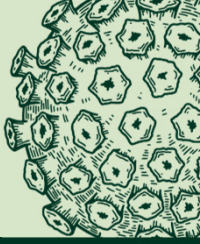


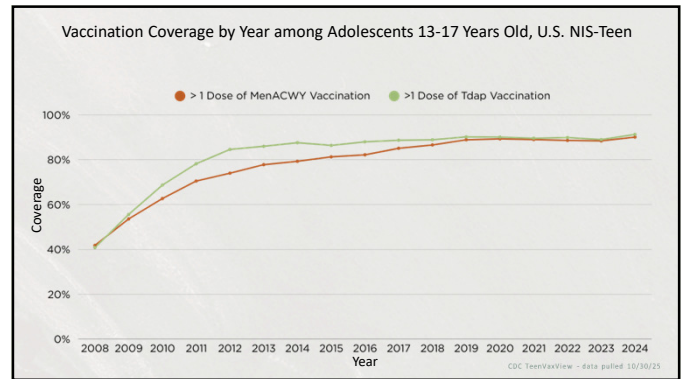
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# HPV Infection: Immunizing for Cancer Prevention

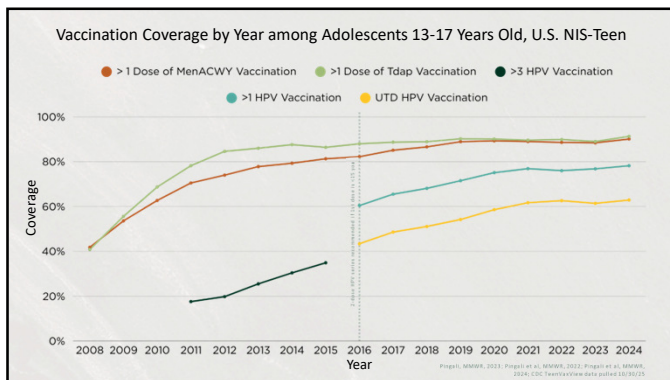


Tracie Newman, MD, MPH, FAAP  
Pediatrician, Sanford Health  
Medical Director, NDSU CIRE

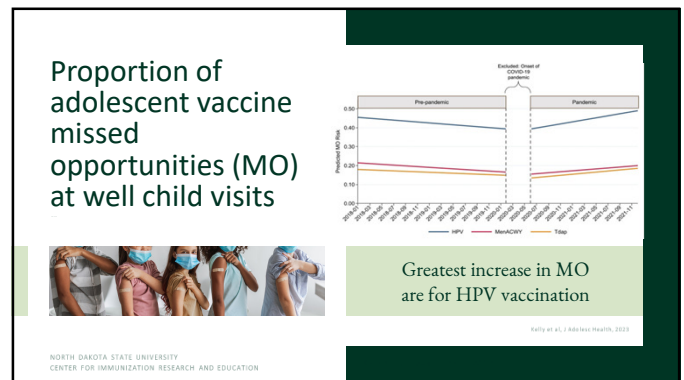
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## Objectives

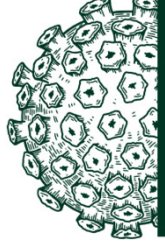
*By the end of today we hope you feel more confident in addressing HPV vaccination with patients and have fewer missed opportunities!*

- 1 Describe the epidemiology and pathology of human papillomavirus (HPV).
- 2 Summarize HPV vaccine efficacy, real-world effectiveness, and current coverage data.
- 3 Apply effective communication strategies to improve HPV vaccination confidence and reduce missed opportunities in practice.

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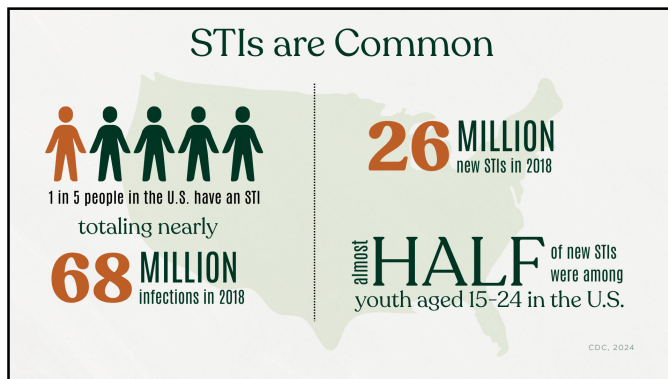
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## Epidemiology and Pathology

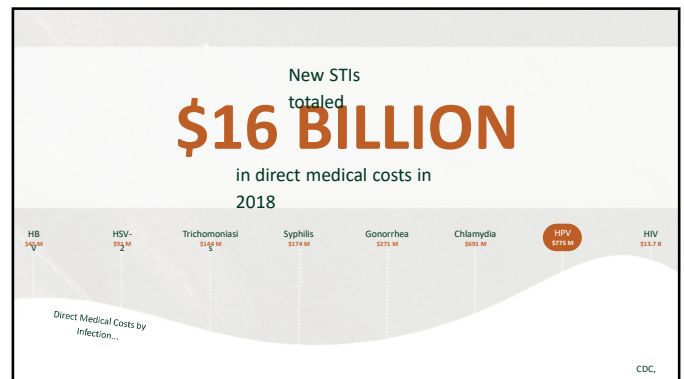


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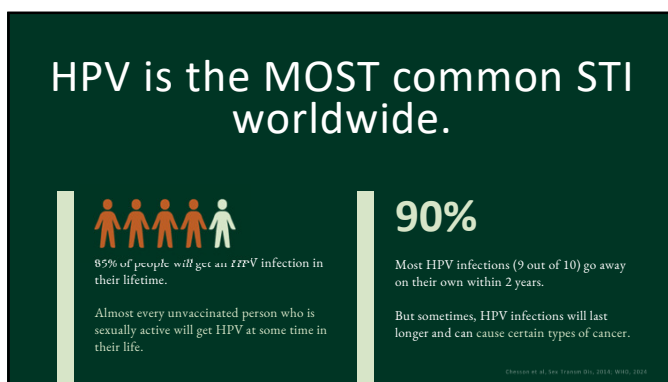
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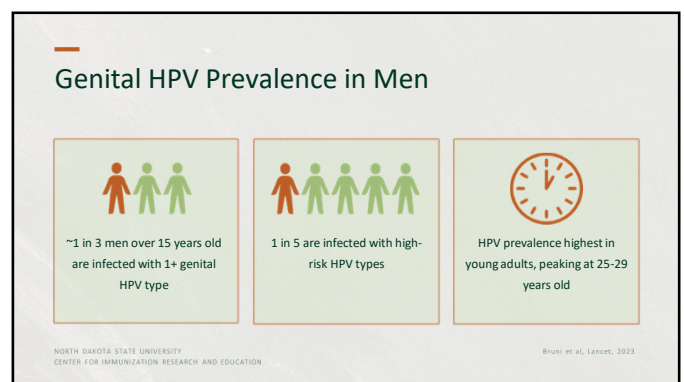
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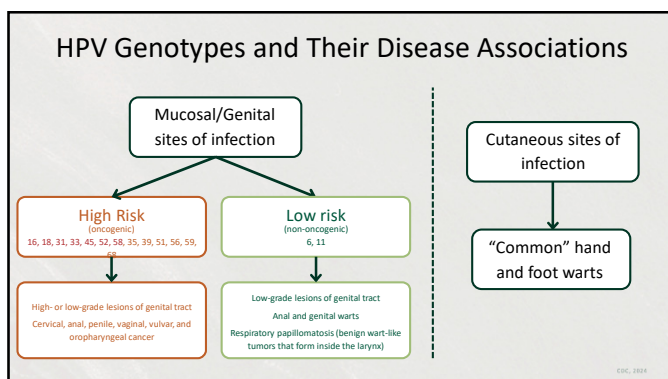
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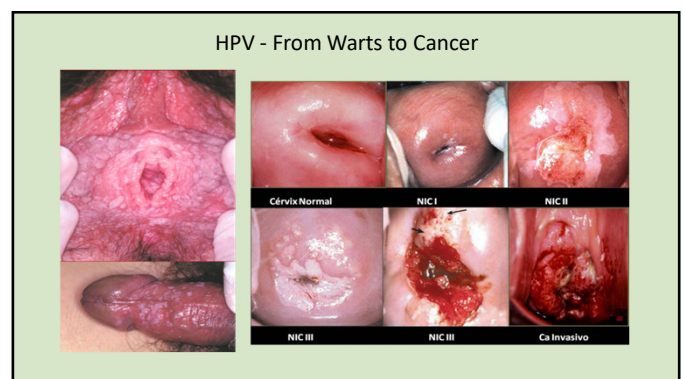
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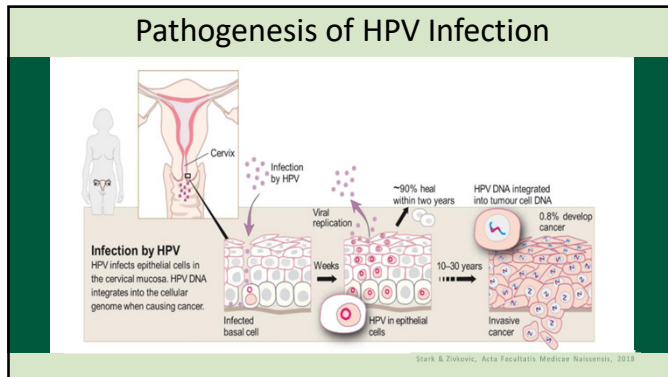
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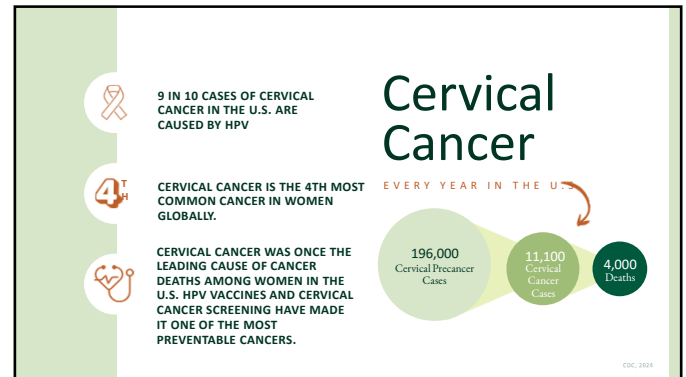
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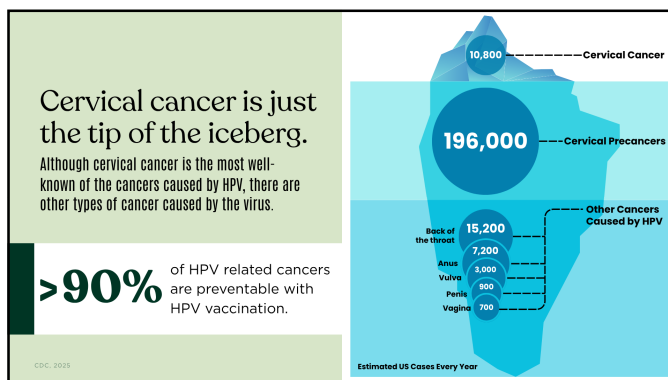
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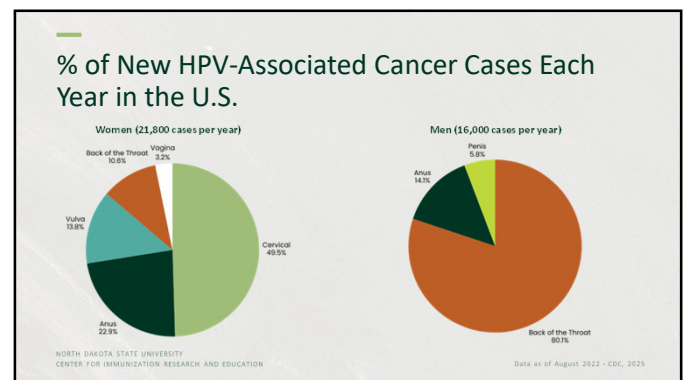
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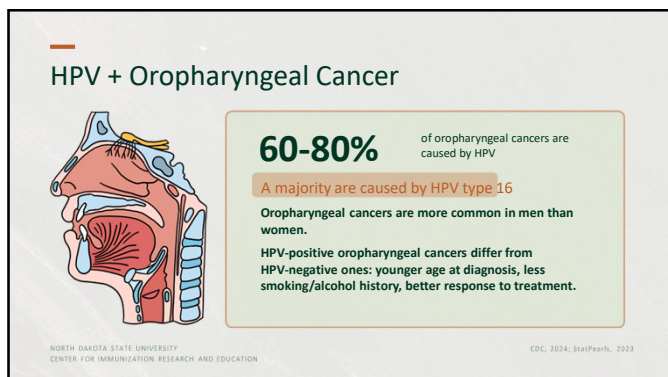
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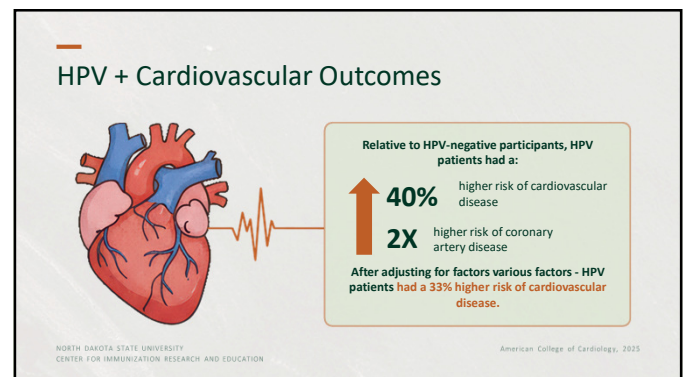
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## HPV + Infertility

### IN WOMEN:

- High-risk HPV may increase odds of infertility (evidence mixed)
- Possible impact on endometrial implantation and trophoblastic cells
- Treatment of cervical lesions (e.g., LEEP, cone biopsy) **can increase** risk of cervical changes affecting pregnancy
- Treatment for cervical cancer (e.g., hysterectomy, radiation, chemotherapy) **can cause** infertility

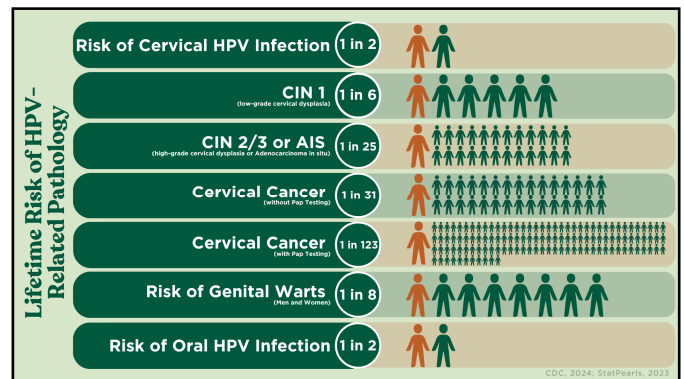
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### IN MEN:

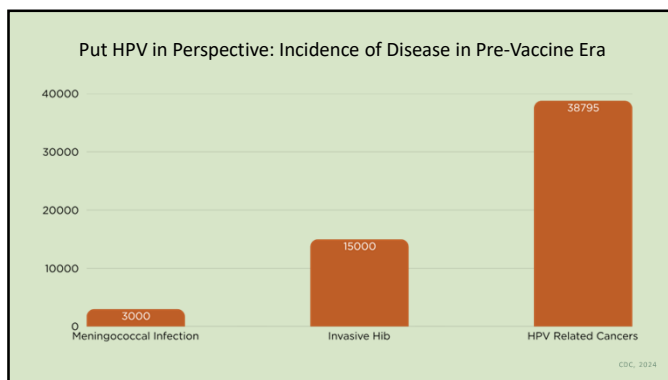
- HPV linked to reduced sperm motility and quality
- May cause abnormal sperm morphology and DNA fragmentation
- Associated with oxidative stress affecting sperm function

Notari et al, Nature, 2024; Ardekani et al, Eur J Med Res, 2025; Pereira et al, J Pathol, 2015

19



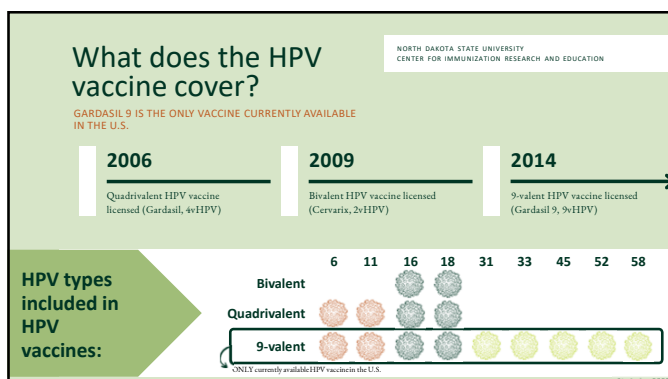
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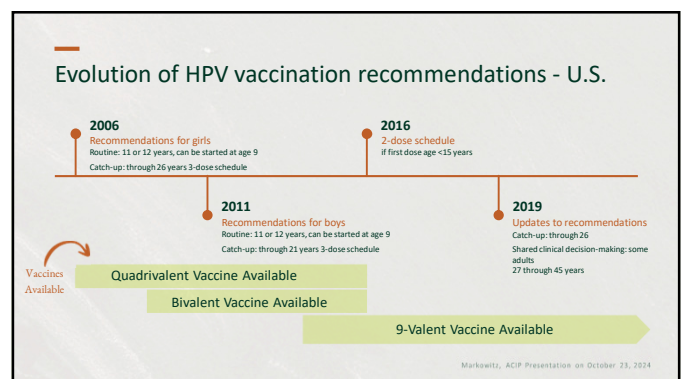
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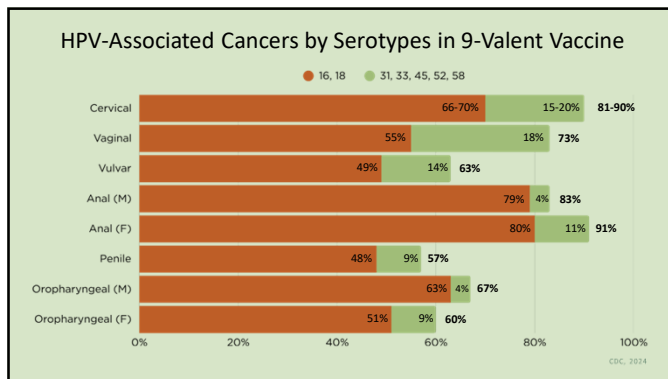


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### HPV Vaccine: Who Gets it and When

**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

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Marites et al, MMWR, 2019

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### Vaccine Efficacy

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### 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	
<b>Cervical Cancer:</b> HPV 16/18-related CIN 2/3 OR AIS	8,493	2	8,464	112	<b>~98%</b> (93.5, 99.8)
<b>Vulvar Cancer:</b> HPV 6/11/16/18-related VIN 2/3	7,772	0	7,744	10	<b>100%</b> (55.5, 100)
<b>Vaginal Cancer:</b> HPV 6/11/16/18-related VaIN 2/3	7,772	0	7,899	9	<b>100%</b> (49.5, 100)
<b>Anal Cancer in Males:</b> HPV 6/11/16/18-related AIN 2/3	194	3	208	13	<b>~75%</b> (8.8-95.4)

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

Marites, 2015

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### HPV Vaccine Efficacy – cervical, vaginal, vulvar disease

HPV Vaccine	Efficacy in HPV-naïve populations	Overall Population
Bivalent	99%	61%
Quadrivalent	97-100%	44-62%
9-Valent	97%	

Garland et al, NEJM, 2007; The FUTURE II Study Group, NEJM, 2007;  
Journe et al, NEJM, 2015; Lehtinen et al, Lancet, 2012

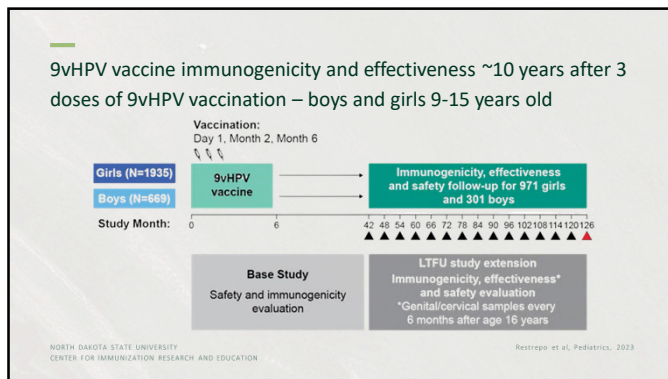
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### Take home message

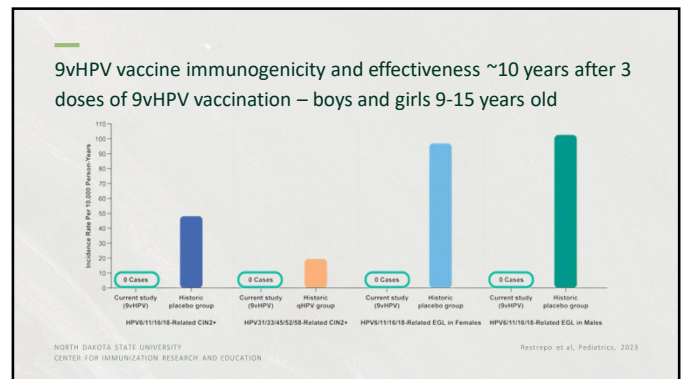
Just like putting on a bike helmet BEFORE going on a bike ride to protect against head injury...

...HPV vaccination is INCREDIBLY effective if given BEFORE exposure to the virus.

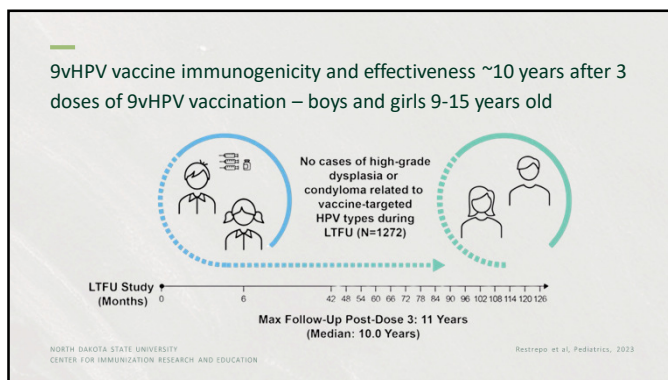
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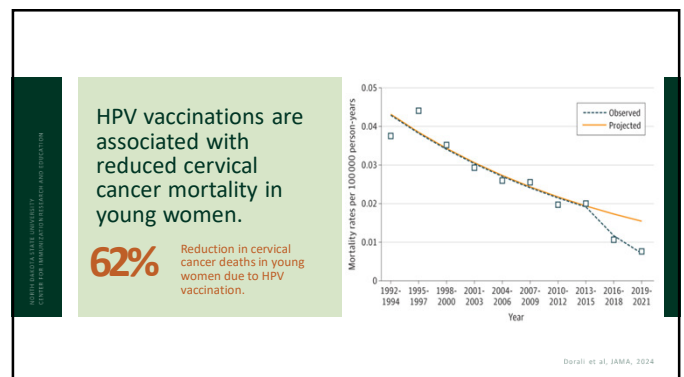
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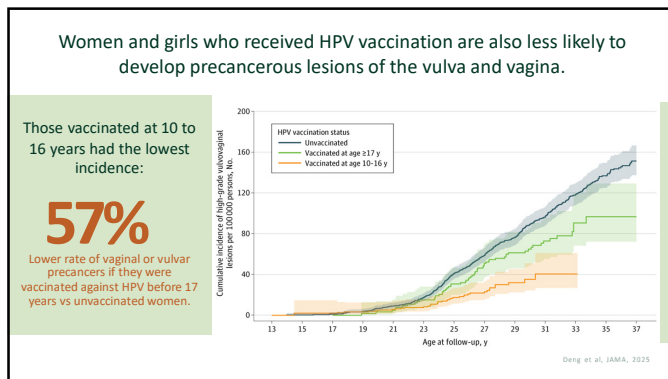
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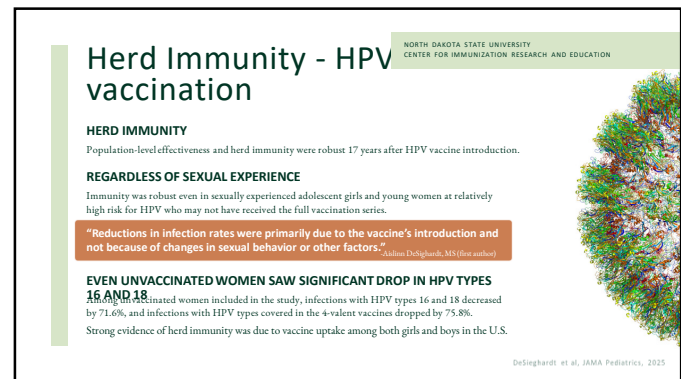
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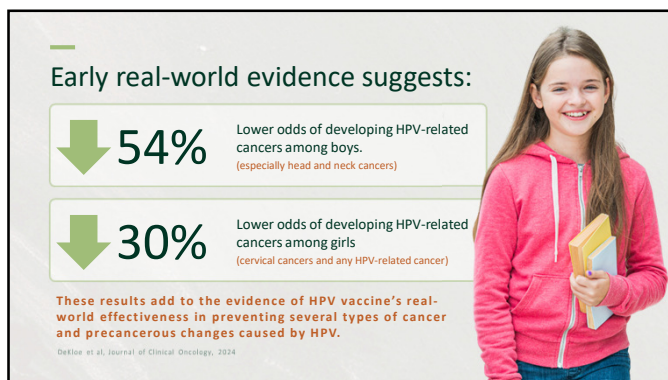
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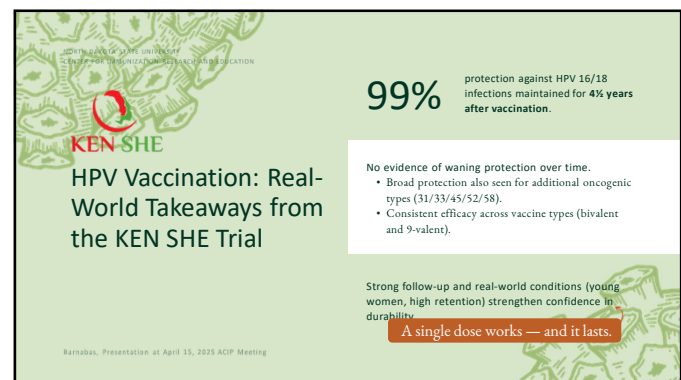
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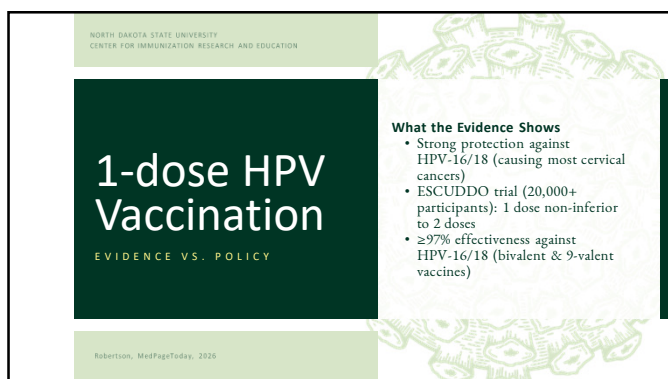
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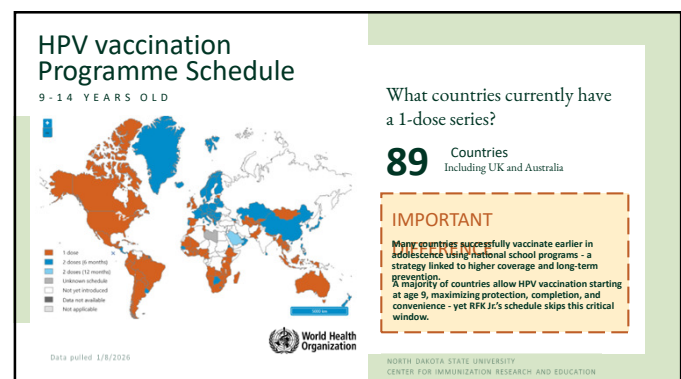
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## Does 1-dose provide adequate protection?

**BEYOND CERVICAL CANCER**  
What about protection against other HPV disease (head and neck cancers, genital warts, and Recurrent Respiratory Papillomatosis [RRP])

**1 in 4 people who receive only one dose may not mount an antibody response against important strains.**

**STUDY FOLLOW-UP: STILL GATHERING LONG-TERM DATA**  
Likely that protection from one dose will be long-lived. However, the longest period of follow-up has only been 5 years.

**20%** Nearly 20% didn't make detectable antibodies against HPV 6 after a single dose.

WM1

The Evidence Collective, 2026; Kemp et al, npj Vaccines, 2025

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## 1-dose HPV Vaccination

EVIDENCE VS. POLICY

Robertson, MedPageToday, 2026

**What We Still Don't Know**

- Long-term durability of protection
- Protection against **non-cervical HPV disease** (head and neck cancers, genital warts, recurrent respiratory papillomatosis [RRP])
- Which groups still need multiple doses (older adolescents, immunocompromised)

**WHY THIS MATTERS**

The **HHS move** was made without standard expert review.

Expert groups (AAP, ACOG) suggest the evidence is promising - **but process matters**. Professional guidance still recommends completing the full series.

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## 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.

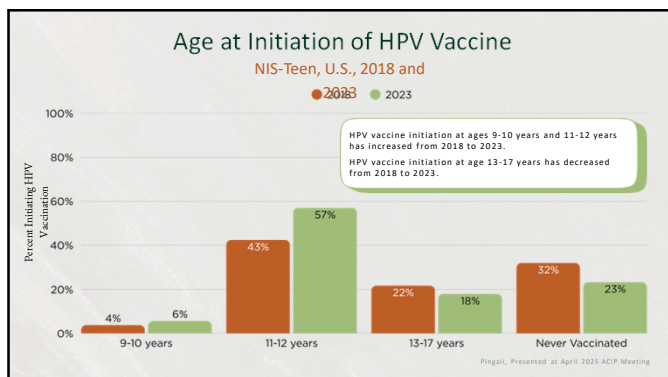
CDC, 2025

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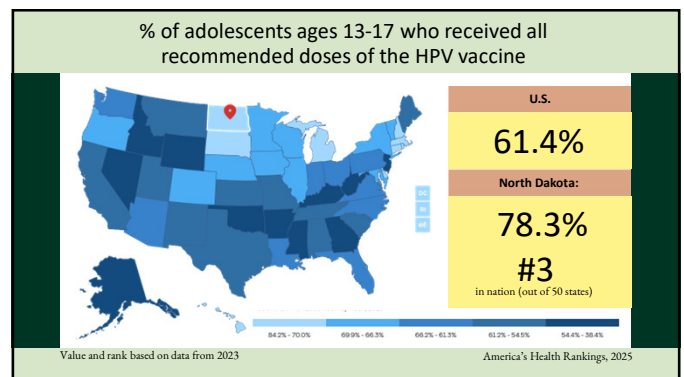
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## HPV Vaccination Rates

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## Slide 43

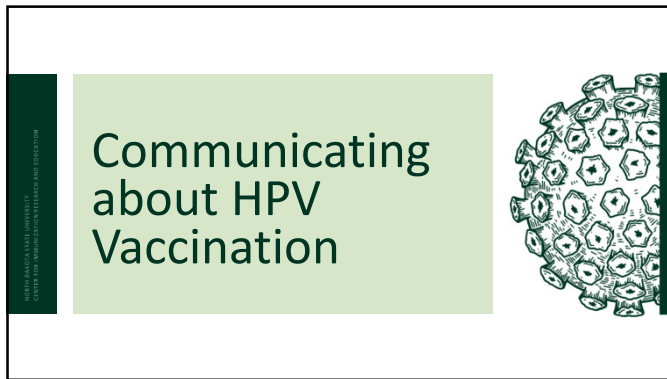
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**WM1** Looks like this text box might be missing a last word and parenthesis?

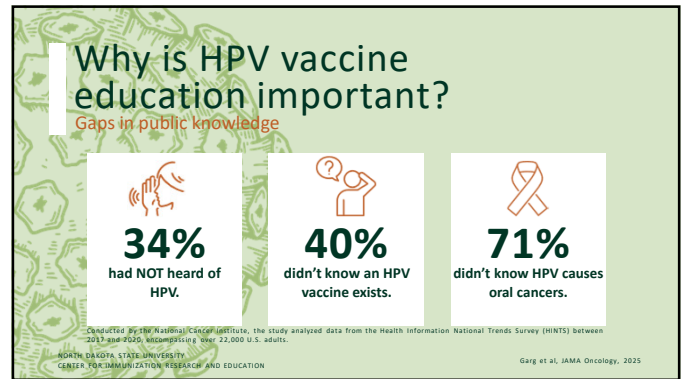
Williams, Maeve, 2026-01-09T17:48:13.992

**LD1 0** Great catch - updated :)

Dybsand, Lauren, 2026-01-09T19:11:00.679



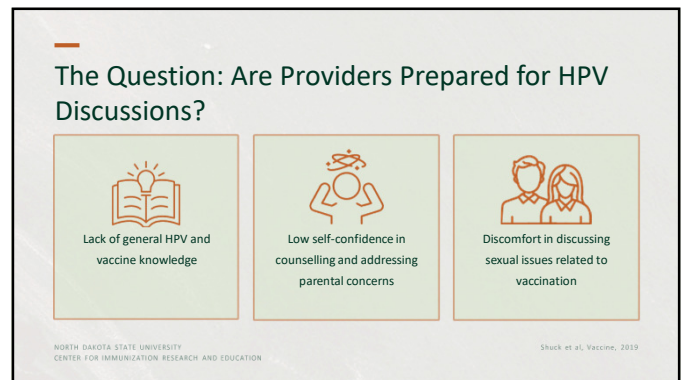
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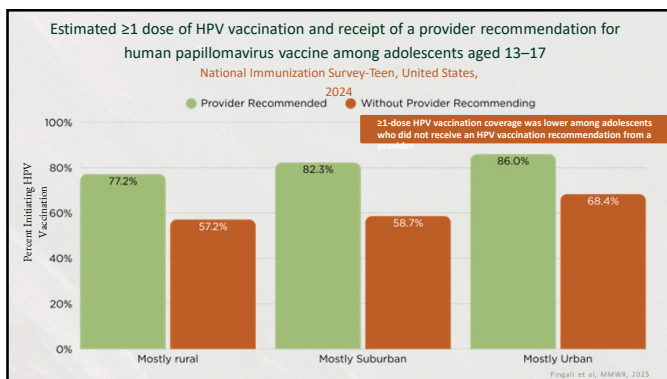
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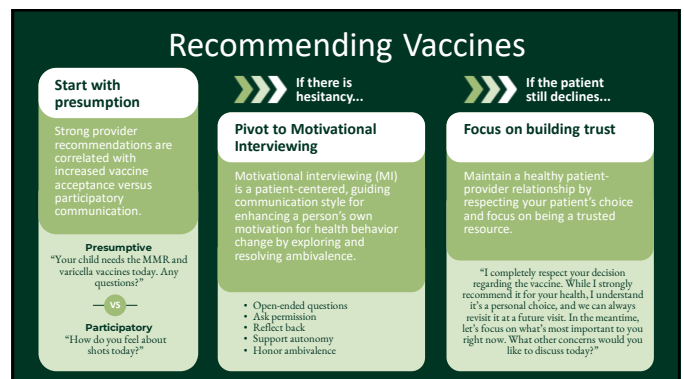
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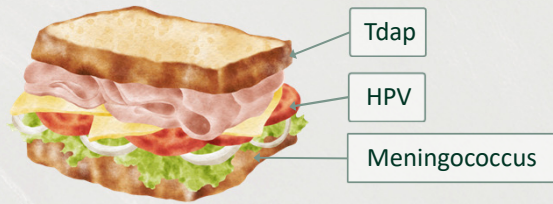


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## Normalize HPV Vaccination: "Sandwich"



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## Case Study #1:

Great to see you, Julie! I see we have Carly in for a sports physical today. As a part of today's visit, Carly is due for her Tdap, HPV, and meningococcal vaccines. Any questions?

You know, I am just not sure about Carly getting the HPV vaccine. I have done some research online and I'm worried about how safe it is. I read it may cause something called POI which could impact Carly's ability to have kids!

You aren't the first parent that has come to me with this concern. Can I share some information with you?

Sure.

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## Case Study: Know the facts!

### HPV vaccine has been around for 15+ years.

- Extensive safety testing occurs before any vaccine is licensed by the FDA in the U.S., including HPV vaccination! Gardasil 9 was approved for use and licensed in 2014. Clinical trials looked at 15,000+ men and women indicated that the vaccine was safe and the benefits outweigh any risk.
- 130+ million doses of HPV vaccine have been distributed since they were licensed.
- 160+ studies have shown that HPV vaccines have a favorable safety profile.

### HPV vaccine safety will continue to be monitored.

- Systems like VAERS, VSD, and CISA work together to provide timely data on vaccine safety in our country on vaccines that licensed and recommended for use.

### Acknowledge common side effects of HPV vaccination.

- Pain, redness, or swelling in the arm where the shot was given are common.
- Side effects are generally self-limiting. Put into perspective: HPV vaccination is cancer prevention.

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CDC, 2024

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## What is primary ovarian insufficiency (POI)?

Also known as "premature menopause," this is a condition in which a woman's ovaries stop functioning before age 40. Causes of primary ovarian insufficiency include:

- Genetics
- Chemicals in the environment
- Cancer treatments
- Cigarette smoking
- Autoimmune disorders
- Some viral infections

However, in many cases it's not possible to determine the cause. CDC and FDA have not found any proof that HPV vaccines cause POI.

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CDC, 2024; UpToDate, 2024

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## How have the CDC & FDA addressed the concerns of HPV vaccines causing POI?

As part of ongoing safety monitoring of HPV vaccines, CDC has reviewed reports of POI to VAERS following both Gardasil 9 and Gardasil vaccination

CDC has also conducted additional safety research on HPV vaccine in the Vaccine Safety Datalink

Let's take a look at the  
research...

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CDC, 2025

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“

With more than 12 years of HPV vaccine safety monitoring and research from the United States and other countries, we have robust data showing the HPV vaccines are safe. With regard to concerns about HPV vaccination and fertility in women, CDC and FDA have not found any convincing evidence that HPV vaccines cause primary ovarian insufficiency (POI).

Also known as “premature menopause,” POI is a condition in which a woman’s ovaries stop functioning before age 40. Causes of POI include genetics, chemicals in the environment, cancer treatments, smoking cigarettes, autoimmune disorders, and some viral infections.

A 2018 study from CDC’s Vaccine Safety Datalink that included nearly 200,000 women did not find an increased risk of POI following HPV vaccination.

-Frank Destefano, Director, Immunization Safety Office, CDC

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## Research in other countries:

In 2021, a retrospective cohort study was published in JAMA looking at a nationwide dataset of ~1M Danish-born girls/women aged 11-34. No association was found between HPV vaccination and primary ovarian insufficiency.

**JAMA Network Open**  
Original Investigation | Public Health  
**Association Between Human Papillomavirus Vaccination and Primary Ovarian Insufficiency in a Nationwide Cohort**  
Anders Hald, Dorte Hald, Dorte Hald, Thomas M. K.

**Abstract**  
**IMPORTANCE:** Anecdotal case reports have suggested an association between human papillomavirus (HPV) vaccination and primary ovarian insufficiency, but observational studies of safety and primary ovarian insufficiency are rare, and that findings do not support an association. However, available studies have been limited by statistical power, and concerns about fertility after vaccination are associated with lower levels of uptake of the cancer-preventing vaccine in many countries.  
**OBJECTIVE:** To evaluate the risk of primary ovarian insufficiency after quadrivalent human papillomavirus (HPV) vaccination.  
**DESIGN, SETTING, AND PARTICIPANTS:** This retrospective cohort study with follow-up from 2007 to 2016 used nationwide data for 998 300 Danish-born girls and women aged 11 to 34 years. Cox proportional hazards regression was used to estimate hazard ratios (HRs) of primary ovarian insufficiency.

**Key Points**  
**Question:** Is human papillomavirus vaccination associated with primary ovarian insufficiency among Danish girls and women?  
**Findings:** In this cohort study of 998 300 girls and women, vaccination was not associated with primary ovarian insufficiency.  
**Meaning:** This finding suggests that human papillomavirus vaccination is unlikely to be associated with moderate to large increases in the risk of primary ovarian insufficiency.

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## Case Study #1:

HPV vaccines have been around a long time now, over 15 years! And during this time, over a hundred million doses of HPV vaccines have been distributed in the U.S. We have very promising and reassuring data that these vaccines provide long-lasting protection and that they are very safe. The rumor that this vaccine causes infertility still makes the rounds on social media. What I hear you saying is that you are concerned this vaccine may cause infertility, and specifically Primary Ovarian Insufficiency or POI?

Yes.

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## Case Study #1:

As part of ongoing safety monitoring of HPV vaccines, researchers have taken a look at the risk of POI following both Gardasil 9 and Gardasil vaccination – many studies looking at hundreds of thousands of girls have found no link between HPV vaccination and infertility or POI. Some of my patients do experience some soreness, swelling, and redness at where the shot was given. But this is common and should get better in a day or two. AND do you want to know what is absolutely linked to infertility? HPV cancers. The fact that they can cause issues with having children is unquestioned in the medical world. I vaccinated my own daughter against HPV, and I highly recommend Carly get vaccinated, too. What stands out to you about what I shared?

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## Case Study #1:

No, that makes sense, and I guess I hadn't really realized that HPV vaccination had been around that long. I really appreciate you taking the time to talk to us about it. Your recommendations are important to us. But, I think we are going to take some time to think about it.

Of course. Can I send some resources home with you to take a look at? I think HPV vaccination is an important part of keeping Carly healthy. Can we re-address this at our next appointment?

Absolutely.

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## Questions?

THANK YOU FOR LISTENING

**SPECIAL THANKS TO:**

- MAEVE WILLIAMS
- LAUREN DYBSAND, MPH

**E-MAIL:**  
[nds.cire@ndsu.edu](mailto:nds.cire@ndsu.edu)

**WEB:**  
[www.ndsu.edu/centers/immunize](http://www.ndsu.edu/centers/immunize)

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  - Elicit-Provide-Elicit (EPE)
  - Change Talk & Scaling Questions
  - Best First Responses

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