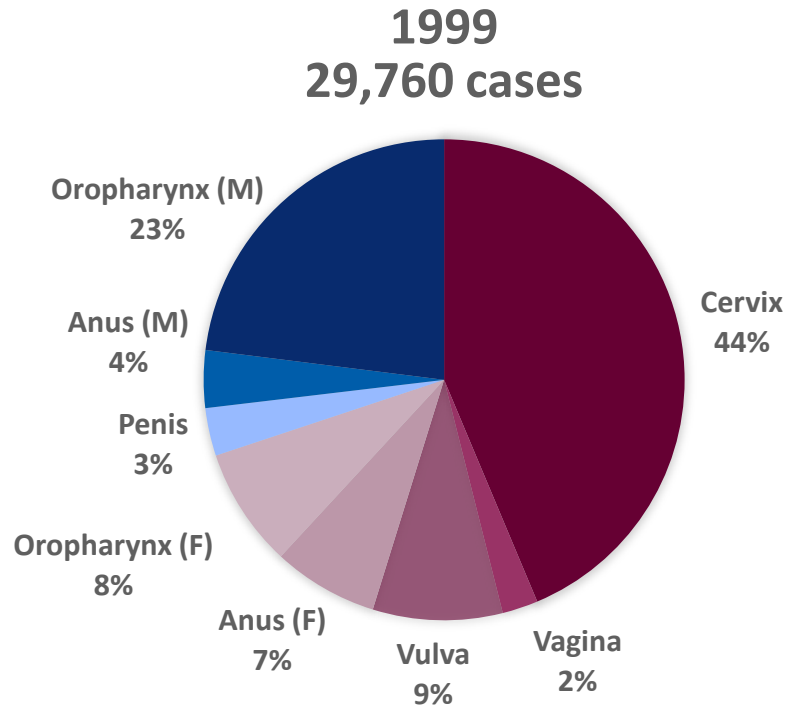
- Average annual percent change (AAPC): weighted average of percent change per year of cancer incidence rates
 - Statistically significant AAPCs were different from zero at the alpha 0.05 level
- Rates and trends were estimated by sex, age group, race, and ethnicity
- Age-adjusted to the 2000 U.S. standard population
- Data were suppressed for rates if cases were <16 per period

Results

- 34,864 cases of HPV-associated cancer were diagnosed annually from 1999–2014
- Incidence rate 11.4 per 100,000 person per year:
 - Males 9.1/100,000
 - Females 13.7/100,000



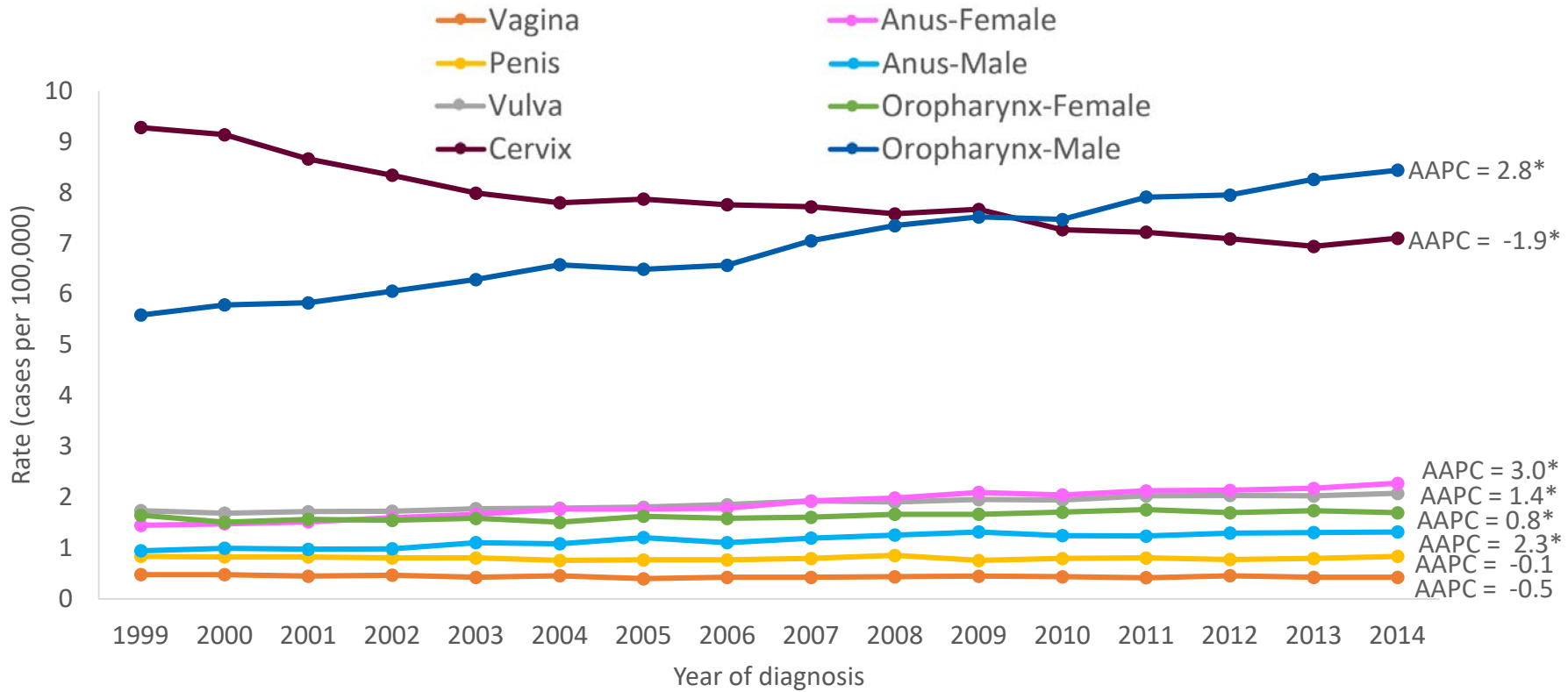
HPV-Associated Cancers by Site and Sex



HPV-associated cancers among males: 1999: 34% → 2014: 44%

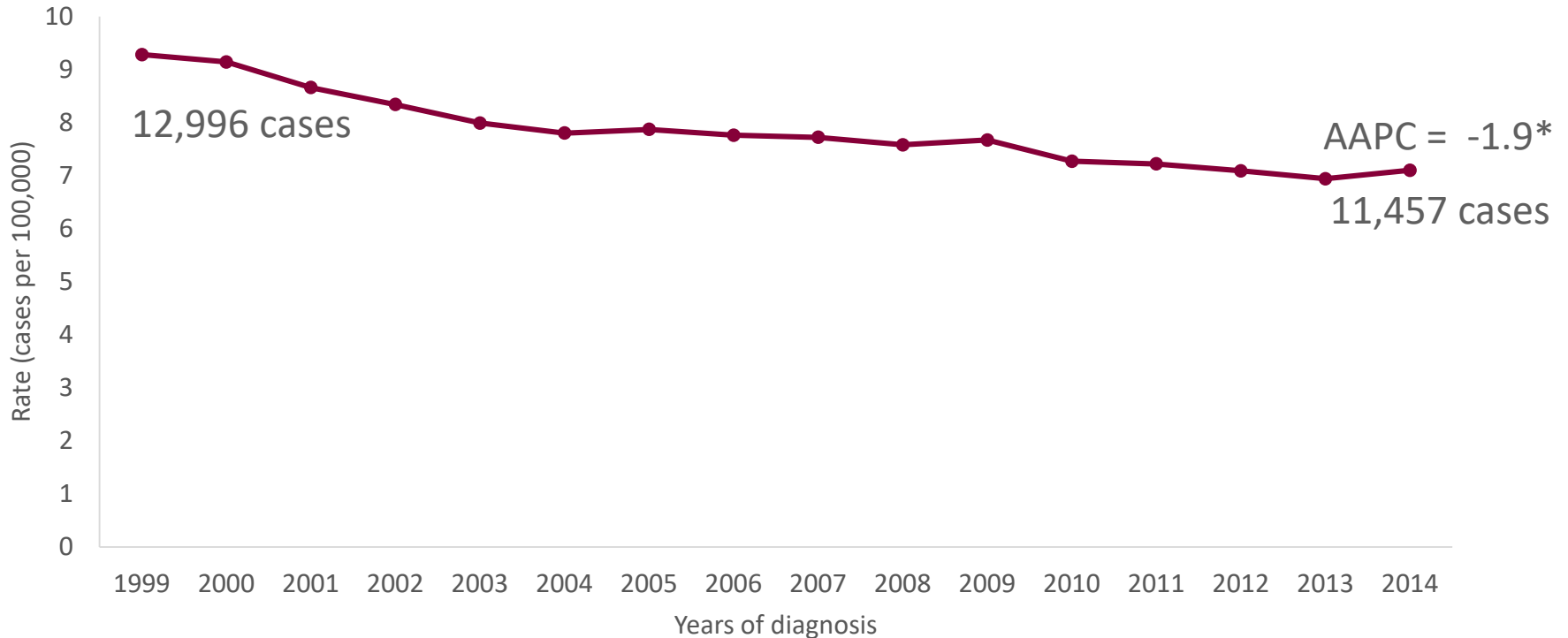
M = male; F = female

HPV-Associated Cancers Trends — United States, 1999–2014



Rates were considered to increase if annual average percentage change (AAPC) >0 (p<0.05) and to decrease if AAPC <0 (p<0.05); otherwise rates were considered stable. * = p<0.05

Cervical Cancer Trends — United States, 1999–2014



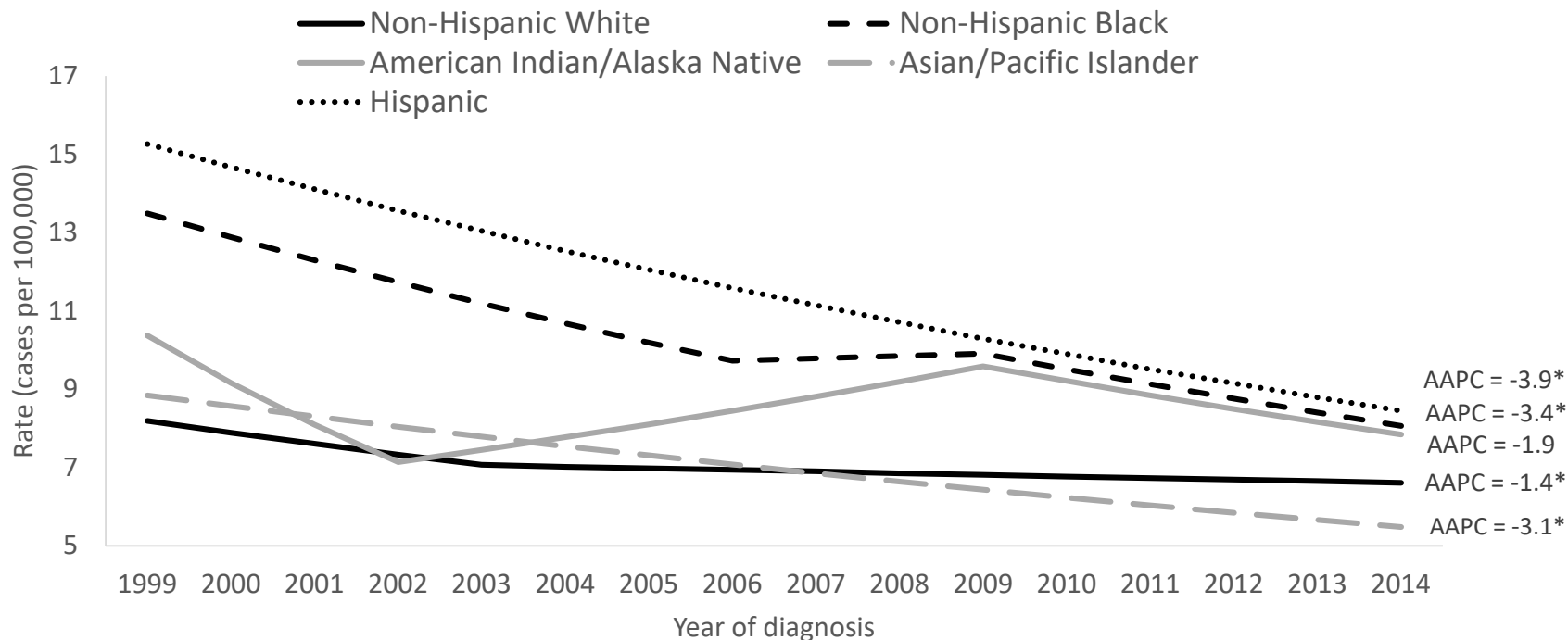
Analyses limited to cervical carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 ($p < 0.05$) and to decrease if AAPC <0 ($p < 0.05$); otherwise rates were considered stable. * = $p < 0.05$.

Cervical Cancer Trends by Age — United States, 1999–2014

Age (Years)	AAPC	(95% CI)	
15–19	**	**	**
20–24	-3.8*	-4.9	-2.7
25–29	-2.7*	-4.0	-1.4
30–34	-1.9*	-2.3	-1.6
35–39	-1.2	-2.4	0.0
40–44	-1.1*	-1.5	-0.6
45–49	-1.4*	-2.3	-0.4
50–54	-1.7*	-2.5	-0.8
55–59	-2.2*	-3.1	-1.2
60–64	-2.8*	-3.7	-2.0
65–69	-3.0*	-3.6	-2.4
≥70	-3.2*	-3.9	-2.6

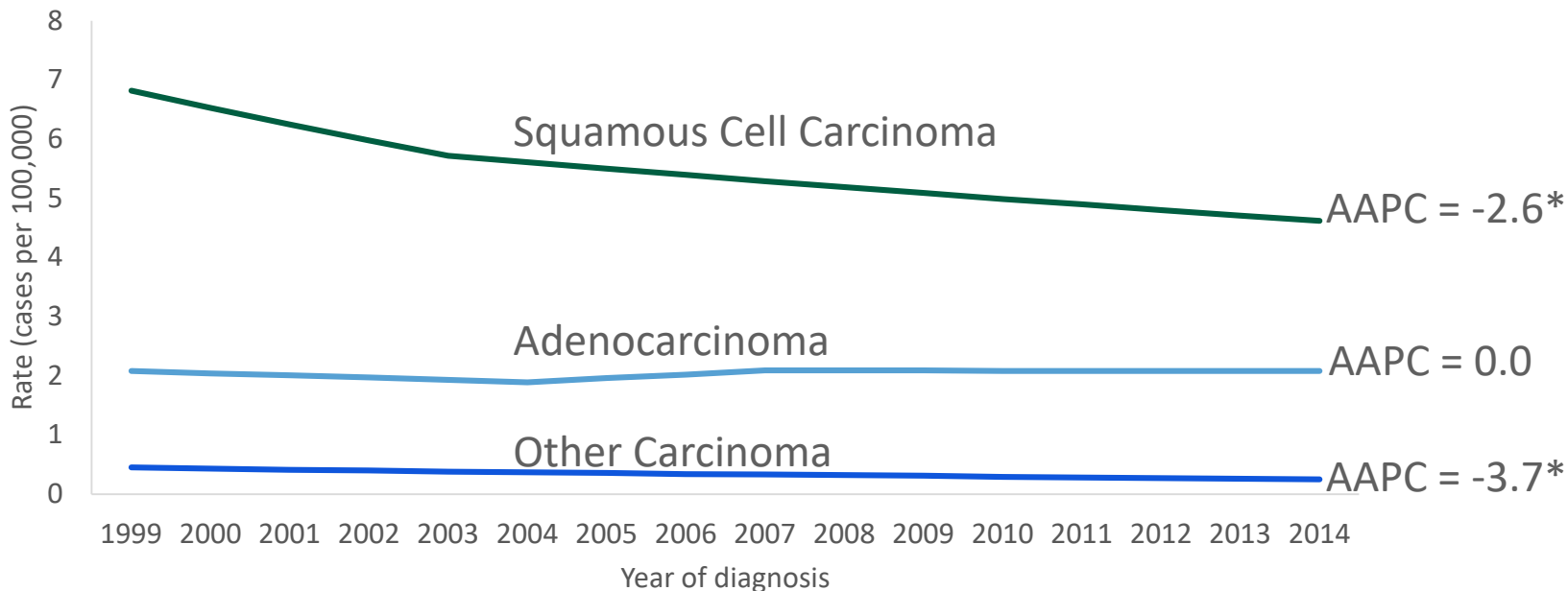
Analyses limited to cervical carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 (p<0.05) and to decrease if AAPC <0 (p<0.05); otherwise rates were considered stable. * = p<0.05. ** Data suppressed.

Cervical Cancer Trends by Race/Ethnicity — United States, 1999–2014



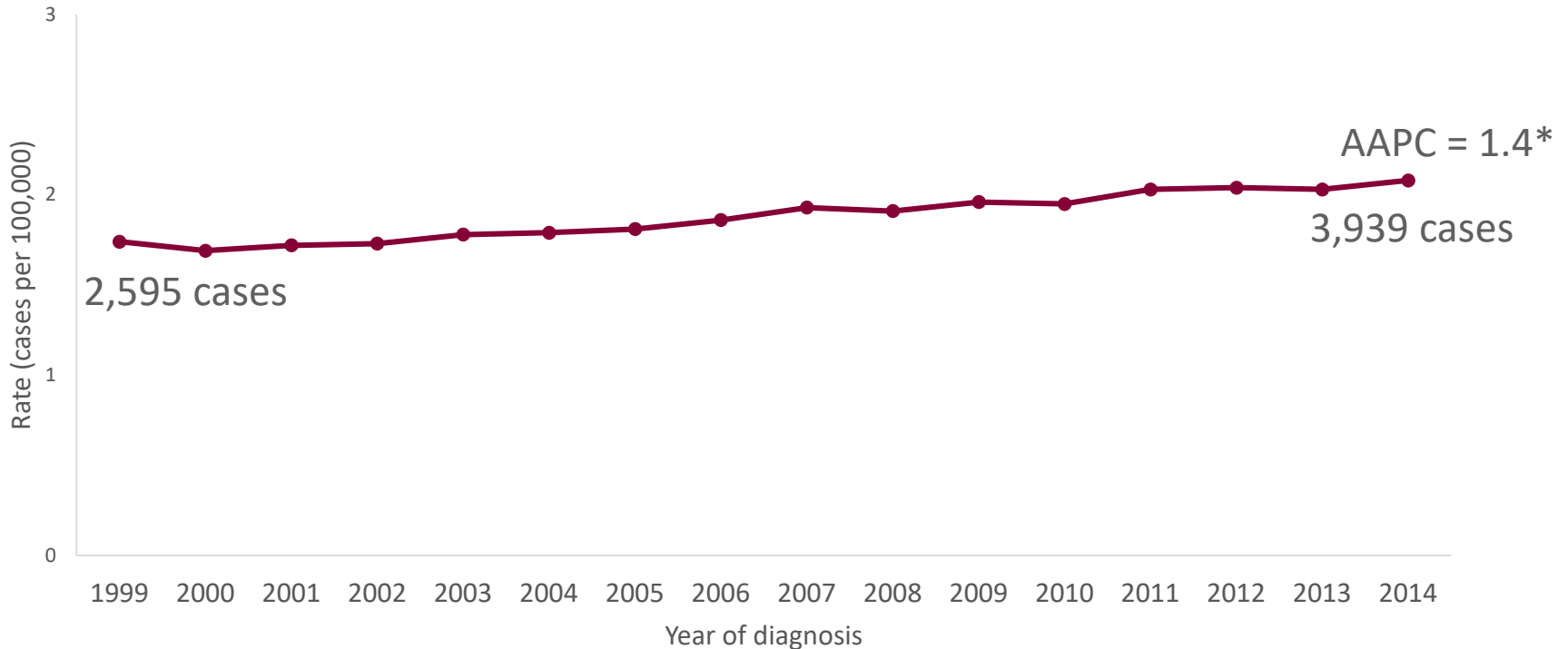
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Cervical Cancer Trends by Histology — United States, 1999–2014



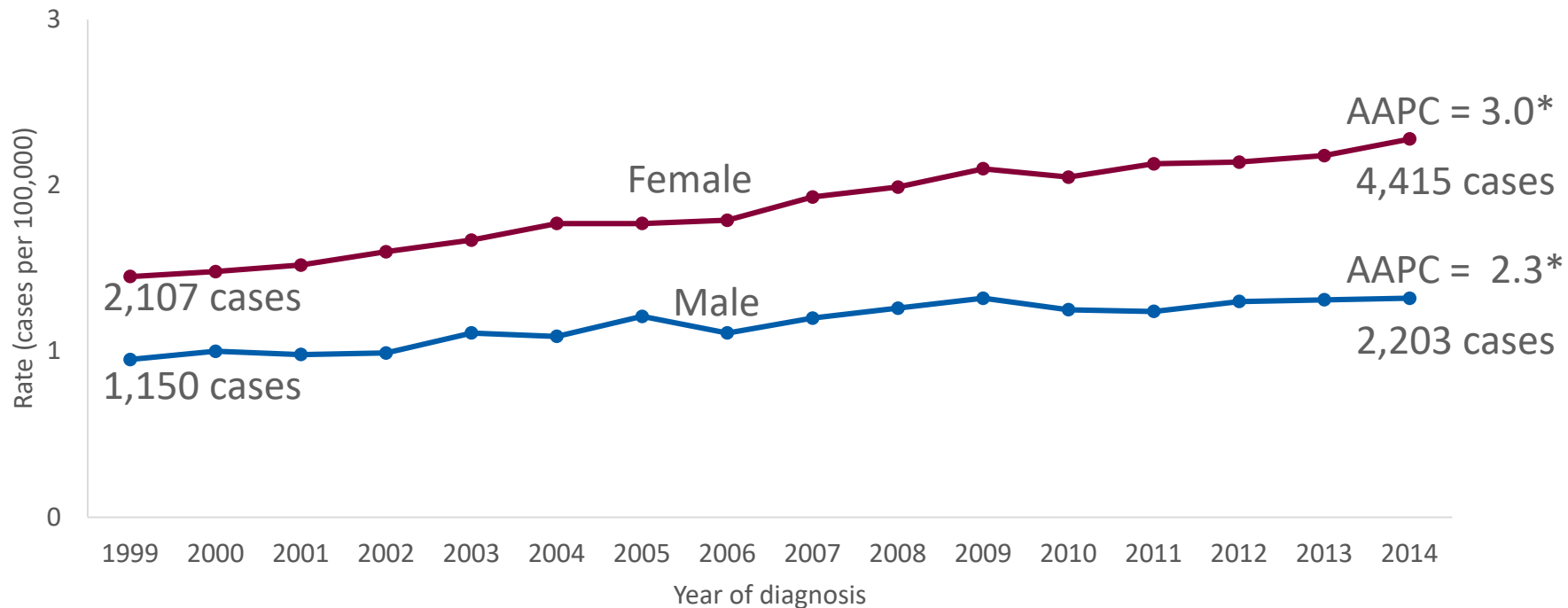
Analyses limited to cervical carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 ($p < 0.05$) and to decrease if AAPC <0 ($p < 0.05$); otherwise rates were considered stable. * = $p < 0.05$.

Vulvar Cancer Trends — United States, 1999–2014



Analyses limited to vulvar squamous cell carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 ($p < 0.05$) and to decrease if AAPC <0 ($p < 0.05$); otherwise rates were considered stable. * = $p < 0.05$.

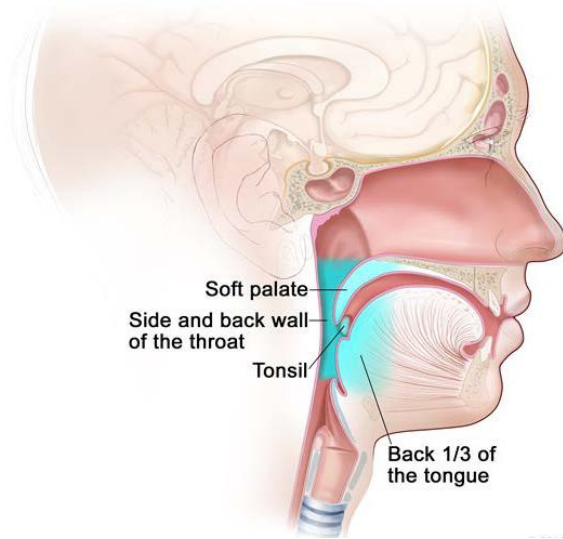
Anal Cancer Trends — United States, 1999–2014



Limited to anal squamous cell carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 ($p < 0.05$) and to decrease if AAPC <0 ($p < 0.05$); otherwise rates were considered stable. * = $p < 0.05$.

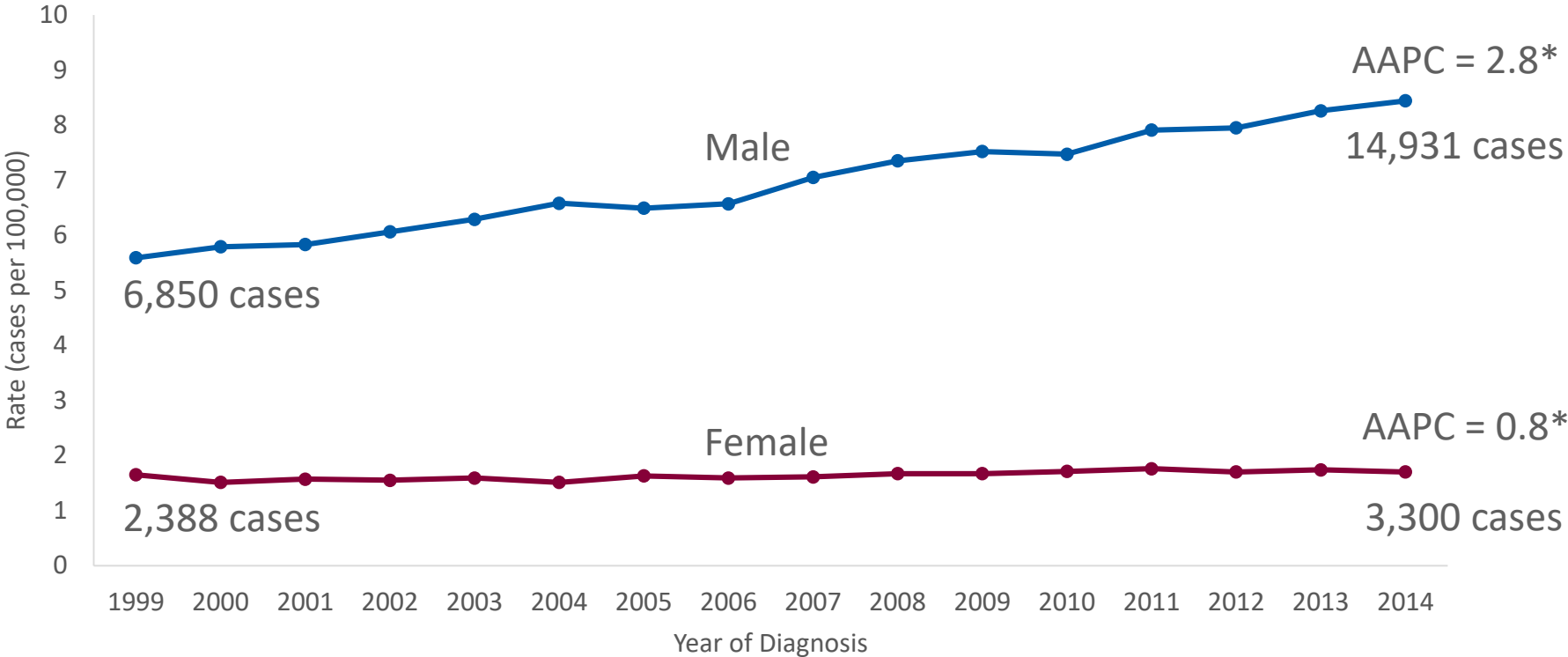
Anatomy of the Oropharynx

Parts of the Oropharynx



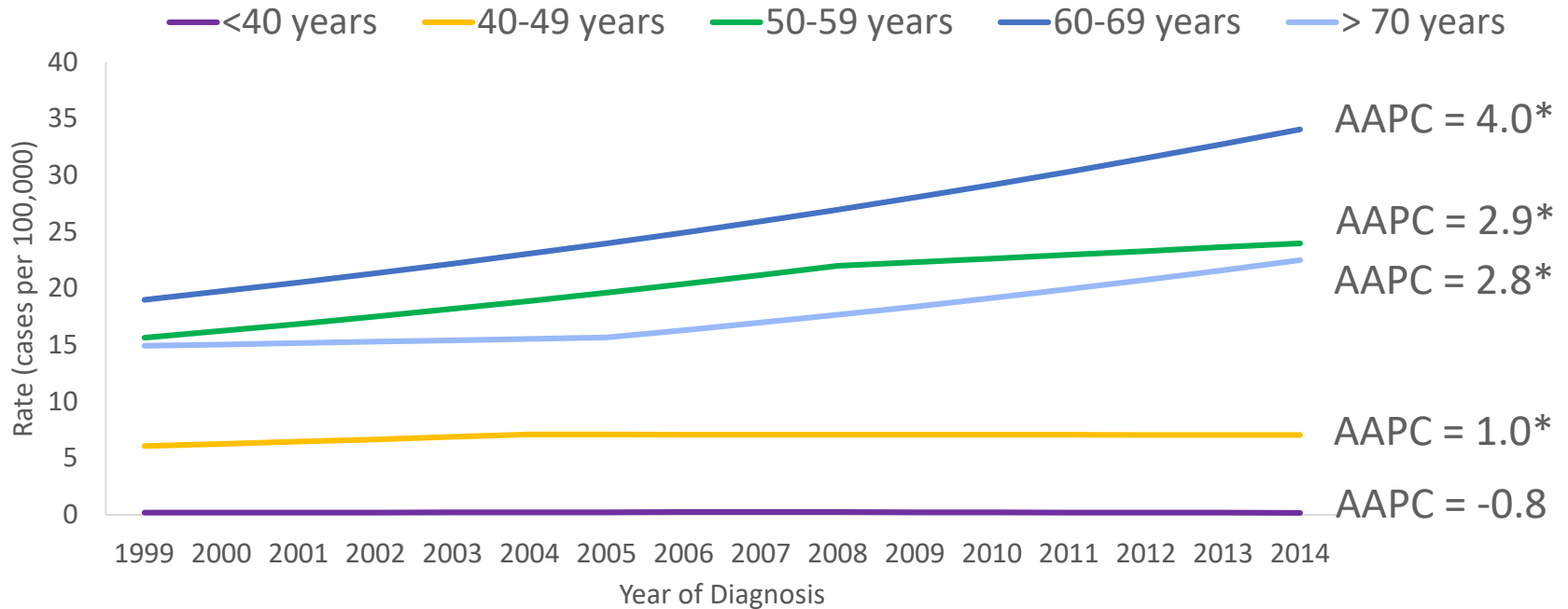
- The parts of the oropharynx are:
 - Soft palate
 - Side and back walls of the throat
 - Tonsils
 - Back one-third of tongue (base of tongue)

Oropharyngeal Cancer Trends — United States, 1999–2014



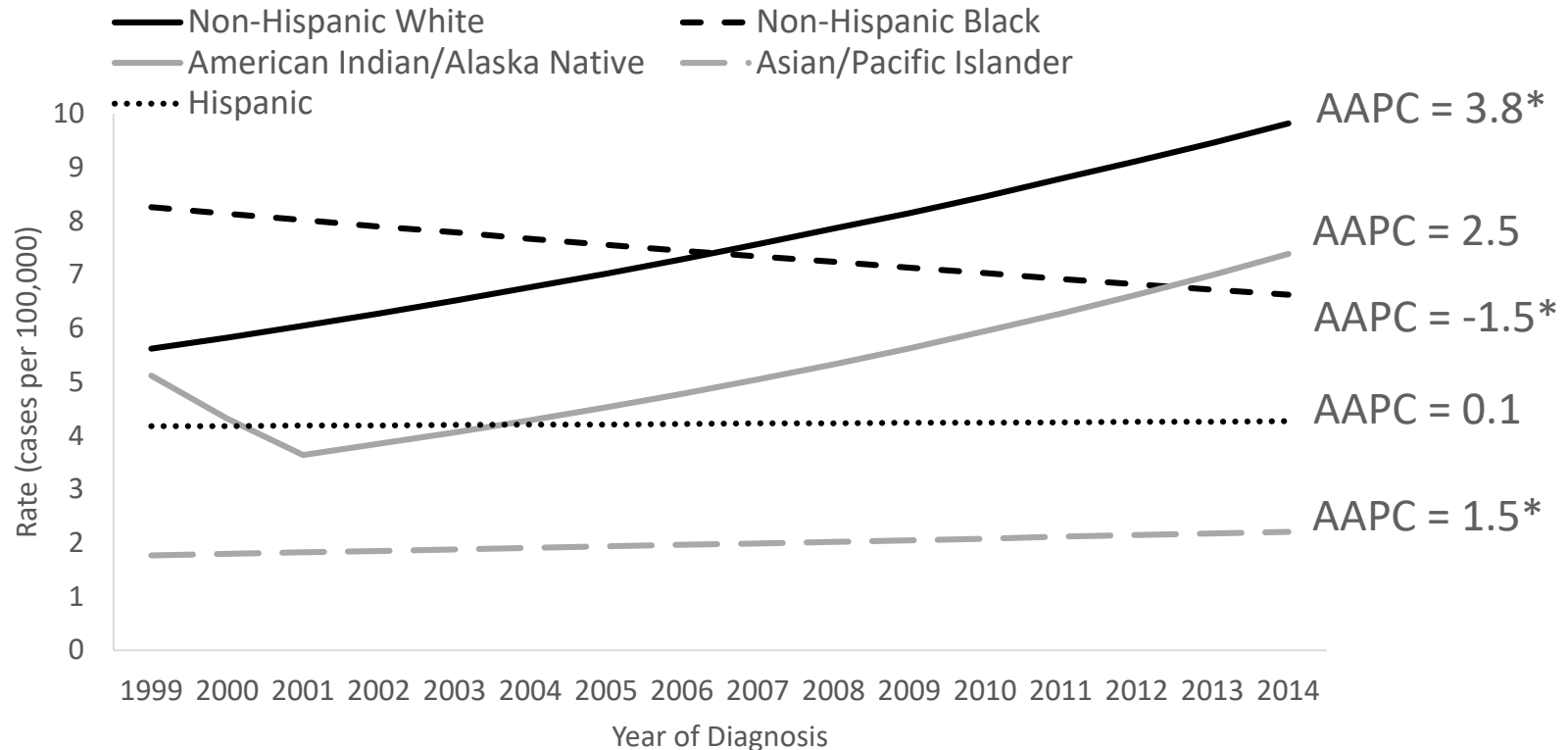
Analyses limited to oropharyngeal squamous cell carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 (p<0.05) and to decrease if AAPC <0 (p<0.05); otherwise rates were considered stable. * = p<0.05.

Oropharyngeal Cancer Trends among Men by Age — United States, 1999–2014



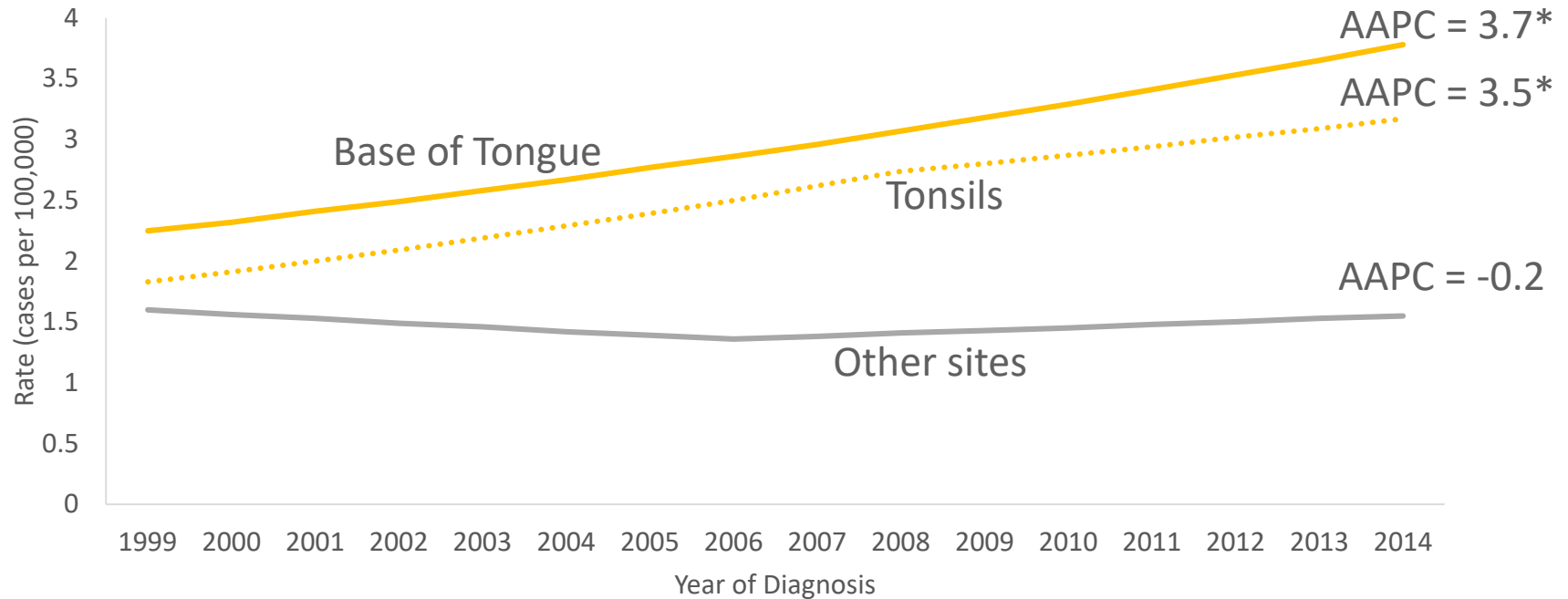
Analyses limited to oropharyngeal squamous cell carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 (p<0.05) and to decrease if AAPC <0 (p<0.05); otherwise rates were considered stable. * = p<0.05.

Oropharyngeal Cancer Trends among Men by Race/Ethnicity — United States, 1999–2014



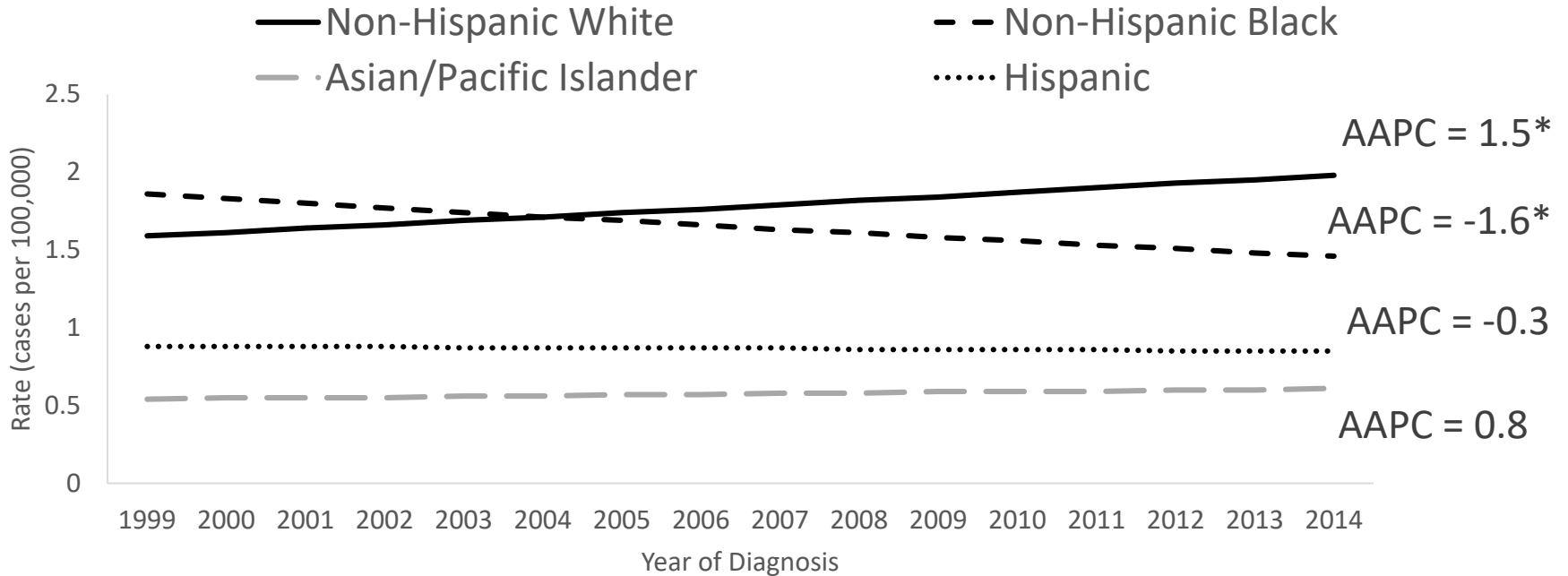
Analyses limited to oropharyngeal squamous cell carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 (p<0.05) and to decrease if AAPC <0 (p<0.05); otherwise rates were considered stable. * = p<0.05.

Oropharyngeal Cancer among Men by Primary Site — United States, 1999–2014



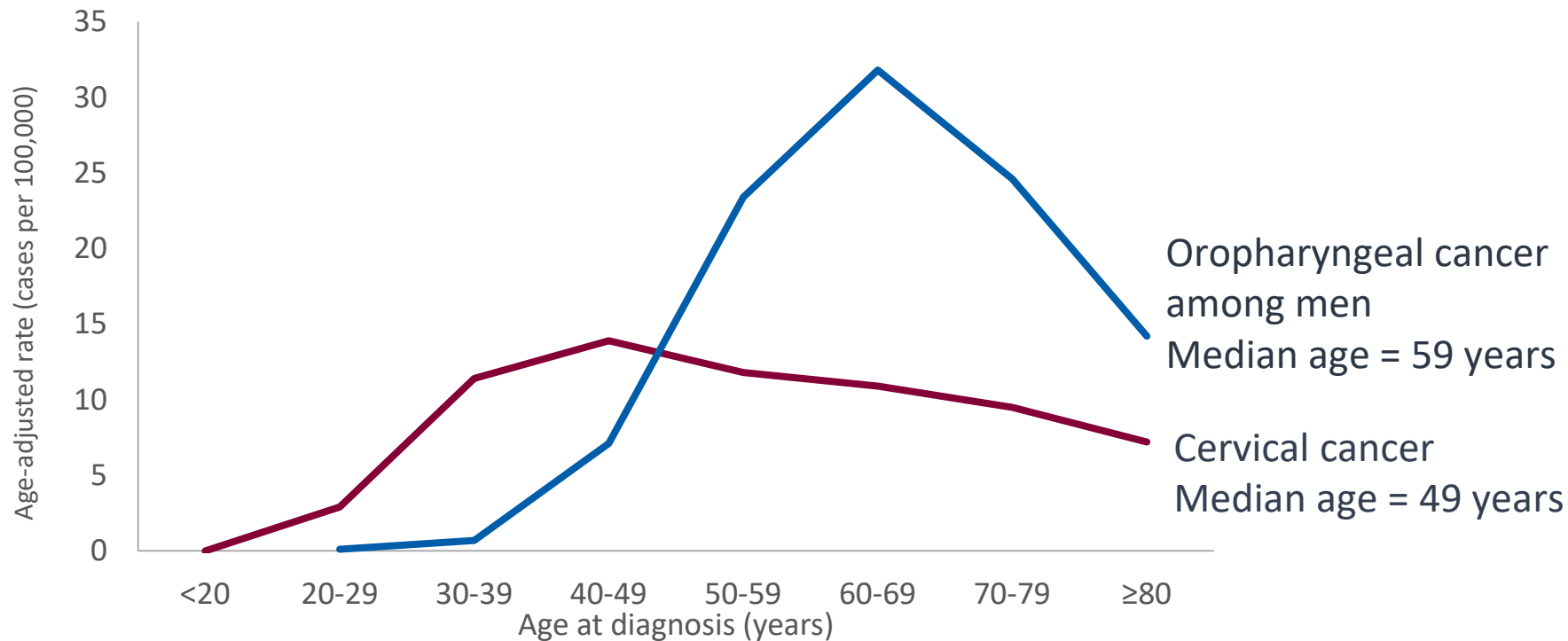
Analyses limited to oropharyngeal squamous cell carcinomas. Rates were considered to increase if annual average percentage change (AAPC) >0 ($p < 0.05$) and to decrease if AAPC <0 ($p < 0.05$); otherwise rates were considered stable. * = $p < 0.05$.

Oropharyngeal Cancer Trends among Women by Race/Ethnicity — United States, 1999–2014



Analyses limited to oropharyngeal squamous cell carcinomas. Trends were measured with AAPC in annual rates (per 100,000, age-adjusted to the 2000 U.S. standard population). Rates were considered to increase if AAPC >0 ($p < 0.05$) and to decrease if AAPC <0 ($p < 0.05$); otherwise rates were considered stable. *Data suppressed for American Indian/Alaska due to counts. * = $p < 0.05$.

Oropharyngeal Cancer among Men and Cervical Cancer by Age — United States, 2010–2014



Strengths

- Systematic population-based approach to monitor HPV-associated cancers in the United States
- High quality data from cancer registries
- Covers the entire U.S. population, so can be used to look at rare cancers
- Assesses trends among age groups and race/ethnicity

Limitations

- Registries do not routinely collect information on HPV DNA status in cancer tissue
- Reporting of race and ethnicity uses data from medical records, which might be inaccurate in a small proportion of cases
- Registries do not necessarily collect information high-risk groups (e.g. HIV)

Summary

HPV-associated cancer rates are changing from 1999–2014

- Increased:
 - Oropharyngeal cancer among men and women
 - Anal cancer among men and women
 - Vulvar cancer
- Decreased:
 - Cervical cancer
- Stable:
 - Penile cancer
 - Vaginal cancer

Conclusion

- Oropharyngeal cancer is now the most common HPV-associated cancer and increasing, particularly among males
- In the future, the HPV vaccine should decrease the burden of HPV-associated cancers, but it may take decades to see population-level impact due to the length of time between the initial HPV infection and the development of cancer

Thank you

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

