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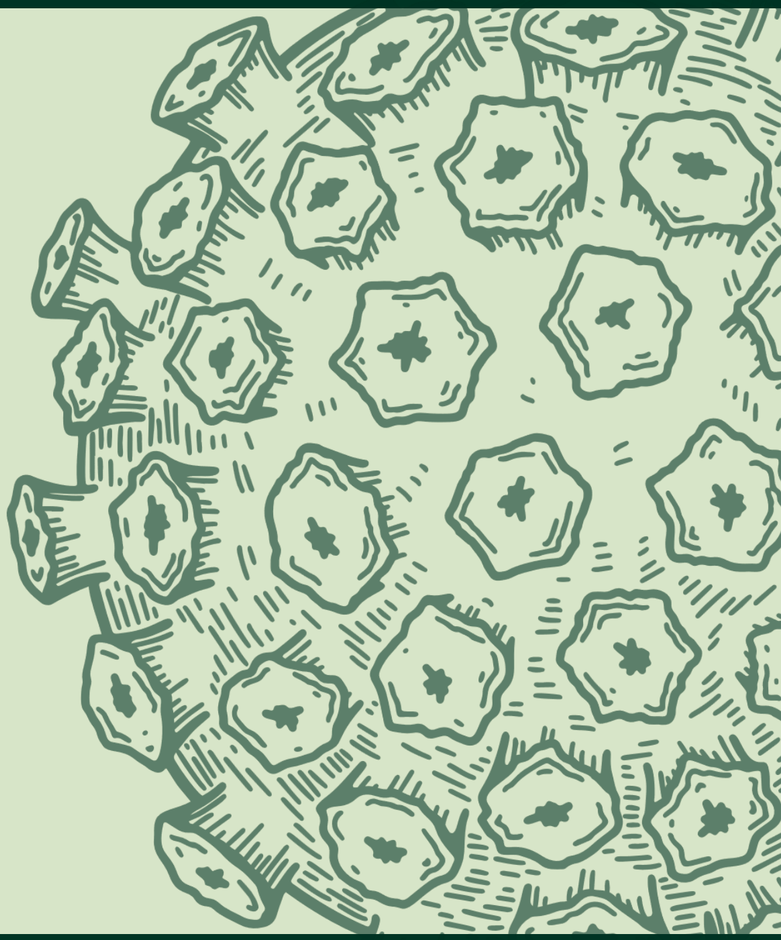
HPV Infection: Immunizing for Cancer Prevention



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Objectives

By the end of today we hope you feel more confident in addressing HPV vaccination with patients and have fewer missed opportunities!

1. Why HPV Matters
2. Summarize HPV vaccine efficacy, real-world effectiveness, and current coverage data
3. Review provider and system-wide ways to increase HPV vaccination rates

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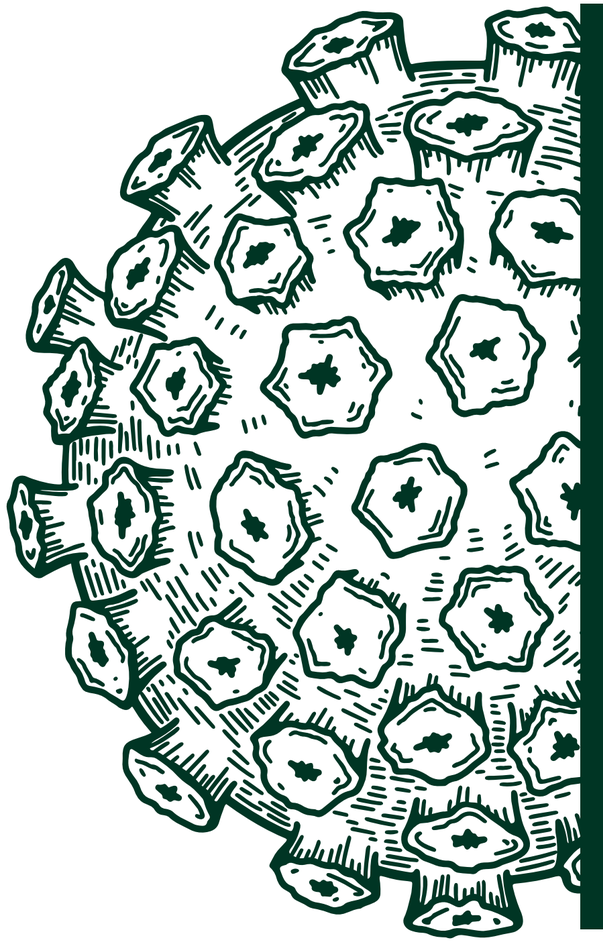
Why HPV Matters



HPV is the MOST common STI worldwide.

85% of people will get an HPV infection in their lifetime.

Almost every unvaccinated person who is sexually active will get HPV at some time in their life.

90%

Most HPV infections (9 out of 10) go away on their own within 2 years.

But sometimes, HPV infections will last longer and can cause certain types of cancer.

Chesson et al, Sex Transm Dis, 2014; WHO, 2024

HPV Genotypes and Their Disease Associations

Mucosal/Genital sites of infection

High Risk
(oncogenic)
16, 18, 31, 33, 45, 52, 58, 35, 39, 51, 56, 59, 68

High- or low-grade lesions of genital tract

Cervical, anal, penile, vaginal, vulvar, and oropharyngeal cancer

Low risk
(non-oncogenic)
6, 11

Low-grade lesions of genital tract

Anal and genital warts

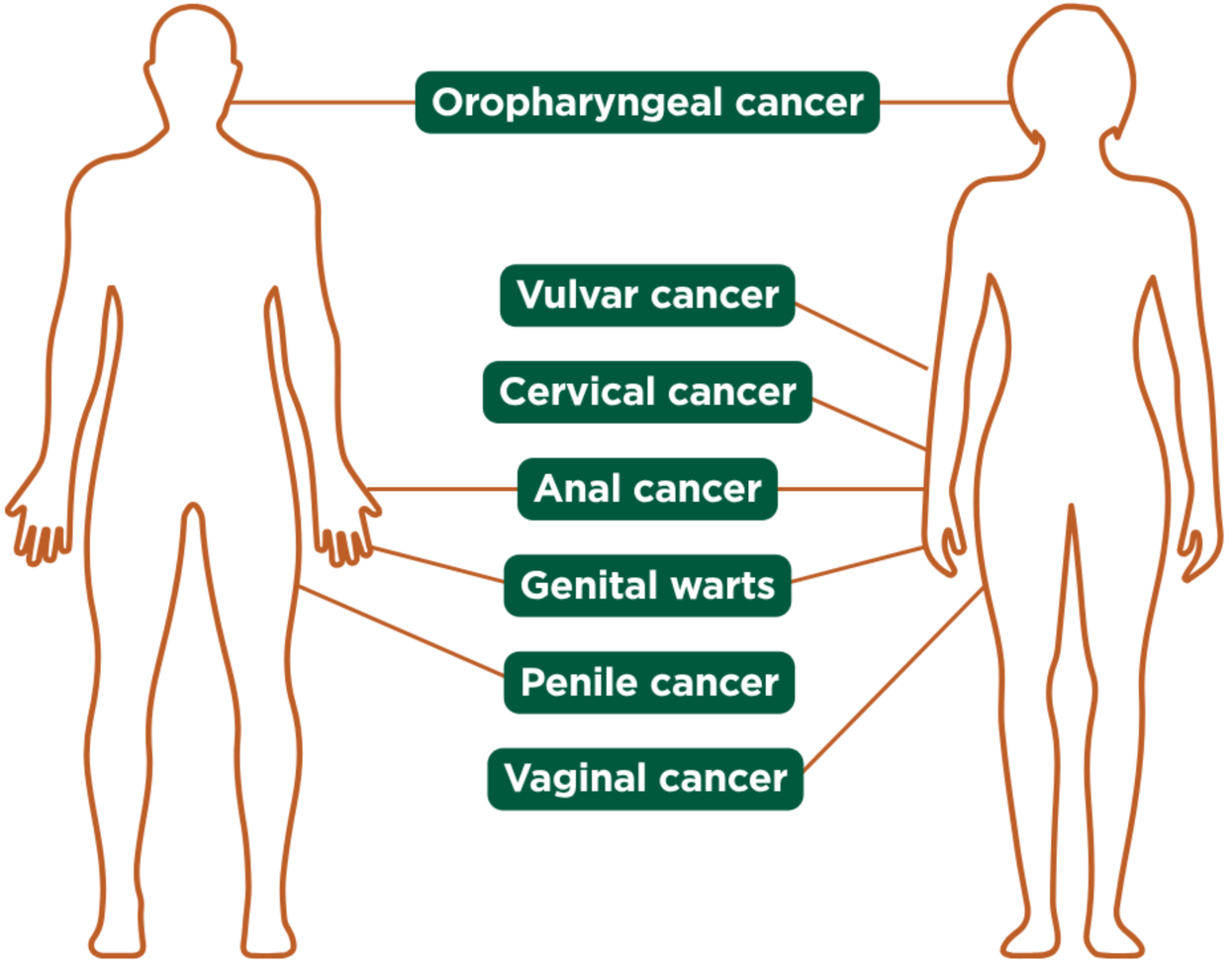
Respiratory papillomatosis (benign wart-like tumors that form inside the larynx)

Cutaneous sites of infection

"Common" hand and foot warts

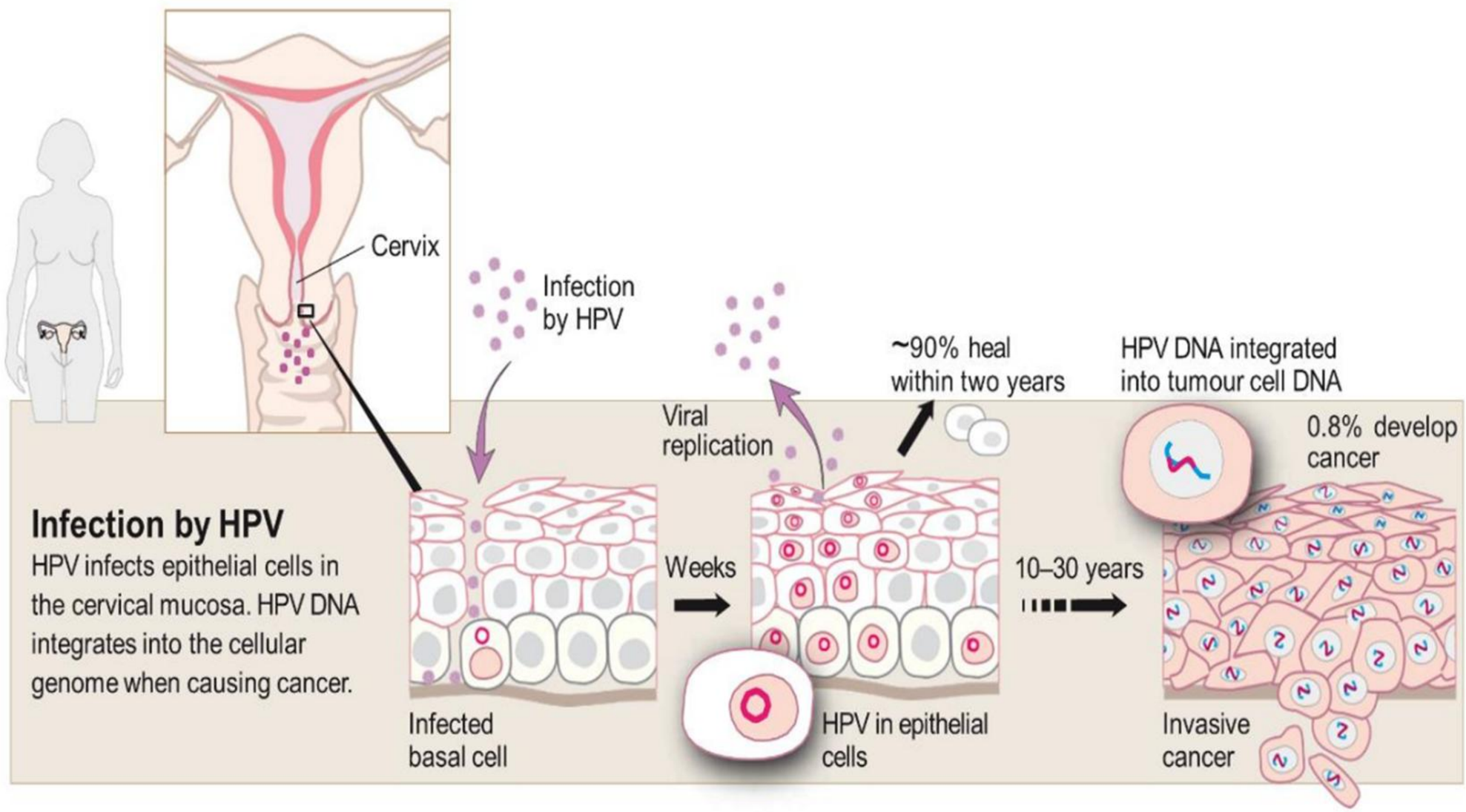
CDC, 2024

HPV infection can cause:



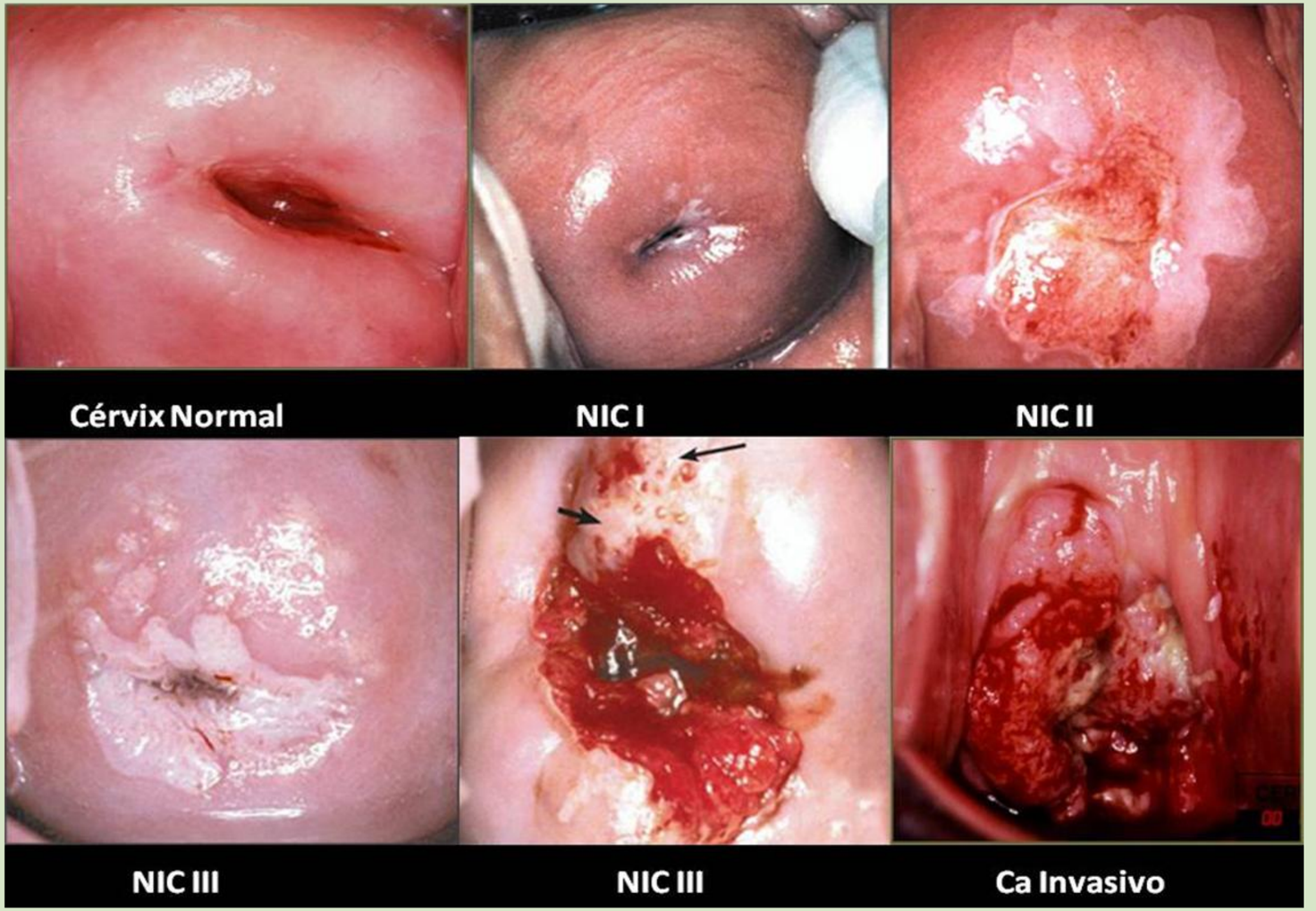
Barzily et al, NEJM, 2025

Pathogenesis of HPV Infection



Stark & Zivkovic, Acta Facultatis Medicae Naissensis, 2018

HPV - From Warts to Cancer

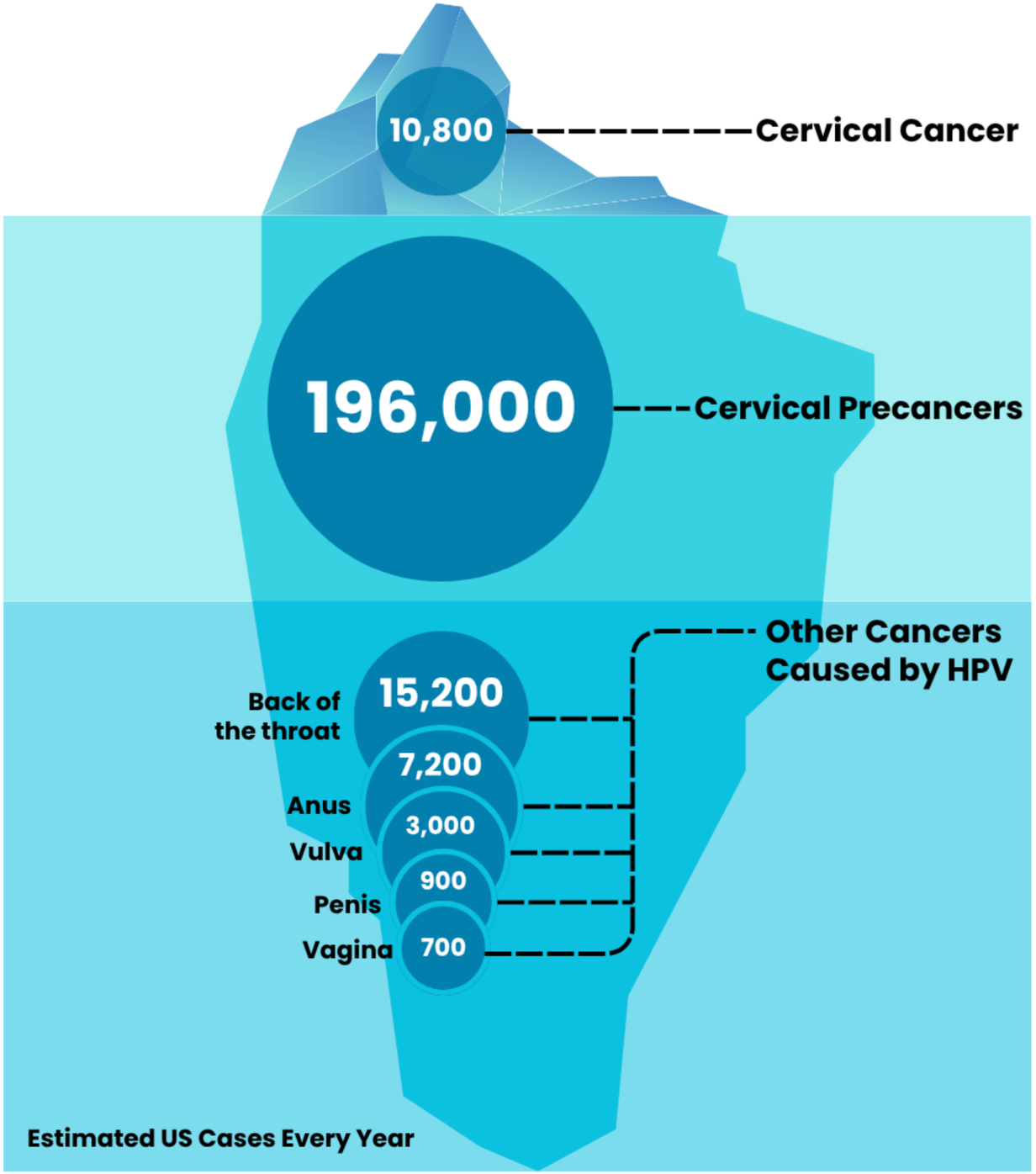


Cervical cancer is just the tip of the iceberg.

Although cervical cancer is the most well-known of the cancers caused by HPV, there are other types of cancer caused by the virus.

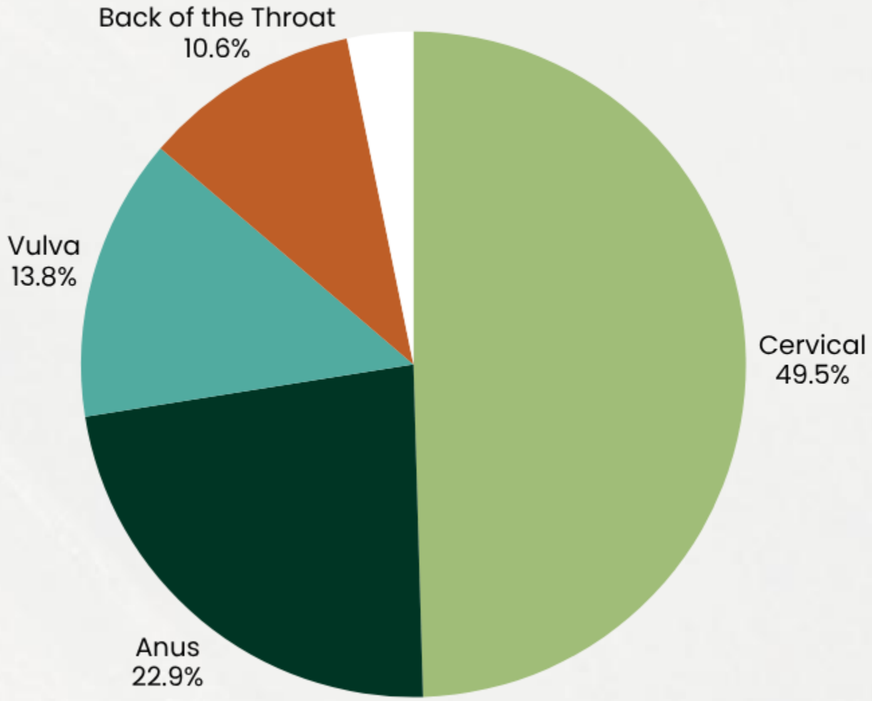
>90% of HPV related cancers are preventable with HPV vaccination.

CDC, 2025

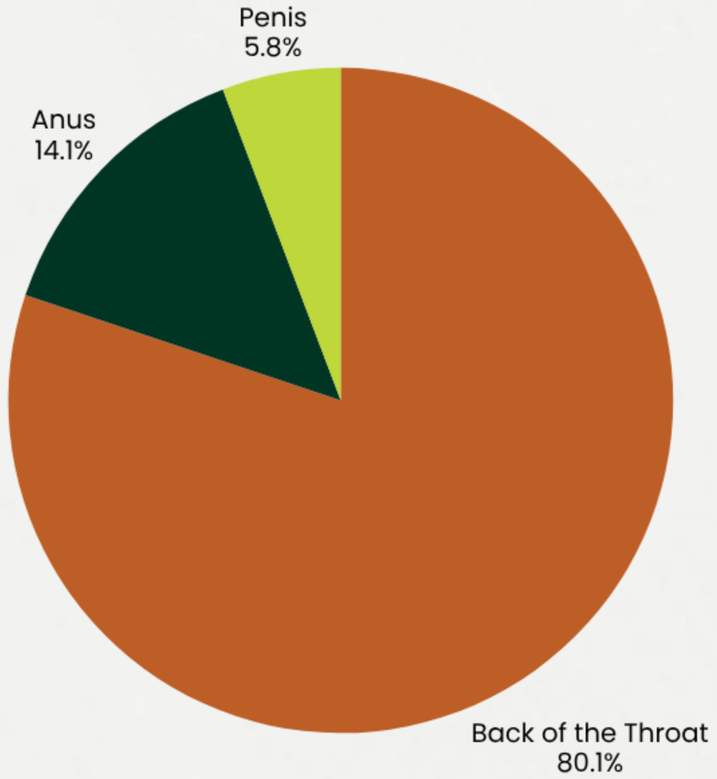


% of New HPV-Associated Cancer Cases Each Year in the U.S.

Women (21,800 cases per year)



Men (16,000 cases per year)



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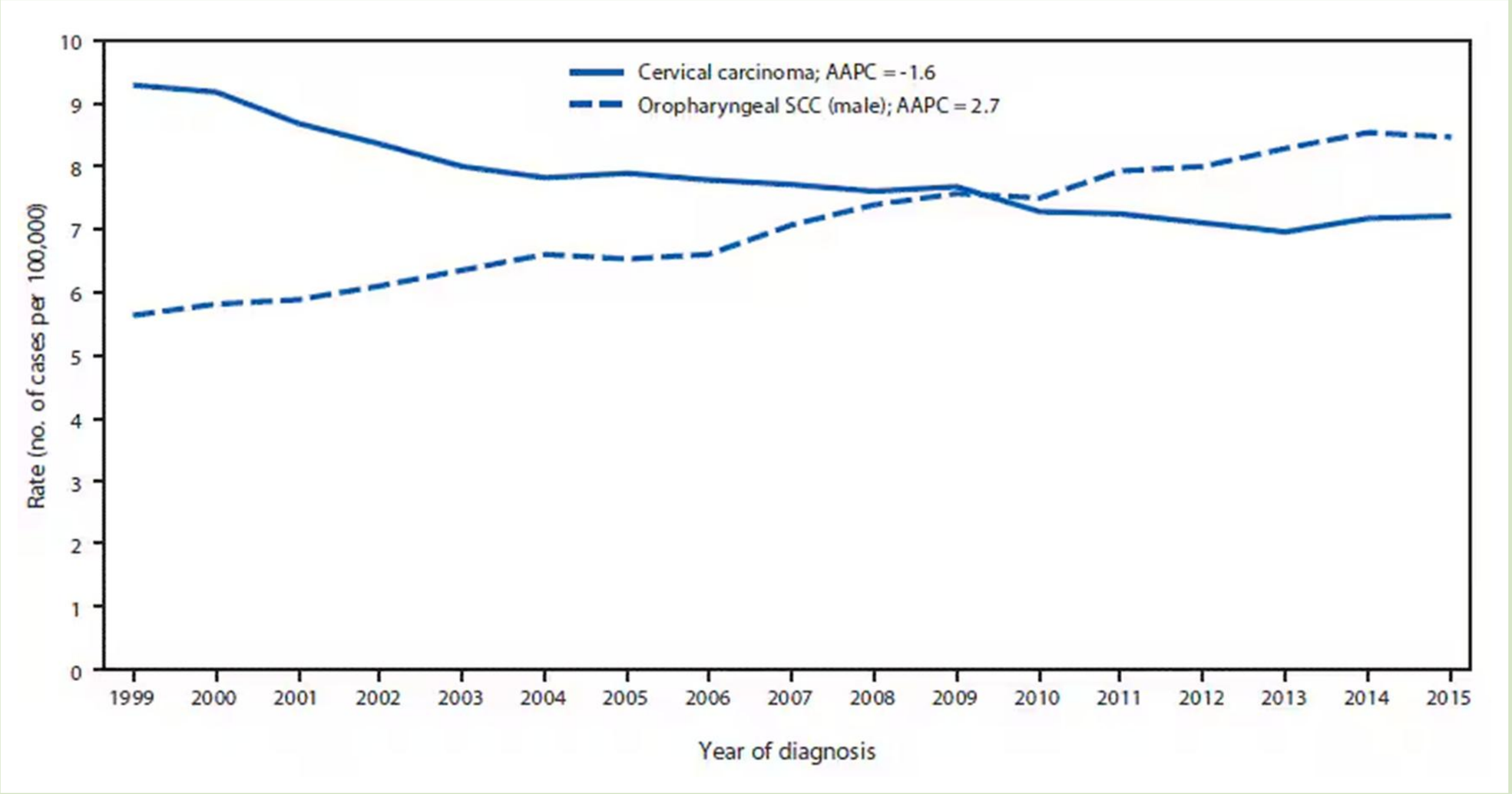
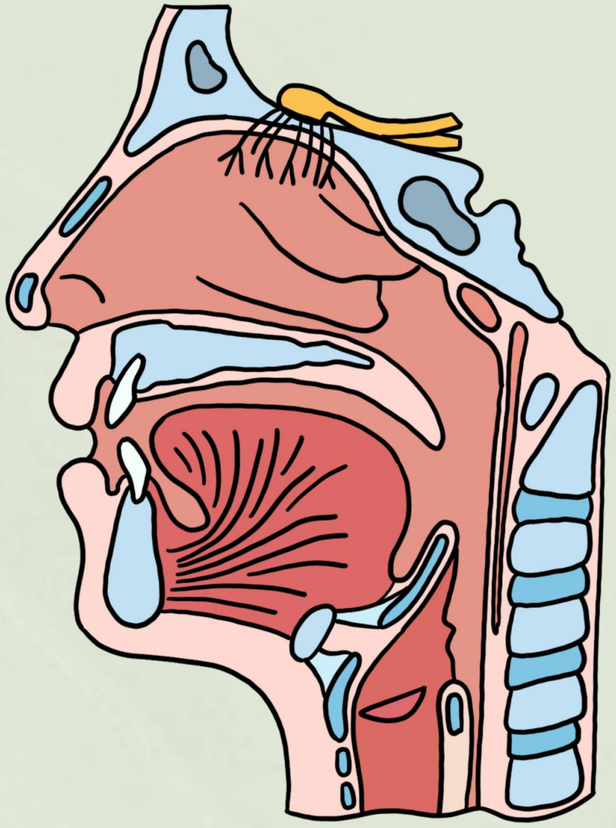
Data as of August 2022 - CDC, 2025

U.S. incidence of cervical cancer (females) and oropharyngeal cancer (males), 1999–2015



Van Dyne et al, MMWR, 2018

HPV + Oropharyngeal Cancer



60-80% of oropharyngeal cancers are caused by HPV

A majority are caused by HPV type 16

Oropharyngeal cancers are more common in men than women.

HPV-positive oropharyngeal cancers differ from HPV-negative ones: younger age at diagnosis, less smoking/alcohol history, better response to treatment.

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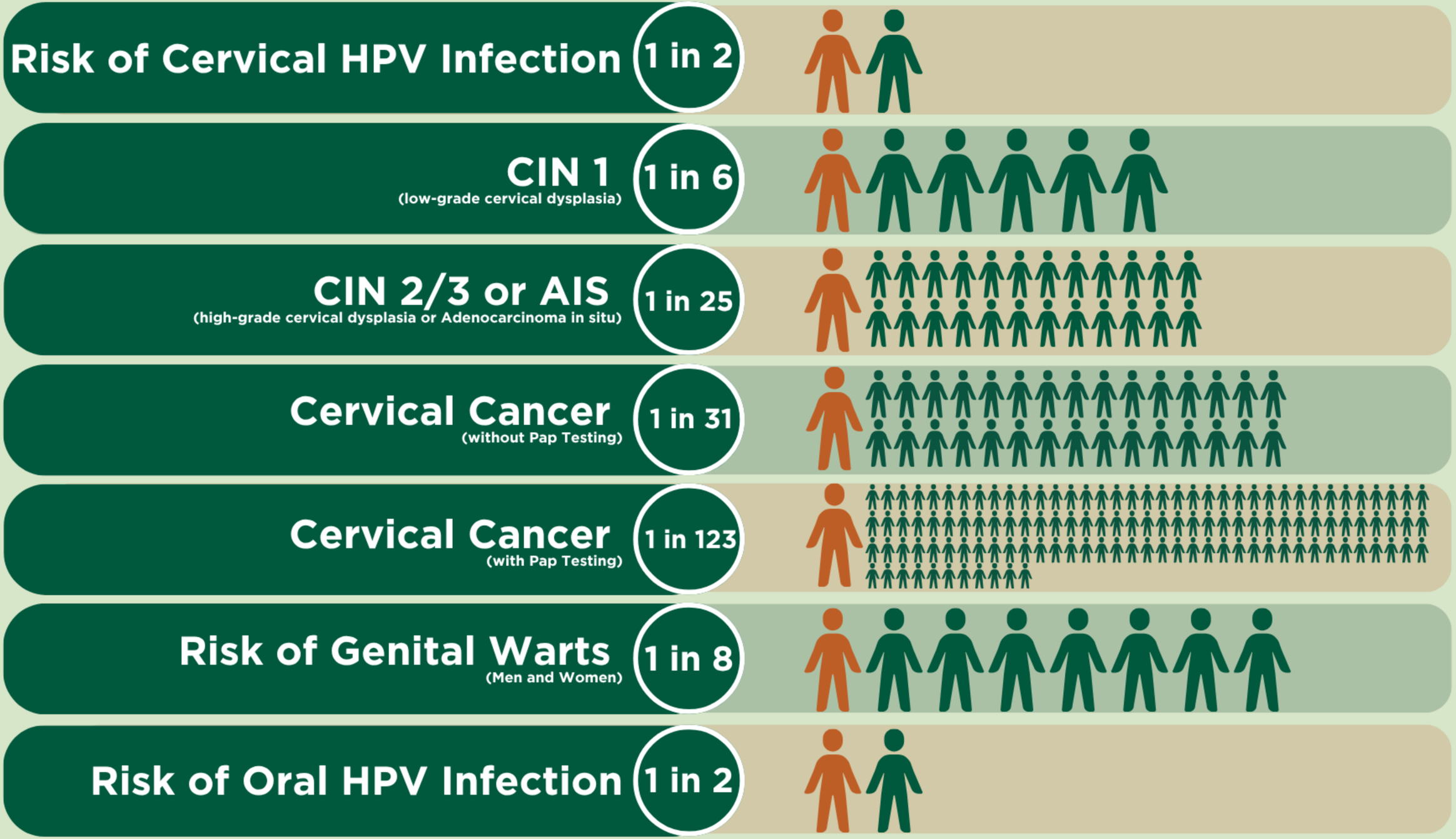
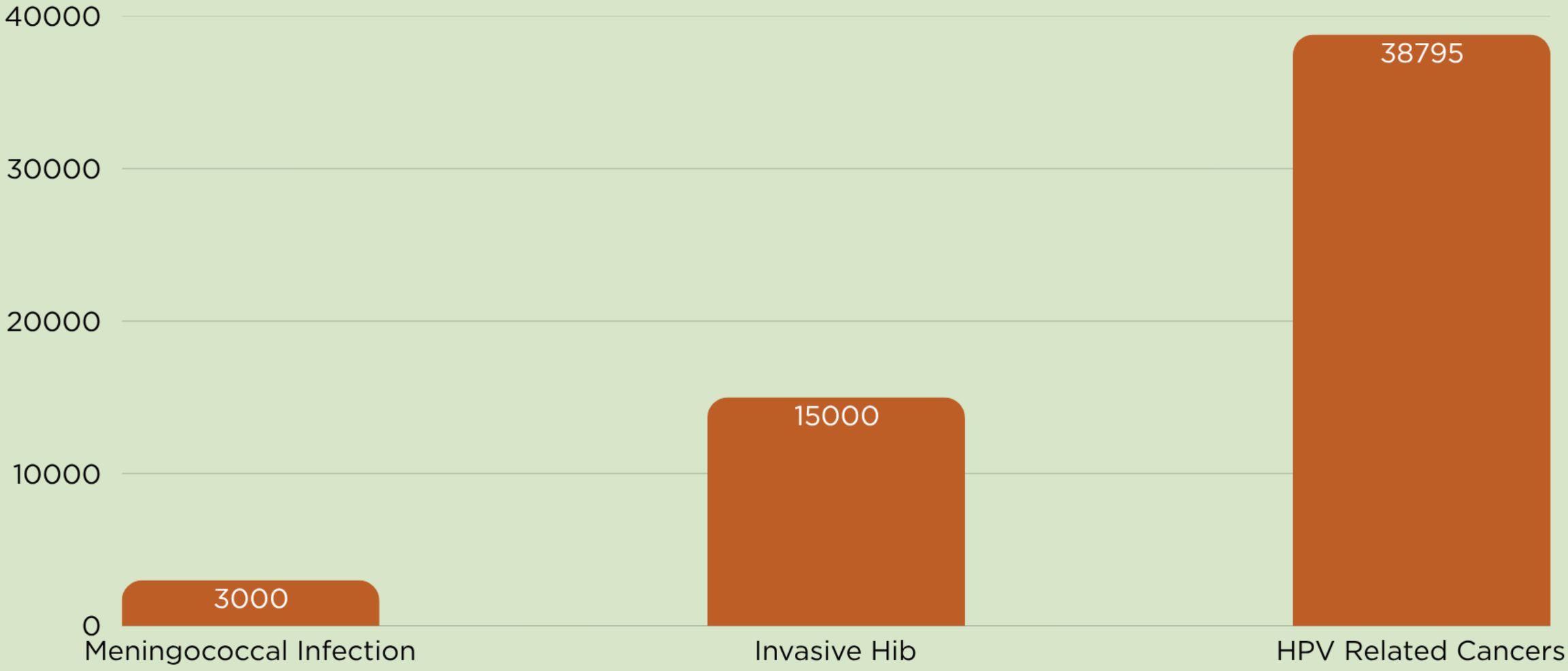
American Cancer Society, 2026; CDC, 2024; StatPearls, 2023

Lifetime Risk of HPV-Related Pathology



CDC, 2024; StatPearls, 2023

Put HPV in Perspective: Incidence of Disease in Pre-Vaccine Era



CDC, 2024

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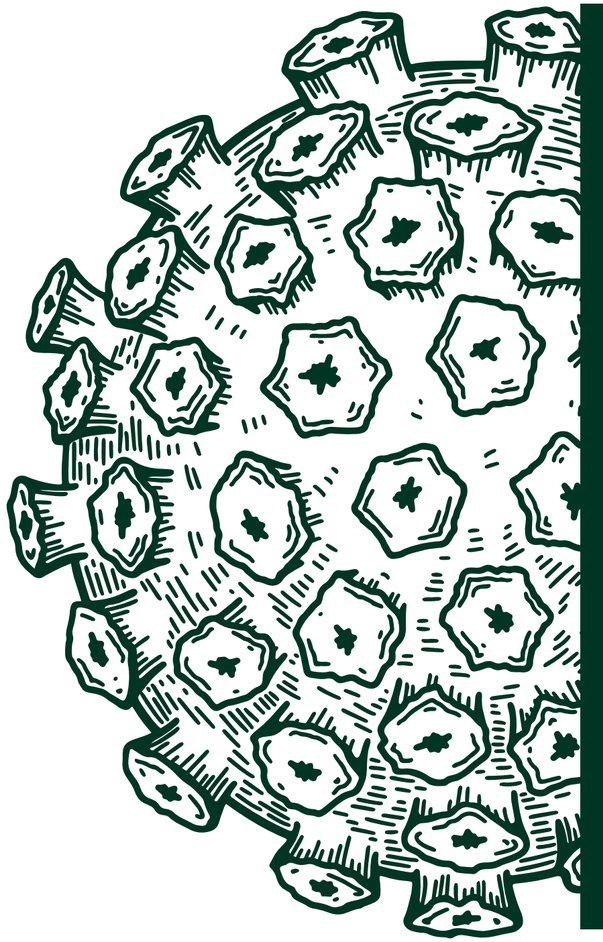
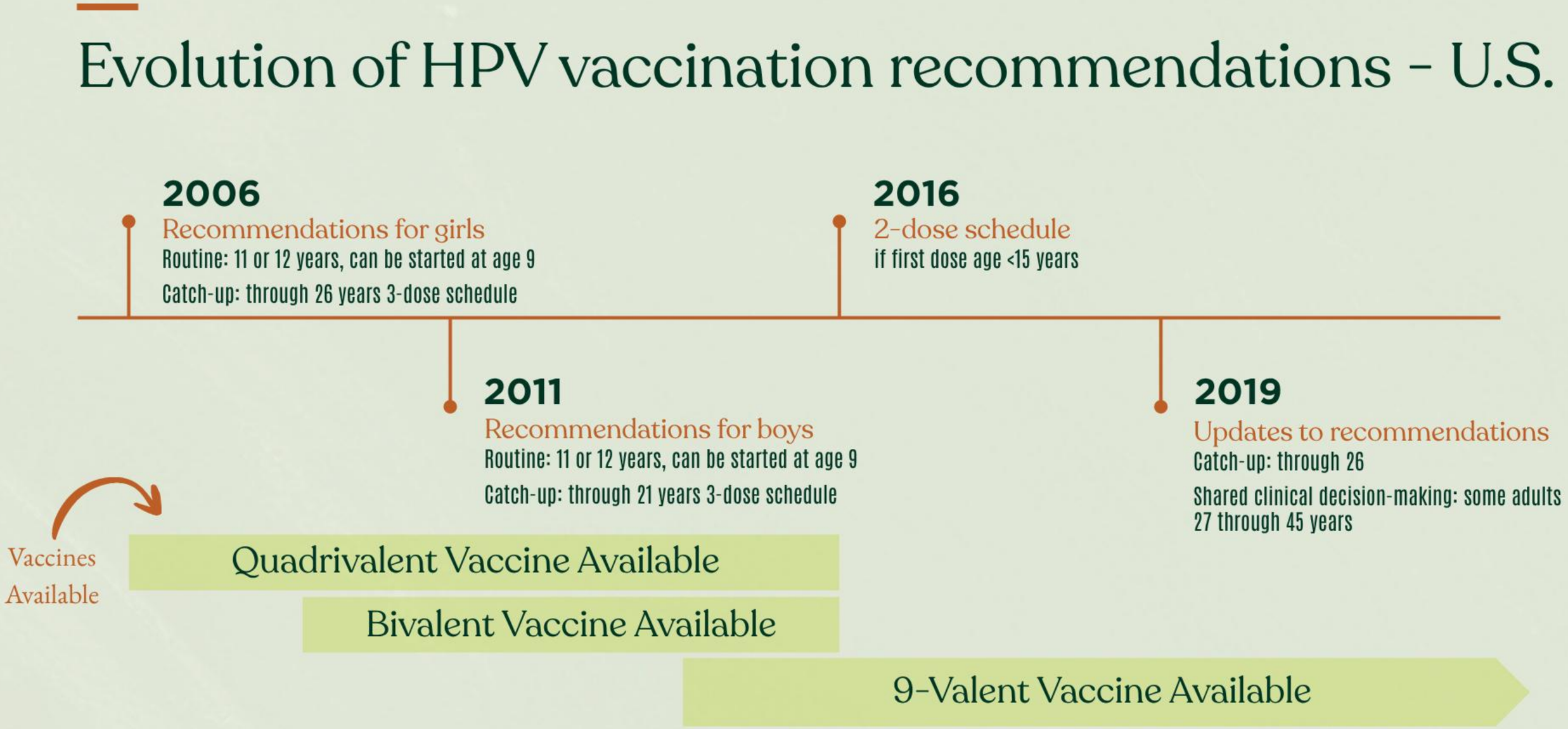
The Vaccine



Evolution of HPV vaccination recommendations - U.S.



Markowitz, ACIP Presentation on October 23, 2024

What does the HPV vaccine cover?

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GARDASIL 9 IS THE ONLY VACCINE CURRENTLY AVAILABLE IN THE U.S.

2006

Quadrivalent HPV vaccine licensed (Gardasil, 4vHPV)

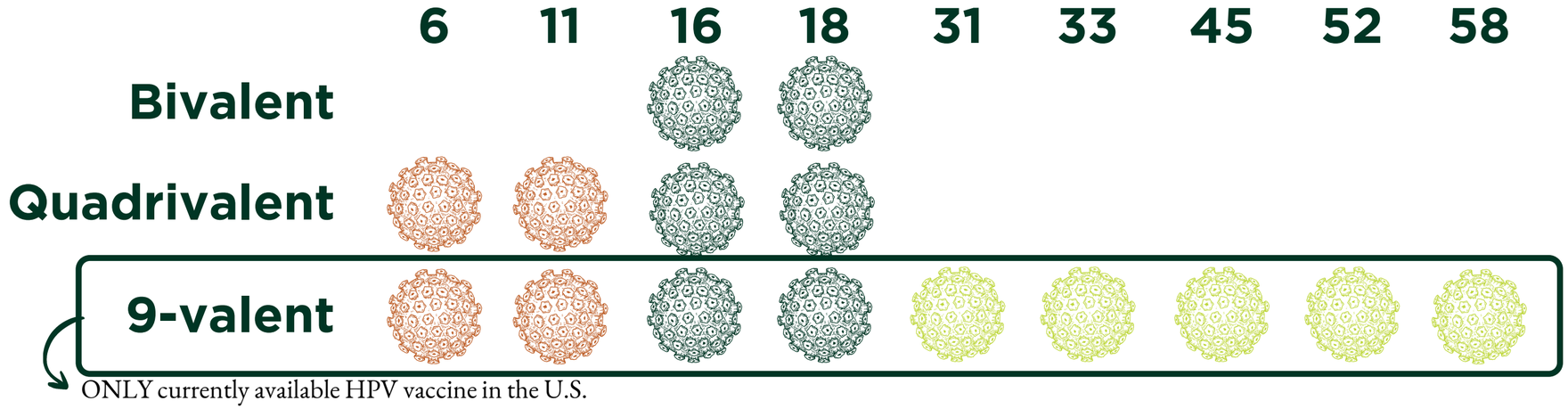
2009

Bivalent HPV vaccine licensed (Cervarix, 2vHPV)

2014

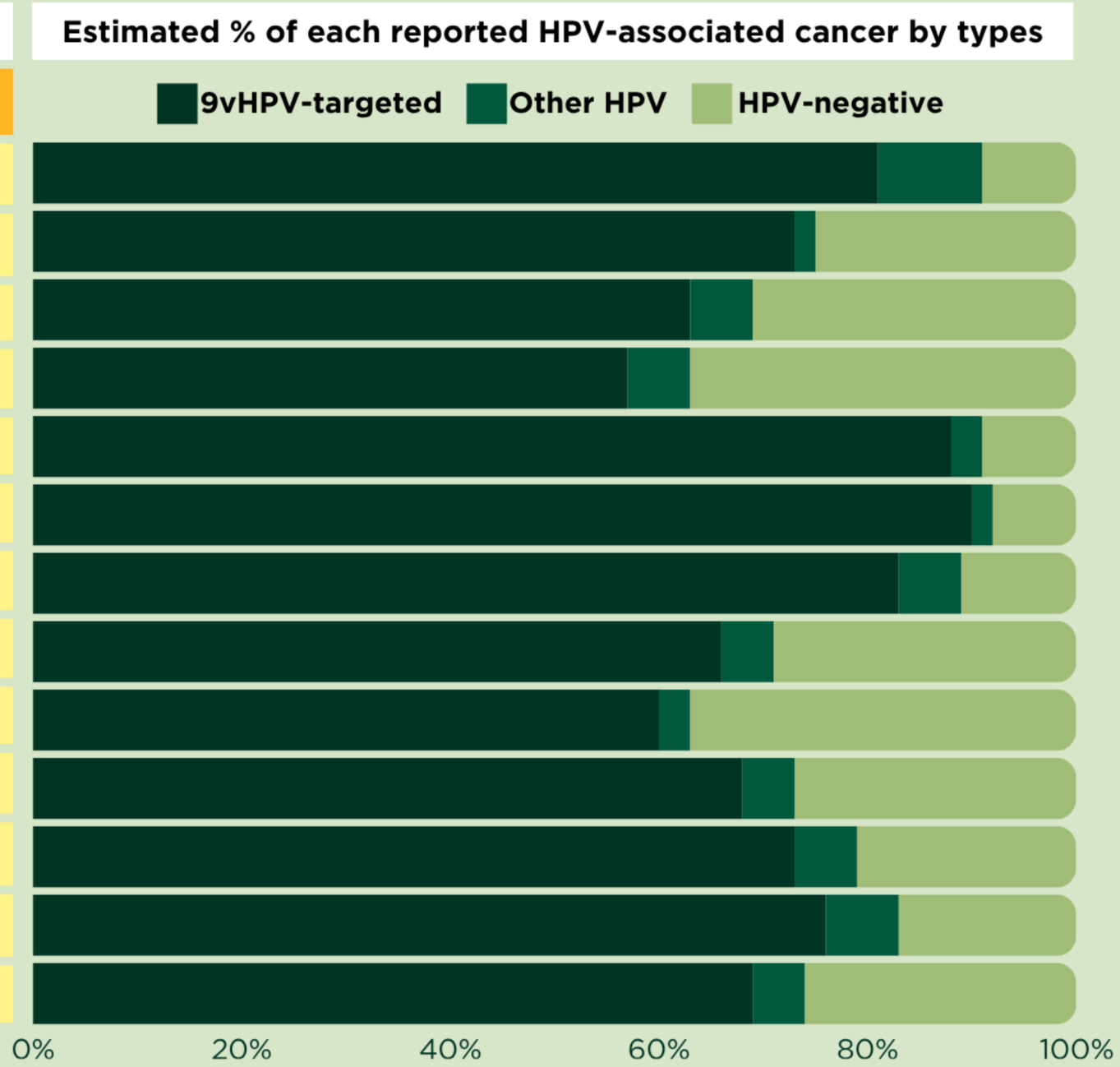
9-valent HPV vaccine licensed (Gardasil 9, 9vHPV)

HPV types included in HPV vaccines:



Average annual number and rate of HPV–associated cancers and estimated % cancers attributable to HPV, by HPV type, cancer type, and sex – U.S. 2012–2016

Reported HPV-associated cancer		
Cancer Type	**Total #**	**Rate**
Cervix	12,015	7.2
Vagina	862	0.4
Vulva	4,009	2.1
Penis	1,303	0.8
Anus	6,810	1.8
Female	4,539	2.3
Male	2,270	1.3
Oropharynx	19,000	4.9
Female	3,460	1.7
Male	15,540	8.5
Total	**43,999**	**12.2**
Female	24,886	13.7
Male	19,113	10.6



Van Dyne et al, MMWR, 2018

HPV Vaccine: Who Gets it and When

9-26 years

Routinely recommended at 11-12 years (ACIP – can be given down to age 9 years) or starting at 9 years (AAP). Catch-up vaccination recommended for everyone through 26 years.

Adults >26 years

Shared clinical decision-making for some people 27-45 years. HPV vaccines are not licensed for >45 years.

Administration

2 doses if started <15 years; 3 doses if after. No prevaccination testing.

Cervical cancer screening

All routine screening guidelines should be followed

Special populations and medical conditions

Pregnancy: delay until after pregnancy; pregnancy testing not needed before vaccination.

Breastfeeding: safe to receive

Meites et al, MMWR, 2019

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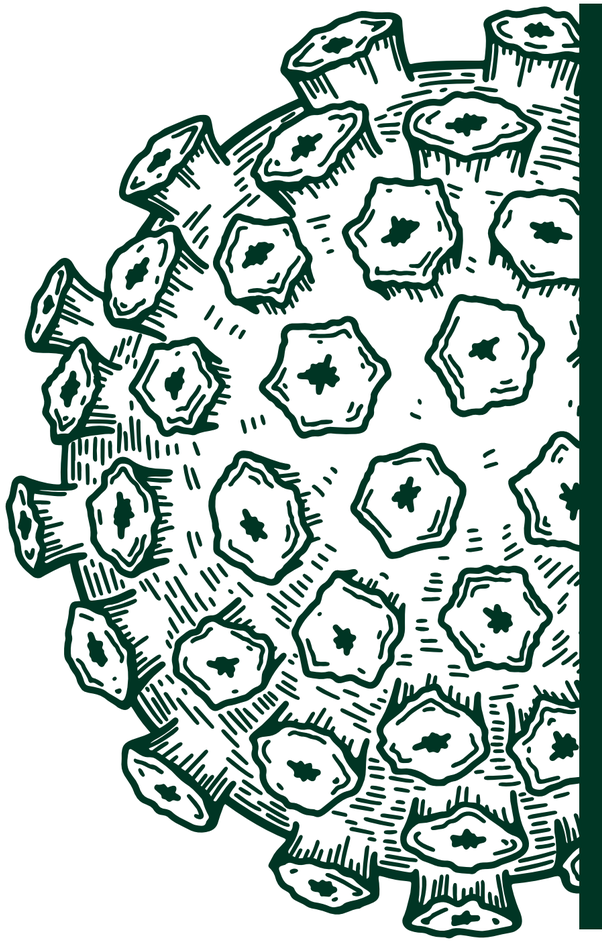
Vaccine Efficacy & Effectiveness



Efficacy of the quadrivalent and 9-valent HPV vaccines against clinical endpoints among patients aged 16-26

Clinical endpoint	Vaccine		Placebo		Vaccine efficacy % (95% CI)
	# of people	# of cases	# of people	# of cases	
Cervical Cancer: HPV 16/18-related CIN 2/3 OR AIS	8,493	2	8,464	112	**~98%** (93.5, 99.8)
Vulvar Cancer: HPV 6/11/16/18-related VIN 2/3	7,772	0	7744	10	**100%** (55.5, 100)
Vaginal Cancer: HPV 6/11/16/18-related VaIN 2/3	7,772	0	7,899	9	**100%** (49.5, 100)
Anal Cancer in Males: HPV 6/11/16/18-related AIN 2/3	194	3	208	13	**~75%** (8.8-95.4)

Clinical endpoint	Gardasil 9		Gardasil		Vaccine efficacy % (95% CI)
	# of people	# of cases	# of people	# of cases	
HPV 31/33/45/52/59-related CIN 2/3, AIS, VIN 2/3, VaIN 2/3	6,016	1	6,017	30	**~97%** (80.9, 99.8)

Merck, 2025

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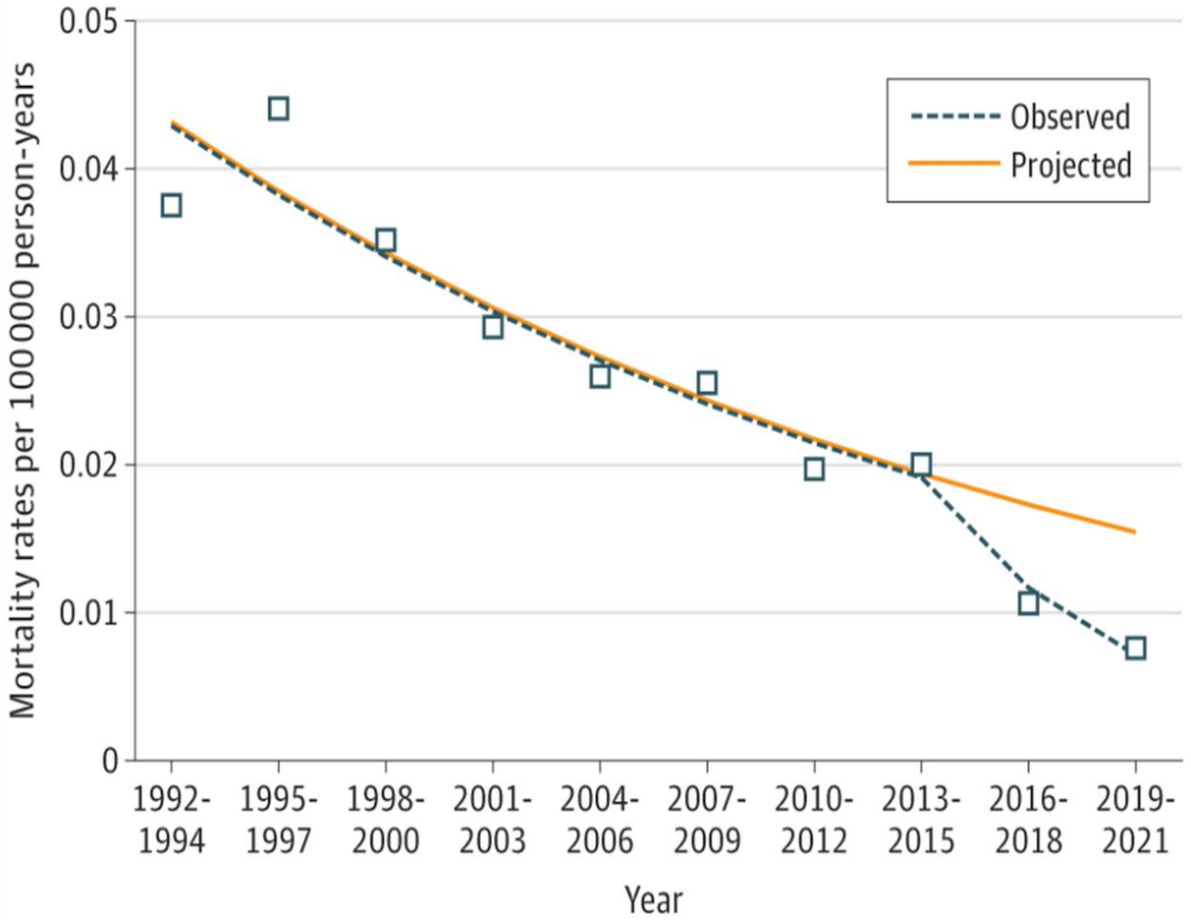
HPV vaccinations are associated with reduced cervical cancer mortality in young women.

62% Reduction in cervical cancer deaths in young women due to HPV vaccination.



Dorali et al, JAMA, 2024

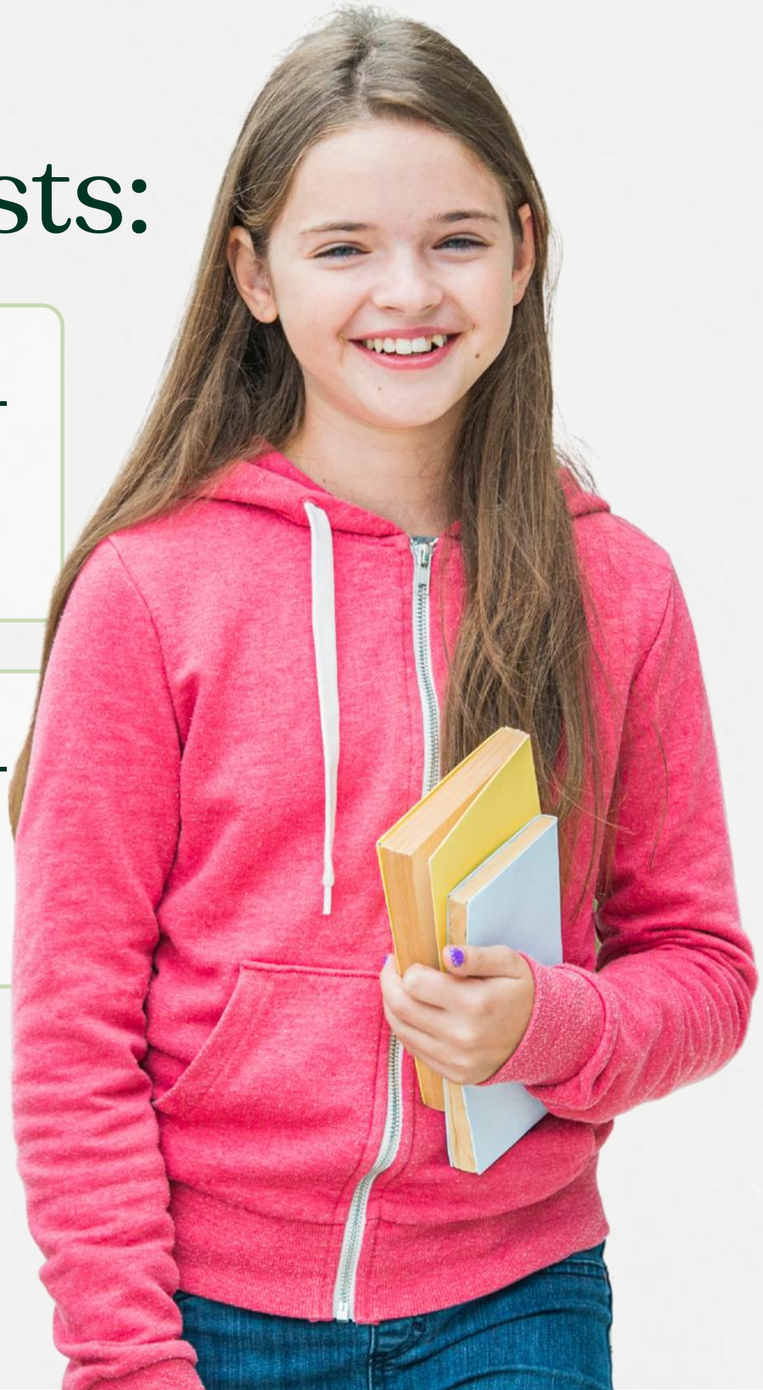
Early real-world evidence suggests:

54% Lower odds of developing HPV-related cancers among boys.
(especially head and neck cancers)

30% Lower odds of developing HPV-related cancers among girls
(cervical cancers and any HPV-related cancer)

These results add to the evidence of HPV vaccine's real-world effectiveness in preventing several types of cancer and precancerous changes caused by HPV.

DeKloe et al, Journal of Clinical Oncology, 2024



Cochrane Review – HPV Vaccination

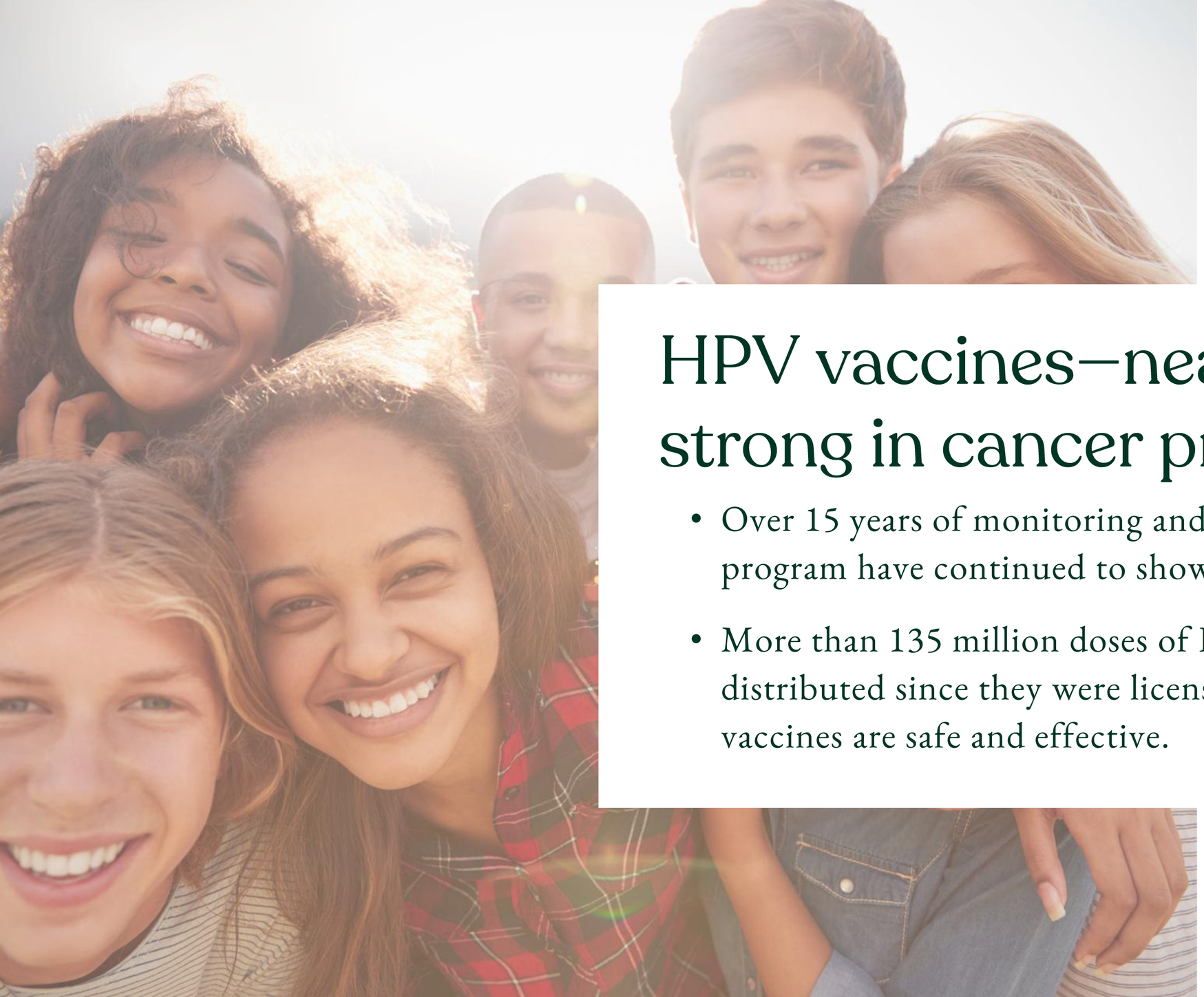
Girls ages 16 years or younger who received HPV vaccines were **80% less likely than their unvaccinated counterparts to develop cervical cancer**.

Evidence from 23 studies showed with moderate certainty that **HPV vaccination lowered the incidence of high-grade cervical precancers**.

Vaccinated persons had **25 fewer cases of anogenital warts per 1,000 participants at 48 months**, regardless of HPV type.

Among 39 RCTs with 97,272 participants, HPV vaccine groups showed little difference compared with controls in rates of serious adverse events at up to 72 months

Bergman et al, Cochrane Database of Systematic reviews, 2025



HPV vaccines—nearly two decades strong in cancer prevention

- Over 15 years of monitoring and research during the vaccination program have continued to show that HPV vaccination is safe.
- More than 135 million doses of HPV vaccines have been distributed since they were licensed. Data continue to show the vaccines are safe and effective.


Take home message
Just like putting on a bike helmet BEFORE going on a bike ride to protect against head injury...
...HPV vaccination is INCREDIBLY effective if given BEFORE exposure to the virus.

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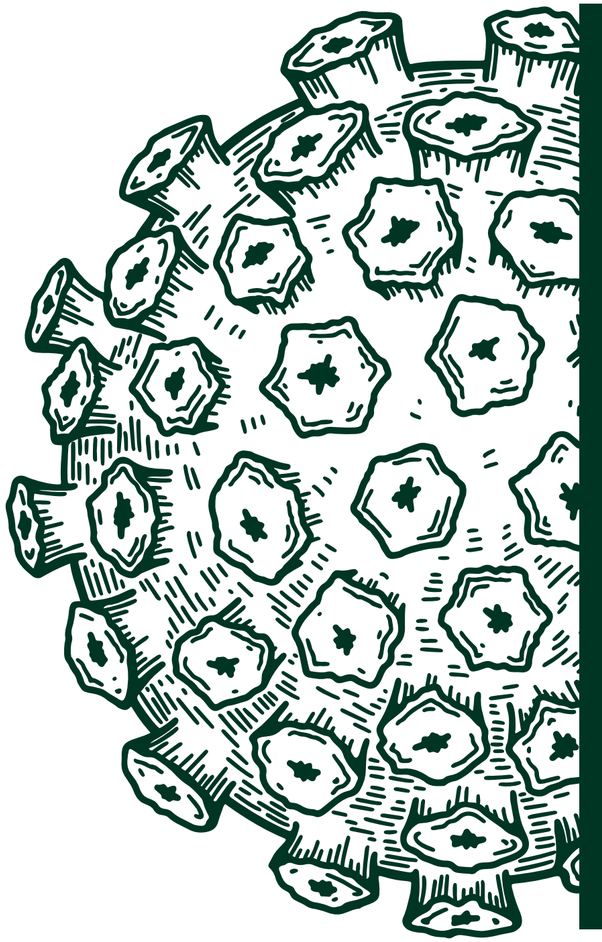
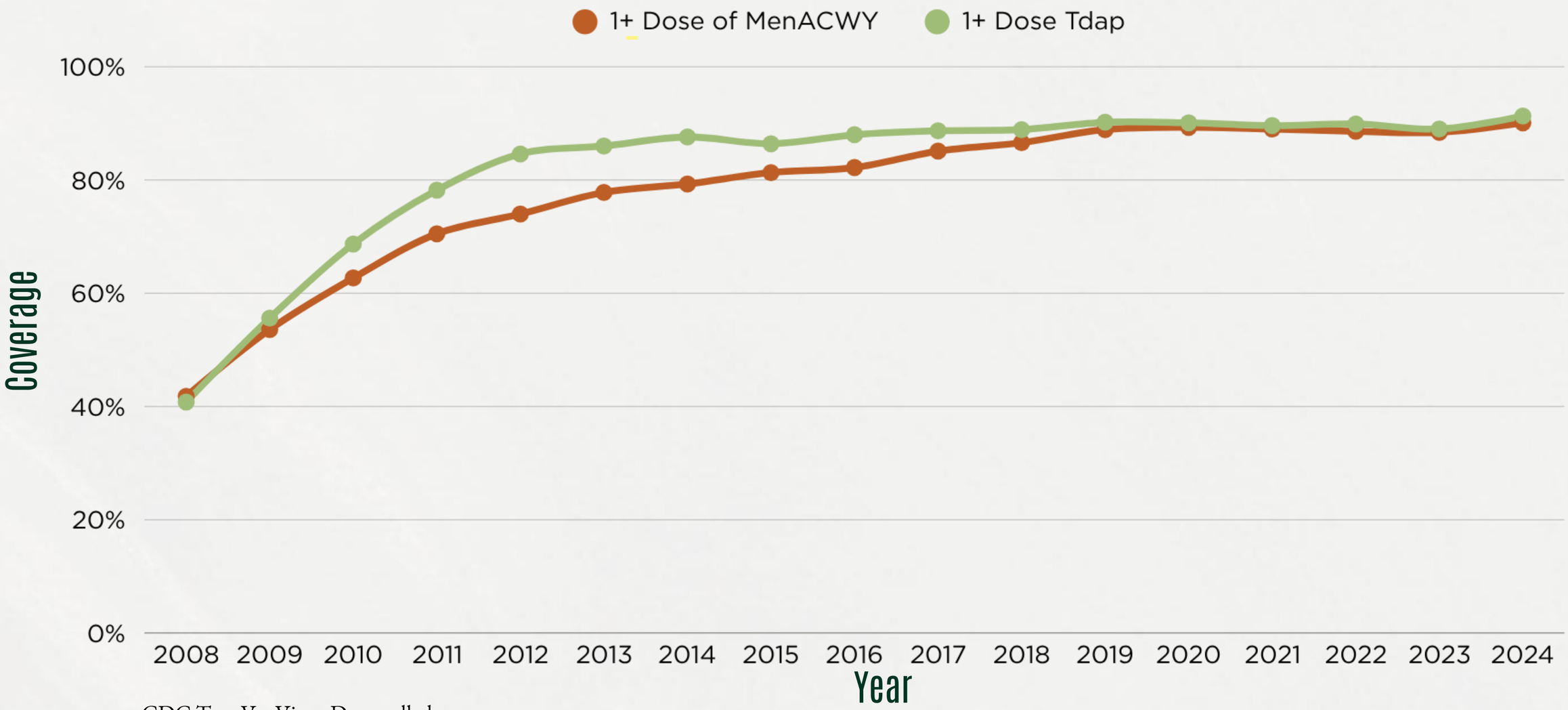
HPV Vaccination Rates

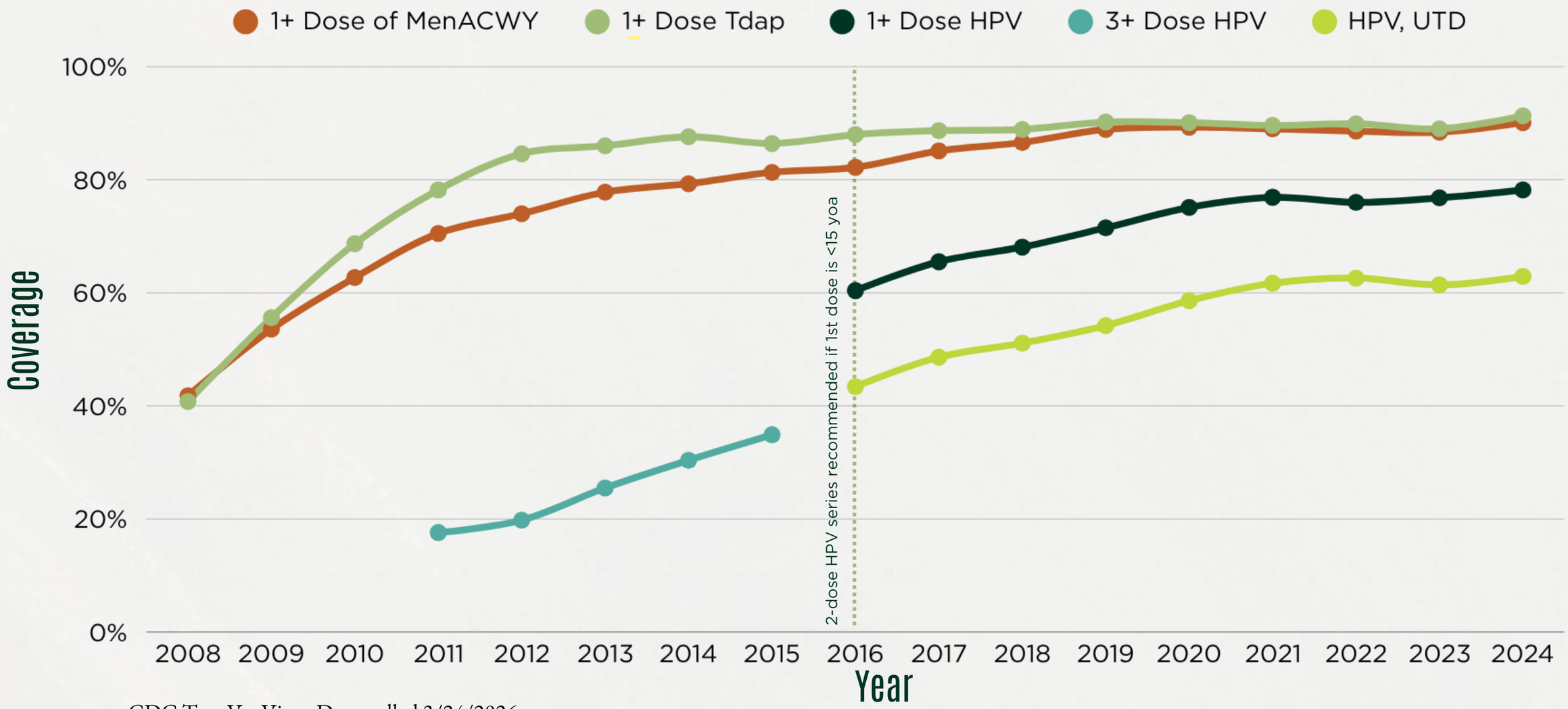


Vaccination Coverage by Year among Adolescents 13-17 Years Old, United States



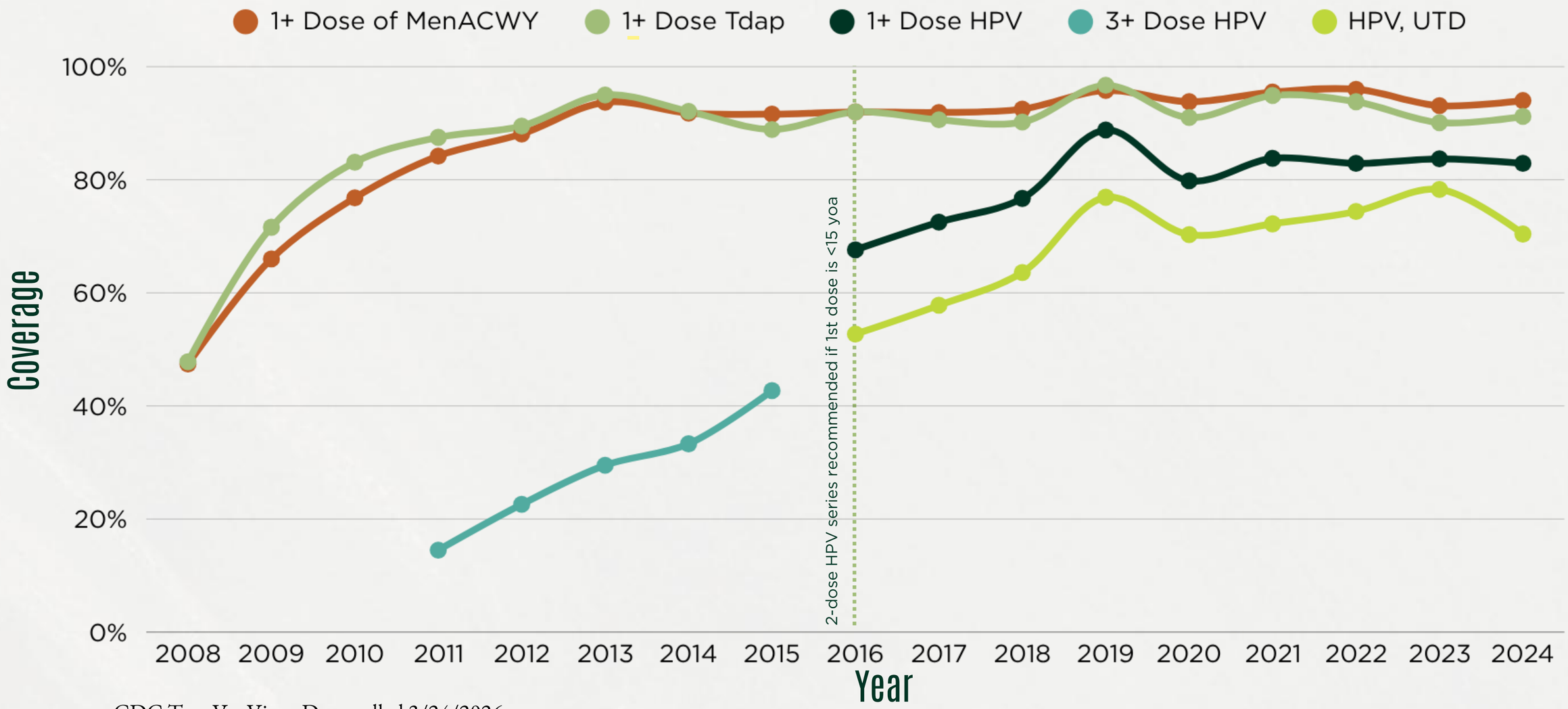
CDC TeenVaxView; Data pulled 3/24/2026.

Vaccination Coverage by Year among Adolescents 13-17 Years Old, United States



CDC TeenVaxView; Data pulled 3/24/2026.

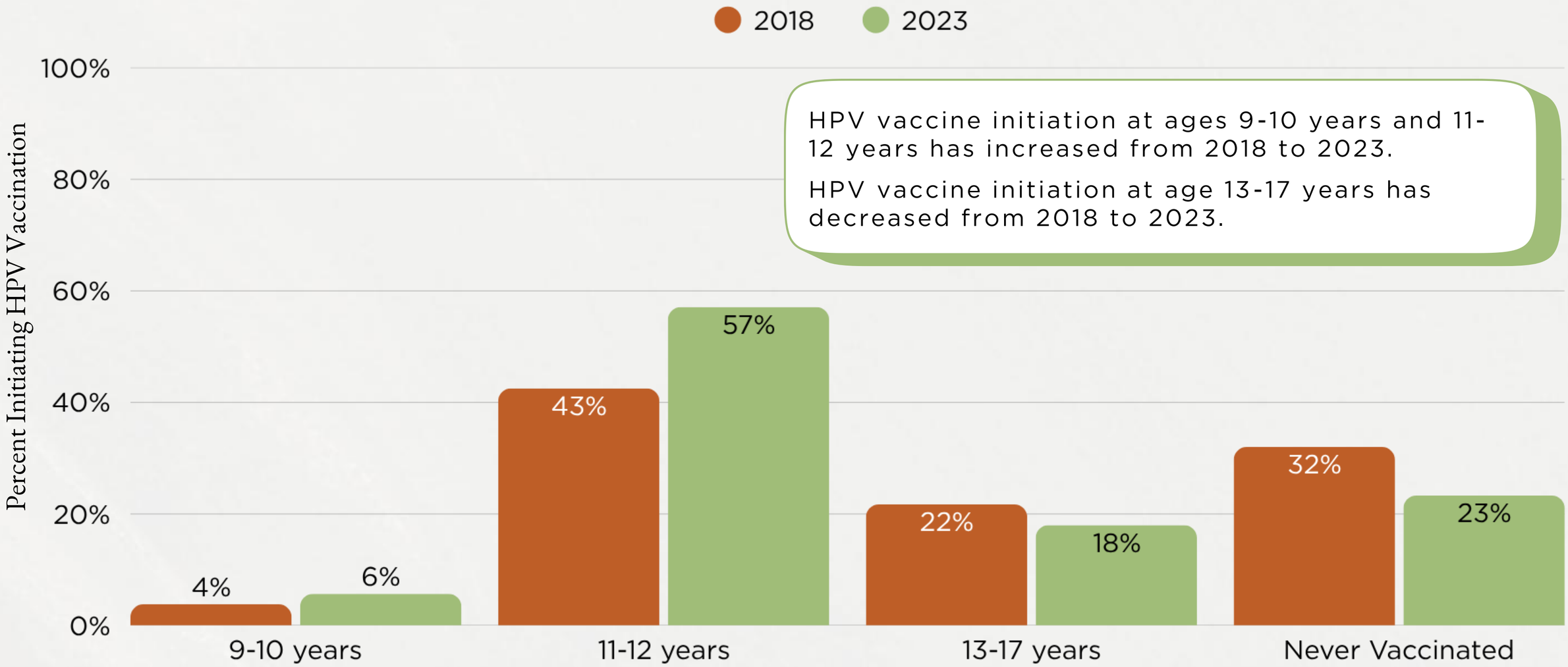
Vaccination Coverage by Year among Adolescents 13-17 Years Old, **North Dakota**



CDC TeenVaxView; Data pulled 3/24/2026.

Age at Initiation of HPV Vaccine

NIS-Teen, U.S., 2018 and 2023



Pingali, Presented at April 2025 ACIP Meeting

1 in 10 (12%) of teens at health system weren't vaccinated against HPV before being sexually active

Clinics that routinely initiated HPV vaccination at age 9 had lower rates of unvaccinated adolescents.

Why is HPV vaccine education important?

Gaps in public knowledge

34%

had NOT heard of HPV.

40%

didn’t know an HPV vaccine exists.

71%

didn’t know HPV causes oral cancers.

Conducted by the National Cancer Institute, the study analyzed data from the Health Information National Trends Survey (HINTS) between 2017 and 2020, encompassing over 22,000 U.S. adults.

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Garg et al, JAMA Oncology, 2025

What Works — In Clinical Practice

Make the Recommendation Count

- Strong, bundled recommendation (same-day, same-way as Tdap/MenACWY)
- Start at age 9 to improve completion
- Normalize it as a routine cancer prevention vaccine

Communication Matters

- Lead with cancer prevention, not risk
- Keep it short, clear, and confident “Your child is due for vaccines that prevent cancer today”

What Works — Systems & Community

Build Systems That Support Success

- Standing orders
- Reminder/recall systems
- EHR prompts
- Data tracking + feedback loops

Extend Beyond the Clinic

- Partner with:
  - Schools
  - American Cancer Society
  - Public health
- Address inaccurate information proactively

YOU Can Make a Difference

HPV Vaccination = Cancer Prevention We Can Deliver Today

Every recommendation matters

↳ A strong, clear provider recommendation is the #1 driver of HPV vaccination

Start earlier, protect sooner

↳ Initiating at ages 9–12 increases completion and normalizes the vaccine

Close the gap

↳ HPV vaccination still lags behind other adolescent vaccines—this is an opportunity

Systems drive success

↳ Reminders, standing orders, and workflow changes increase uptake

Every role counts

↳ Clinical care, IT, quality improvement, and community partnerships all play a part

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Fewer missed vaccines today, means fewer cancer diagnoses tomorrow.

Questions?

THANK YOU FOR LISTENING

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