

# Human Papillomavirus (HPV) and Vaccine-Preventable Cancers

## FACT SHEET

### Human Papillomavirus (HPV) causes several types of cancer

Current research shows that some HPV types are high risk and can cause certain cancers. Most of these cancers are caused by two high-risk types, HPV 16 and 18. The parts of the body most susceptible to high-risk HPV infections are squamous cell tissue of the cervix, genital areas (vagina, vulva, and penis), and oropharynx (back of the throat, base of the tongue, and tonsils). These specific cancers are referred to as HPV-associated cancers.

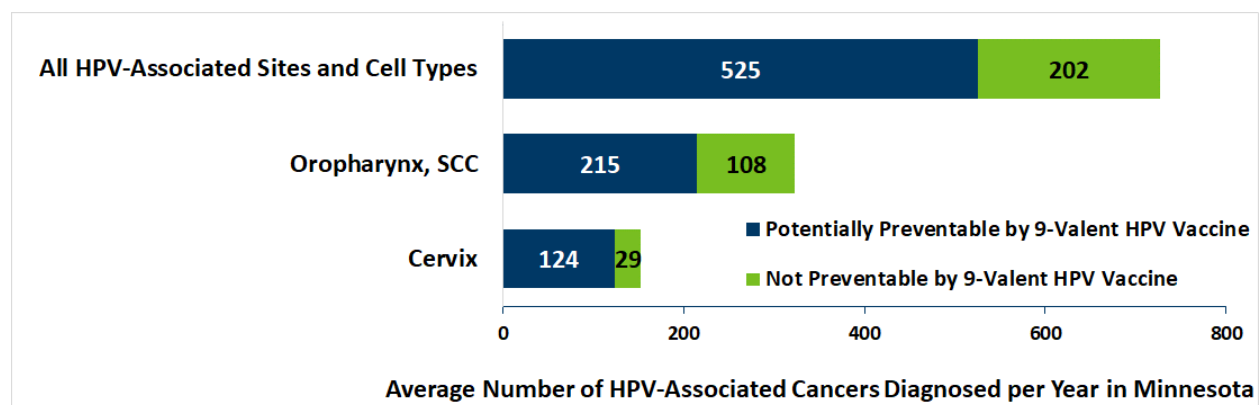
### An effective vaccine against HPV is available

Gardasil 9 is a Food and Drug Administration (FDA) approved HPV vaccine for use in the United States. Gardasil 9 is effective in developing immunity to the nine high-risk HPV types known to cause cancer: 6, 11, 16, 18, 31, 33, 45, 52, and 58.

### HPV vaccination can prevent certain cancers

Researchers have estimated that 72% of all HPV-associated cancers are attributable to infections with the cancer-causing HPV types (Saraiya, 2015; Viens 2016). Vaccination with Gardasil 9 against HPV promises to prevent many of these cancers from developing. In Minnesota, an estimated 727 HPV-associated cancers were reported each year during 2017-2021. Of these, an estimated 525 might be prevented with Gardasil 9, with the greatest potential for preventing oropharynx and cervix cancers.

### Estimated annual number of HPV-associated cancers of the oropharynx and cervix prevented by Gardasil 9 vaccination, Minnesota 2017-2021



Below is a detailed list of the number of cancers that could be prevented in Minnesota with HPV vaccinations (column 4).

**Estimated annual number of HPV-associated cancers prevented in Minnesota <sup>A</sup>**

<b>(1) Invasive Cancer Anatomic Site and Tissue Type <sup>B</sup></b>	<b>(2) Average Number New Cases per Year <sup>D</sup></b>	<b>(3) Percent of Cancers Preventable by 9-Valent Vaccine <sup>E</sup></b>	<b>(4) Number of Cancers Preventable by 9-Valent Vaccine <sup>F</sup></b>
Cervix	153	80.9%	124
Vagina, SCC	11	73.4%	8
Vulva, SCC	96	62.8%	60
Penis, SCC	27	56.9%	15
Anus, SCC - Total	107	88.3%	94
Anus, SCC - Female	76	90.3%	69
Anus, SCC - Male	30	82.9%	25
Rectum, SCC - Total	10	87.6%	9
Rectum, SCC - Female	8	90.3%	7
Rectum, SCC - Male	2	82.9%	2
Oropharynx, SCC <sup>C</sup> - Total	323	66.4%	215
Oropharynx, SCC <sup>C</sup> - Female	55	60.3%	33
Oropharynx, SCC <sup>C</sup> - Male	268	67.8%	182
All Sites - Total	713	—	525
All Sites - Female	390	—	301
All Sites - Male	323	—	224

- A. Estimates are based on the CDC approach for estimating attributable fraction (Saraiya 2015, Table 4 and Viens 2016, Table 3). Source: Minnesota Cancer Reporting System, invasive cancers diagnosed from 2017 to 2021.
- B. Specific anatomic sites and cell types in which HPV DNA is frequently found (HPV-associated sites and histology). Cell types for all sites but the cervix is restricted to squamous cell carcinomas (SCC). SCC make up the majority of cancers diagnosed in the cervix (97%), vagina (64%), vulva (78%), penis (93%), anus (84%), and oropharyngeal sites (90%), but only a very small proportion (2%) of rectal cancer diagnoses.
- C. Oropharynx includes the back base of the tongue, soft palate, side and back walls of the throat, and the tonsils (ICD-O-3 primary site 1.9, 2.4, 2.8, 5.1, 5.2, 9.0, 9.1, 9.8, 9.9, 10.0, 10.1, 10.2, 10.3, 10.4, 10.8, 10.9 having ICD-O-3 histology codes 8050–8084, 8120–8131).
- D. Average number of new cancers per year in Minnesota meeting defined site and histology criteria for HPV-associated cancers.
- E. Percentage of HPV-associated cancers detected by HPV 9-valent vaccine in previous genome sequencing studies (as described in Saraiya et al., 2015). The site and histology-specific percentages are taken from Viens 2016, where they are referred to as the percentage of cancers attributable to HPV 16/18/31/33/45/52/58).
- F. Estimated number of cancers preventable by 9-valent HPV vaccine if the entire at-risk population was vaccinated and the vaccine was completely effective.

## Information on HPV-vaccination and cervical cancer screening

For more information on HPV screening and immunization go to the MDH HPV Basics website:  
<https://www.health.state.mn.us/diseases/hpv/basics.html>.

For information about the MDH Sage Screening Program which offers free cervical cancer screening to women who meet age, insurance and income criteria, go to:  
<https://www.health.state.mn.us/diseases/cancer/sage/screening/index.html>.

## References

Saraiya M, Unger ER, Thompson TD, et al.; HPV Typing of Cancers Workgroup. US assessment of HPV types in cancers: implications for current and 9-valent HPV vaccines. J Natl Cancer Inst 2015;107:djv086. <https://doi.org/10.1093/inci/djv086>

Viens LJ, Henley SJ, Watson M, et al.; Human papillomavirus–associated cancers—United States, 2008–2012. MMWR Morb Mortal Wkly Rep 2016;65:661–6.  
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*The collection of Minnesota Cancer data was supported by Cooperative Agreement Number, NU58DP007128 from the Centers for Disease Control and Prevention (CDC) The contents of this work are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.*

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04/23/2024

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