

IN THE NAME OF GOD

HPV Epidemiology in IRAN and World

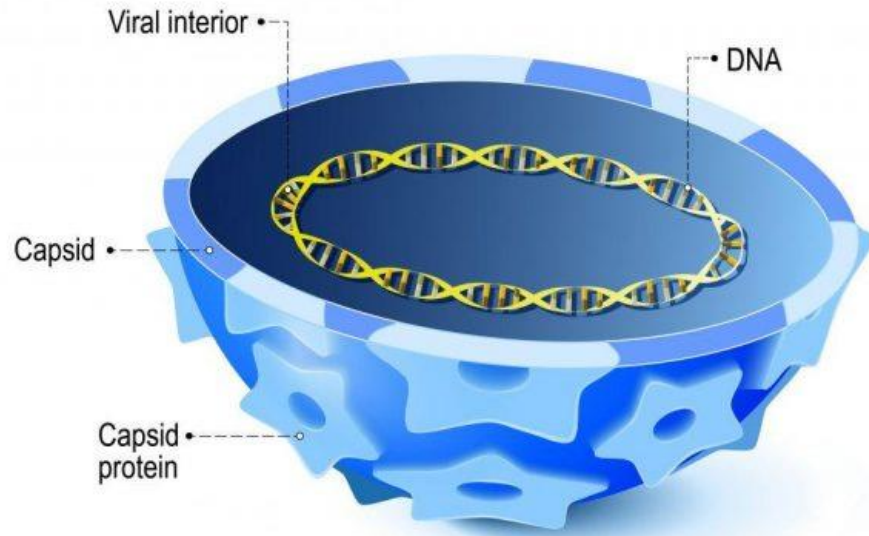
F.Shirvani MD MS



What is Human Papillomavirus (HPV)? - The Basics

A Diverse Family of Viruses:

HPV
human papillomavirus



DNA viruses from the Papillomaviridae family.

Over 200 identified types; ~40-50 affect the anogenital tract.

Tropism:

Infects cutaneous and mucosal epithelial cells

Classification by Oncogenic Risk:

High-Risk (Oncogenic) Types: HPV 16 & 18

are responsible for ~70% of cervical cancers globally. Also include 31, 33, 45, 52, 58.

Low-Risk (Non-Oncogenic) Types: HPV 6 & 11

Cause ~90% of anogenital warts and recurrent respiratory papillomatosis.

A Brief Global History of HPV Discovery

Ancient Times: Clinical signs (warts) described in ancient Greek and Roman medical texts.

1900s: Suspicions of a sexually transmitted agent in cervical cancer.

1970s: Prof. Harald zur Hausen hypothesizes a link between HPV and cervical cancer.

1983-1984: zur Hausen's team isolates and clones HPV 16 and 18 from cervical cancer tissues.

2008: Harald zur Hausen awarded the Nobel Prize in Physiology or Medicine for this discovery

2006: First prophylactic HPV vaccine (Gardasil®) licensed.

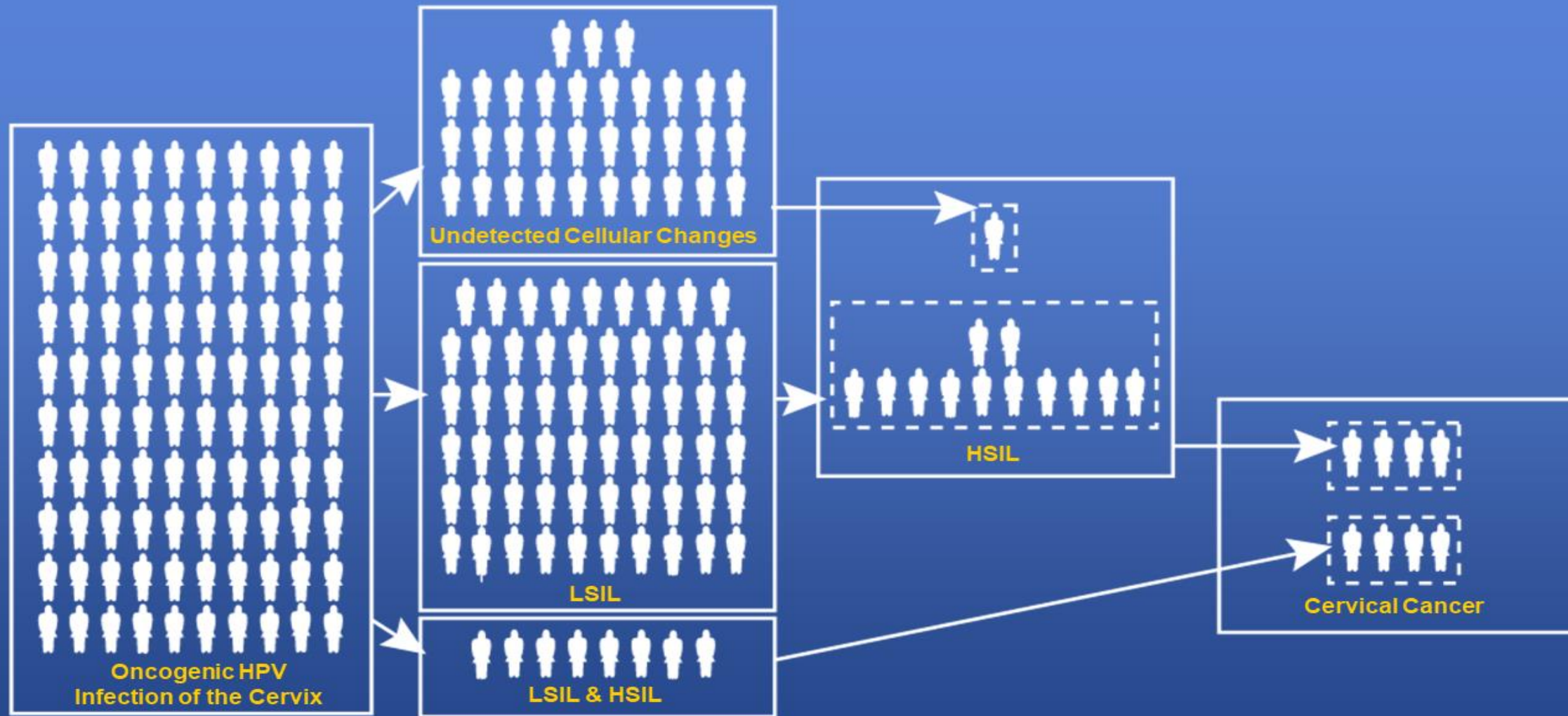
The global burden of HPV-related cancers is significant, with approximately (1.5) million new cases and (350000-755,000) deaths estimated in 2022 alone.

This burden is not evenly distributed, with 85% in **low- and middle-income** countries bearing a disproportionately high share, especially for **cervical cancer**.

While cervical cancer remains the most common HPV-related cancer globally, the incidence of non-cervical cancers, such as oropharyngeal and anal cancers, is rising, and the burden of HPV is often overlooked in males and in relation to non-cervical malignancies.

One of the most common STIs globally.

Natural History from HPV Infection to Cervical Cancer



Median Age
of Event:

Early 20s

Early to mid 20s

Mid to late 20s

40s to 50s

*LSIL = low-grade squamous intraepithelial lesion

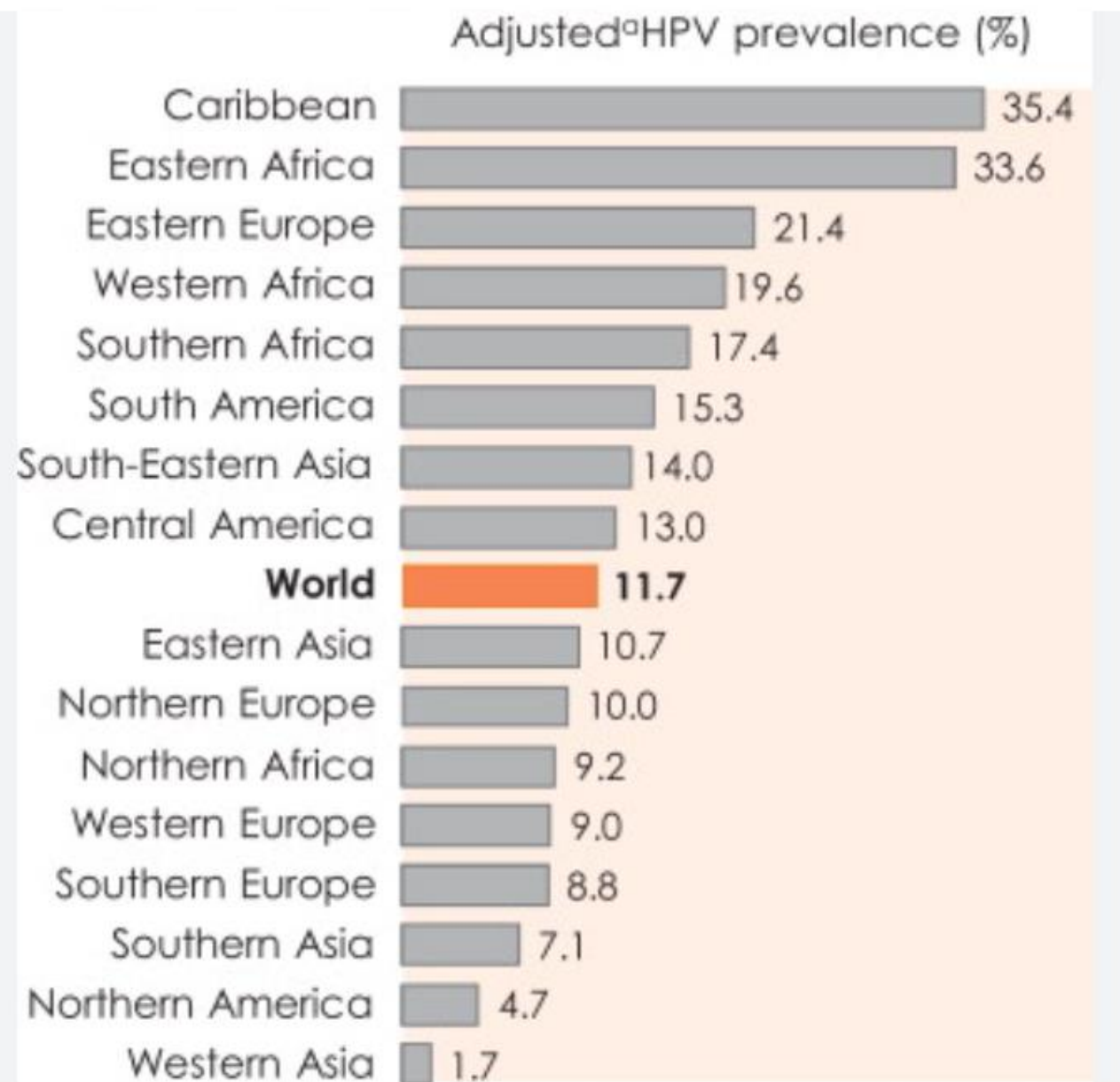
**HSIL = high-grade squamous intraepithelial lesion

Adapted from Baseman JG, Koutsky LA. *J Clin Virol.* 2005;32S:S16–S24, with permission from Elsevier.

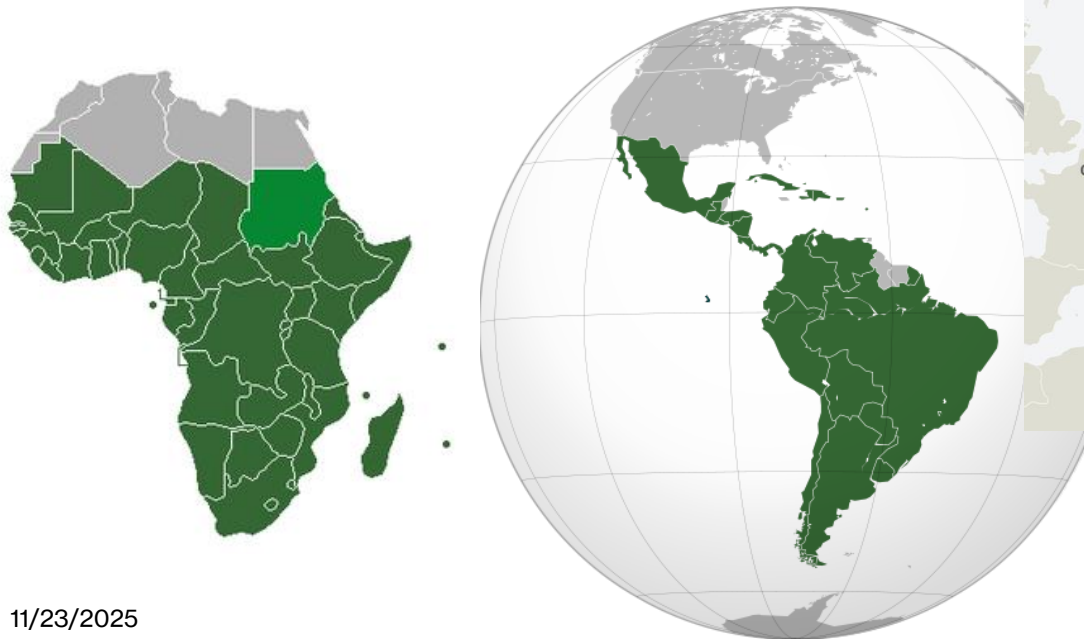
The global adjusted HPV prevalence is 11%.

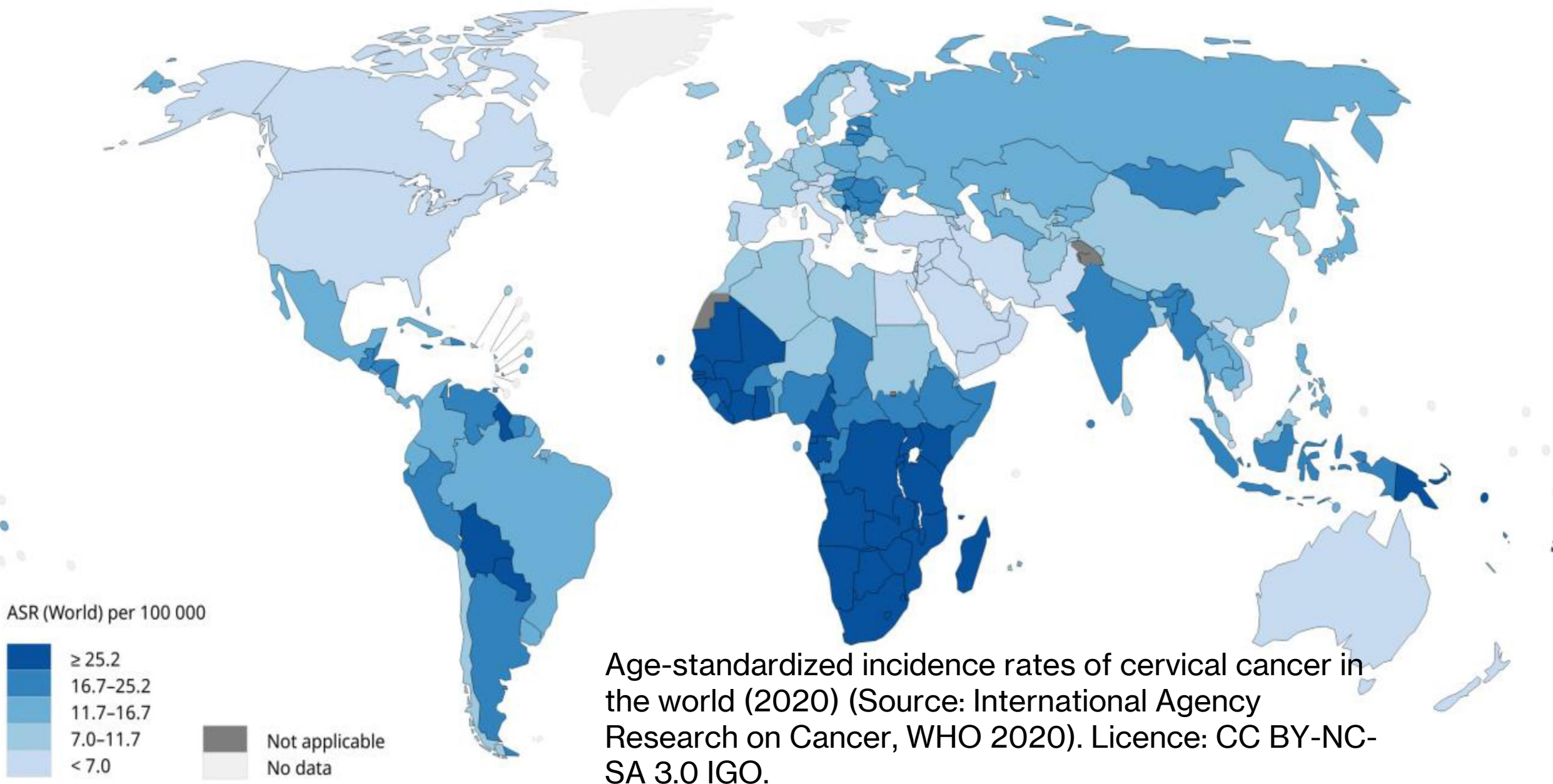
HPV-16 is the most prevalent HPV genotype (5%) followed by HPV-6 (4%).

HPV prevalence is high in young adults, reaching a maximum between the ages of 25 years and 29 years, and stabilized or slightly decreased thereafter.



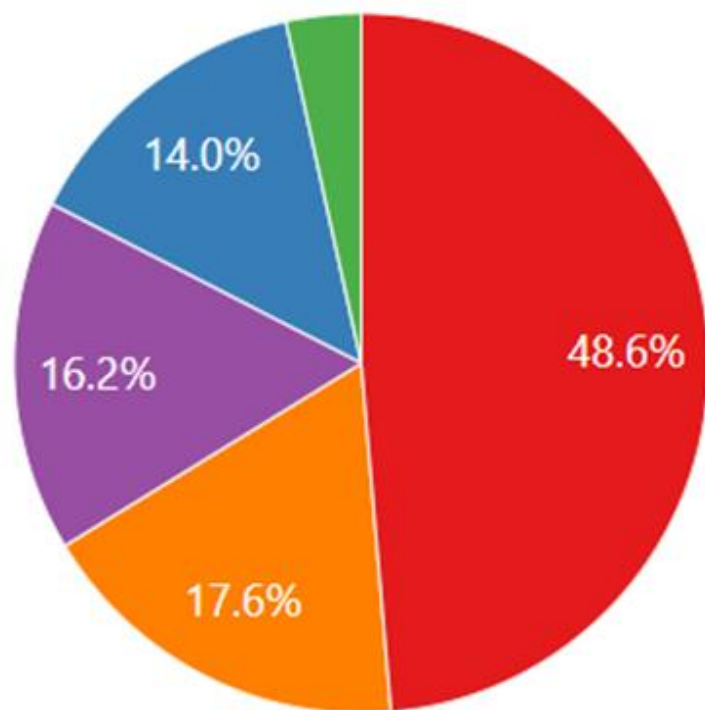
The highest prevalence of **Cervical HPV among women with normal cytology** is in **sub-Saharan Africa (24%)**, followed by **Latin America and the Caribbean (16%)**, **eastern Europe (14%)**, and **South-East Asia (14%)** . Prevalence in men is highly variable based on sexual trends.





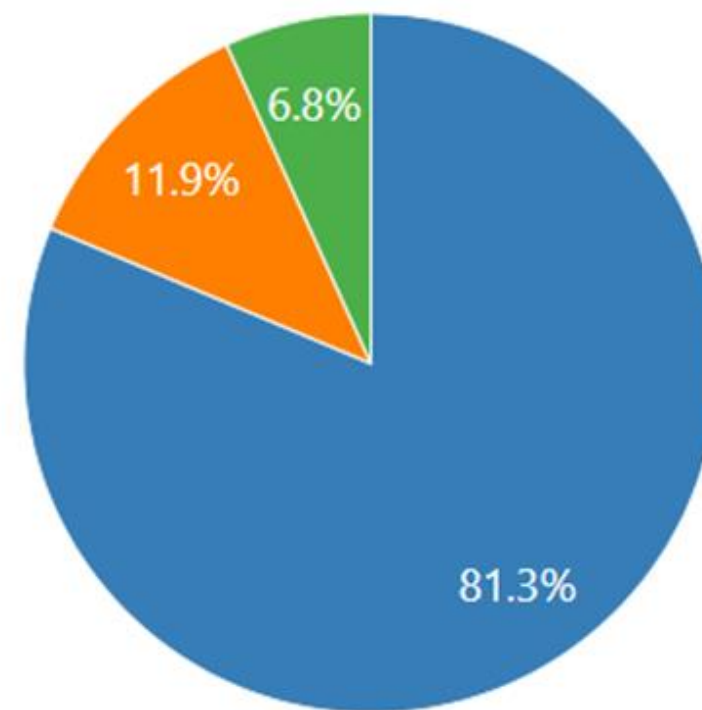
Age-standardized incidence rates of cervical cancer in the world (2020) (Source: International Agency Research on Cancer, WHO 2020). Licence: CC BY-NC-SA 3.0 IGO.

Females



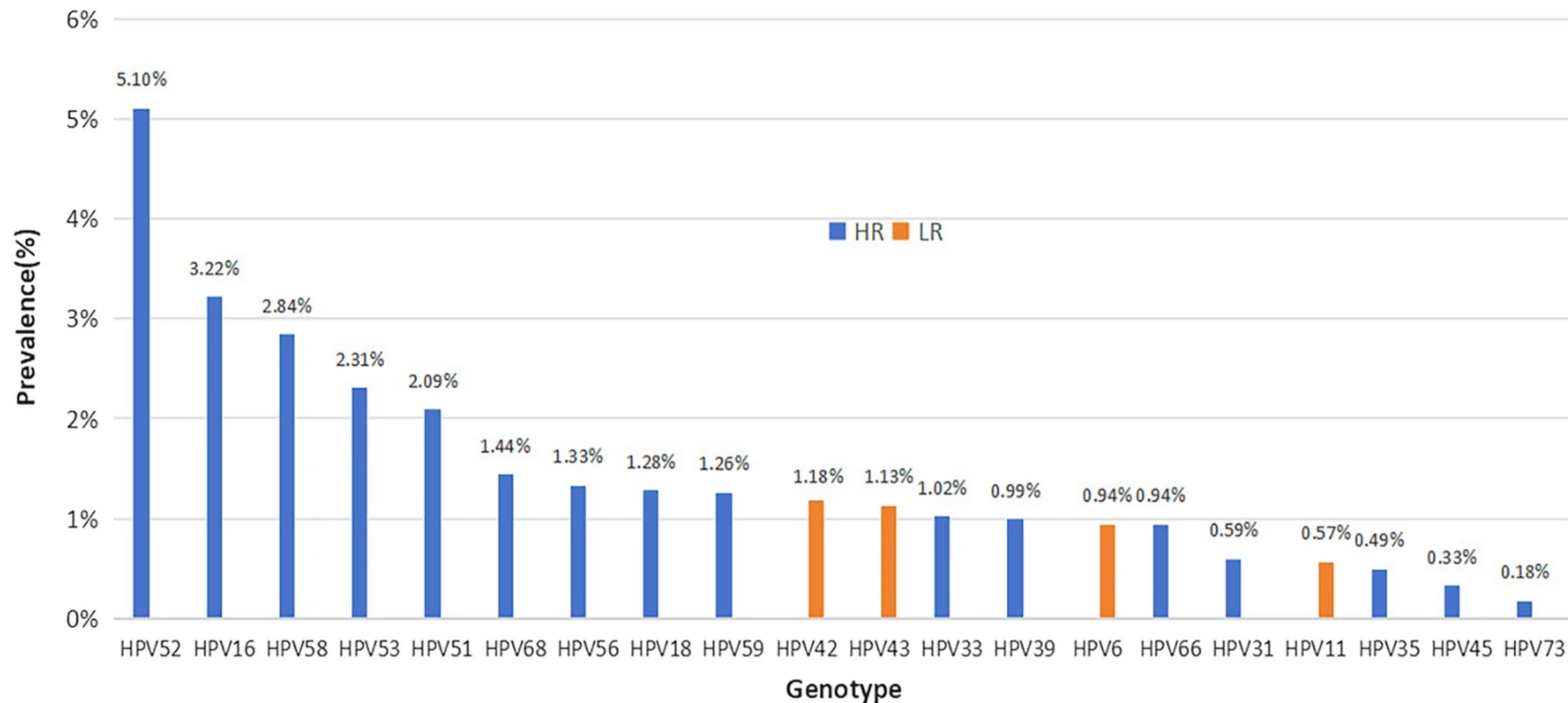
■ Oropharynx
 ■ Anus*
 ■ Vagina
 ■ Vulva
 ■ Cervix
 [Reset](#)

Males



■ Oropharynx
 ■ Anus*
 ■ Penis
 [Reset](#)

From: [Prevalence and genotype distribution of HPV6/11/16/18 infections among 180,276 outpatient females from a Women's and Children's Central Hospital, 2015–2021, Chengdu, China](#)



Prevalence and genotype distribution of HPV infection in 180,276 women from 2015 to 2021 (HR-HPV and LR-HPV).



Iran (Islamic Republic of)

Health data overview for the Islamic Republic of Iran

Population	90 608 707 (2023)
Current health expenditure (% of GDP)	5.77 (2021)
WHO region	Eastern Mediterranean
World Bank income level	Upper-middle income (UMC)



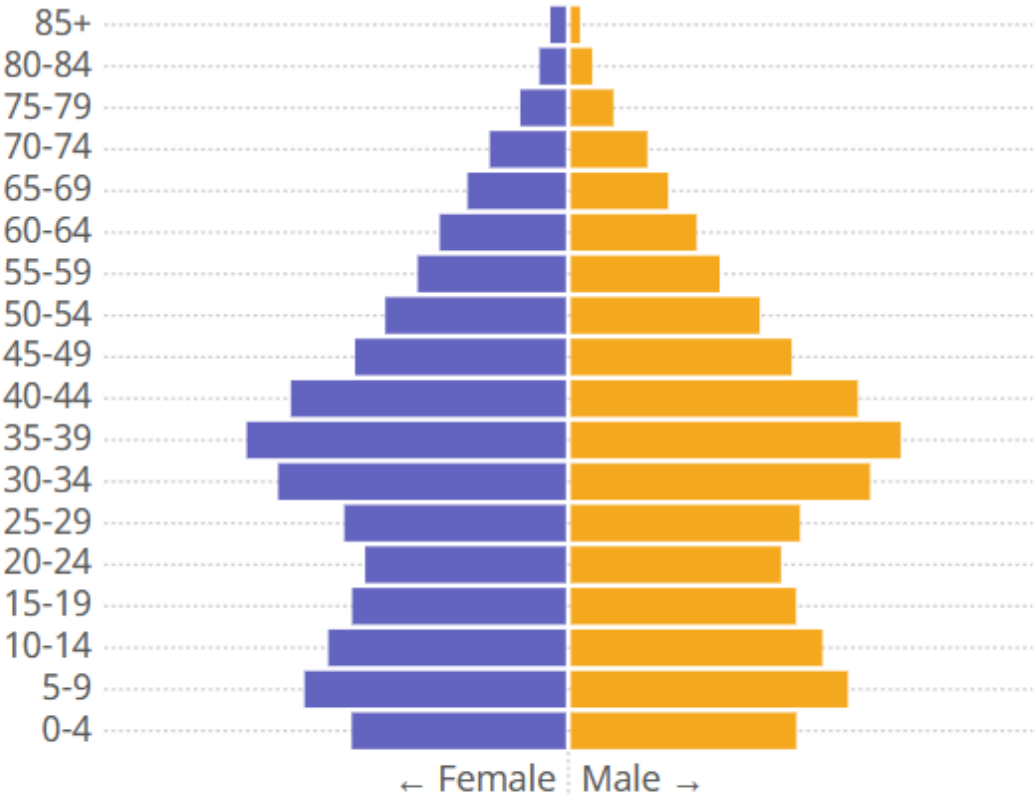
Population, Iran (Islamic Republic of)

 Iran (Islamic Republic of)

Demographic change 2023 - 2050

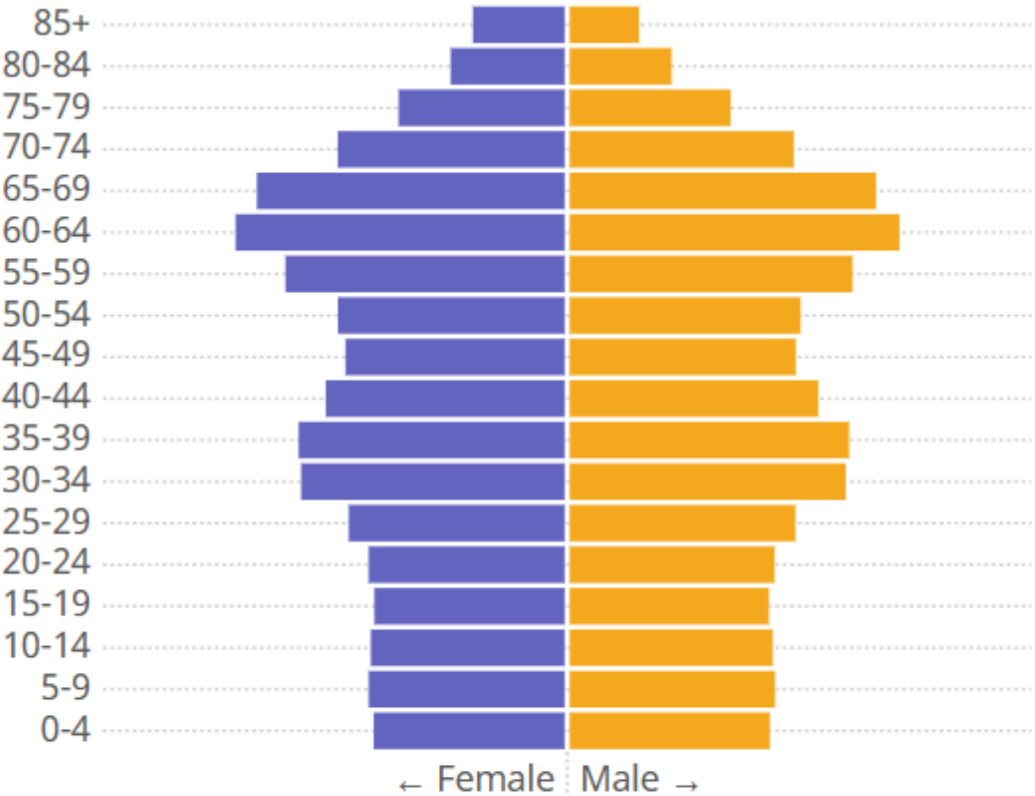
2023

Population by age and sex. Iran (Islamic Republic of)



2050

Projected population by age and sex. Iran (Islamic Republic of)





Epidemiology of HPV in Iran - Key Findings

Overall HPV Prevalence:

Varies widely across studies (**from ~2% in the general population to >80% in cervical cancer patients**), reflecting different studied populations.

Prevalence in Women with Normal Cytology:

Estimated between 2% - 9%

Prevalence in Cervical Cancer: >80%

Of invasive cervical cancer cases in Iran are attributable to HPV.

HPV 16 is the dominant type, followed by HPV 18 and 31.

Regional Variation:

Prevalence can differ between provinces.

The Prevalence of HPV Genotypes in Iranian Population: An Update

Mina Mobini Kesheh¹ , Hossein Keyvani^{2*} 

1. Student Research Committee, Department of Virology, School of Medicine, Iran University of Medical Science, Tehran, Iran
2. Department of Virology, School of Medicine, Iran University of Medical Science, Tehran, Iran

KEYWORDS

Human papillomavirus (HPV),
Age distribution,
Genotype distribution,
Iran,
INNO-LiPA HPV genotyping

Scan to discover online



ABSTRACT

Background & Objective: *Human papillomavirus* (HPV) is the main cause of genital warts and some anogenital cancers in male and female subjects which is commonly transmitted by sexual contacts. The objective of this cross-sectional study was to examine the prevalence of HPV genotypes in 10,266 Iranian male and female population, according to their age.

Methods: Samples were collected from the penile and anal sites of male subjects and the vagina and cervix of female subjects in a time period between 2011 and 2016. HPV DNA was detected in PCR using the MY09 and MY11 primers, and the INNO-LiPA assay was applied for HPV genotyping. To investigate the relevance of HPV infection and age, the samples were classified into 4 age groups (13-29, 30-44, 45-59, and 60-74).

Table1. The prevalence of HPV genotypes as a single infection in Iranian female and male population

Sex					
Female			Male		
HPV Genotypes		No	%, 95% CI	No	%, 95% CI
LR HPV	6	1004	26.1 (24.8-27.6)	828	66.5 (64.0-68.9)
	11	201	5.2 (4.5-6.0)	131	10.5 (8.8-12.1)
	44	26	0.7 (0.4-0.9)	18	1.4 (0.8-2.2)
	54	42	1.1 (0.8-1.4)	3	0.2 (0.0-0.6)
	62	26	0.7 (0.4-0.9)	2	0.2 (0.0-0.4)
	89	20	0.5 (0.3-0.8)	0	0 (0.0-0.0)
	43	9	0.2 (0.1-0.4)	0	0 (0.0-0.0)
	40	9	0.2 (0.1-0.4)	0	0 (0.0-0.0)
	61	17	0.4 (0.3-0.7)	0	0 (0.0-0.0)
	67	9	0.2 (0.1-0.4)	0	0 (0.0-0.0)
	81	10	0.3 (0.1-0.4)	0	0 (0.0-0.0)
	83	8	0.2 (0.1-0.4)	0	0 (0.0-0.0)
	42	10	0.3 (0.1-0.4)	3	0.2 (0.0-0.6)
53		108	2.8 (2.3-3.4)	3	0.2 (0.0-0.6)

pHR HPV	83	8	0.2 (0.1-0.4)	0	0 (0.0-0.0)
	42	10	0.3 (0.1-0.4)	3	0.2 (0.0-0.6)
	53	108	2.8 (2.3-3.4)	3	0.2 (0.0-0.6)
	66	65	1.7 (1.3-2.1)	6	0.5 (0.2-0.9)
	26	10	0.3 (0.1-0.4)	0	0 (0.0-0.0)
	73	12	0.3 (0.2-0.5)	1	0.1 (0.0-0.2)
	82	12	0.3 (0.1-0.5)	1	0.1 (0.0-0.2)
	70	6	0.2 (0.1-0.3)	1	0.1 (0.0-0.2)
HR HPV	16	214	5.6 (4.8-6.2)	34	2.7 (1.8-3.6)
	18	35	0.9 (0.7-1.2)	3	0.2 (0.0-0.6)
	31	23	0.6 (0.4-0.8)	2	0.2 (0.0-0.4)
	35	19	0.5 (0.3-0.7)	1	0.1 (0.0-0.2)
	39	45	1.2 (0.8-1.5)	3	0.2 (0.0-0.6)
	45	24	0.6 (0.4-0.9)	1	0.1 (0.0-0.2)
	51	72	1.9 (1.5-2.3)	11	0.9 (0.4-1.4)
	52	86	2.2 (1.8-2.7)	8	0.6 (0.2-1.1)
	56	33	0.9 (0.6-1.2)	4	0.4 (0.1-0.7)
	58	28	0.7 (0.5-1.0)	1	0.1 (0.0-0.3)
	68	21	0.5 (0.3-0.8)	1	0.1 (0.0-0.2)
	59	10	0.3 (0.1-0.4)	3	0.2 (0.0-0.6)
	33	7	0.2 (0.1-0.3)	1	0.1 (0.0-0.3)
Mixed infection*		1620	42.1 (40.2-43.9)	174	14.1 (12.4-15.7)
Total		3841	100.0	1244	100.0

Table 2. The prevalence of HPV genotypes in mixed infections in Iranian female and male population

HPV genotypes	Females		Males	
	No	%, 95% CI	No	%, 95% CI
More frequent genotypes with other HPV genotypes in mixed infections*				
HPV-6	659	40.7 (38.2-43.0)	139	79.9 (73.6-85.6)
HPV-11	236	14.6 (13.0-16.5)	40	23.0 (16.7-29.3)
HPV-16	426	26.3 (24.3-28.6)	34	19.5 (13.8-25.9)
HPV-52	282	17.4 (15.6-19.2)	32	18.4 (12.7-24.1)
HPV-53	259	16.0 (14.2-17.8)	15	8.6 (4.6-13.2)
HPV-31	247	15.2 (13.5-17.1)	13	7.5 (4.0-12.1)
HPV-51	236	14.6 (13.0-16.5)	24	13.8 (9.2-19.0)
HPV-66	232	14.3 (12.7-16.1)	16	9.2 (5.2-13.8)
HPV-39	178	11.0 (9.4-12.5)	9	5.2 (2.3-8.6)
HPV-18	143	8.8 (7.3-10.3)	11	6.3 (2.9-10.3)
HPV-45	84	5.2 (4.2-6.4)	2	1.1 (0.0-2.9)
Total number of mixed infections	1620		174	

The percentages were computed in the formula of 'the frequency/total number' (the total number was 3,841 in female subjects and 1,244 in male subjects).

*Other HPV genotypes obtained one or more of these HPV genotypes: HPV-16, -18, -31, -33, -35, -39, -45, -51, -52, -56, -58, -59, -68, -26, -53, -66, -70, -73, -82, -6, -11, -40, -42, -43, -44, -54, -61, -62, -67, -81, -83, and -89.

Table 3. The frequency and percentage of HPV infections of 31 Iranian provinces among HPV DNA samples

Province	Frequency	%, 95% CI
Alborz	296	5.8 (5.2-6.5)
Ardabil	80	1.6 (1.2-1.9)
Bushehr	45	0.9 (0.6-1.1)
Chaharmahal and Bakhtiari	31	0.6 (0.4-0.8)
East Azerbaijan	68	1.3 (1.0-1.7)
Esfahan	72	1.4 (1.1-1.8)
Fars	67	1.3 (1.0-1.7)
Gilan	817	16.1 (15.0-17.1)
Golestan	23	0.5 (0.3-0.6)
Hamadan	11	0.2 (0.1-0.4)
Hormozgan	115	2.3 (1.9-2.7)
Ilam	2	0.0 (0.0-0.1)
Kerman	35	0.7 (0.5-0.9)
Kermanshah	61	1.2 (0.9-1.5)
Khuzestan	165	3.2 (2.8-3.8)
Kohgiluyeh and Boyer-Ahmad	5	0.1 (0.0-0.2)
Kurdistan	68	1.3 (1.0-1.7)
Lorestan	69	1.4 (1.0-1.7)



Markazi	139	2.7 (2.3-3.2)
Mazandaran	286	5.6 (5.0-6.3)
Northern Khorasan (Bojnord)	62	1.2 (0.9-1.5)
Qazvin	55	1.1 (0.8-1.4)
Qom	203	4.0 (3.5-4.6)
Razavi Khorasan (Mashhad)	43	0.8 (0.6-1.1)
Semnan	25	0.5 (0.3-0.7)
Sistan and Baluchestan (Zabol)	40	0.8 (0.6-1.0)
South Khorasan (Birjand)	11	0.2 (0.1-0.4)
Tehran	2073	40.8 (39.4-42.1)
West Azerbaijan	58	1.1 (0.9-1.5)
Yazd	48	0.9 (0.7-1.2)
Zanjan	12	0.2 (0.1-0.4)
Total	5085	100.0

*The percentages were computed in the formula of 'the frequency/total number' (the total number was 5085).

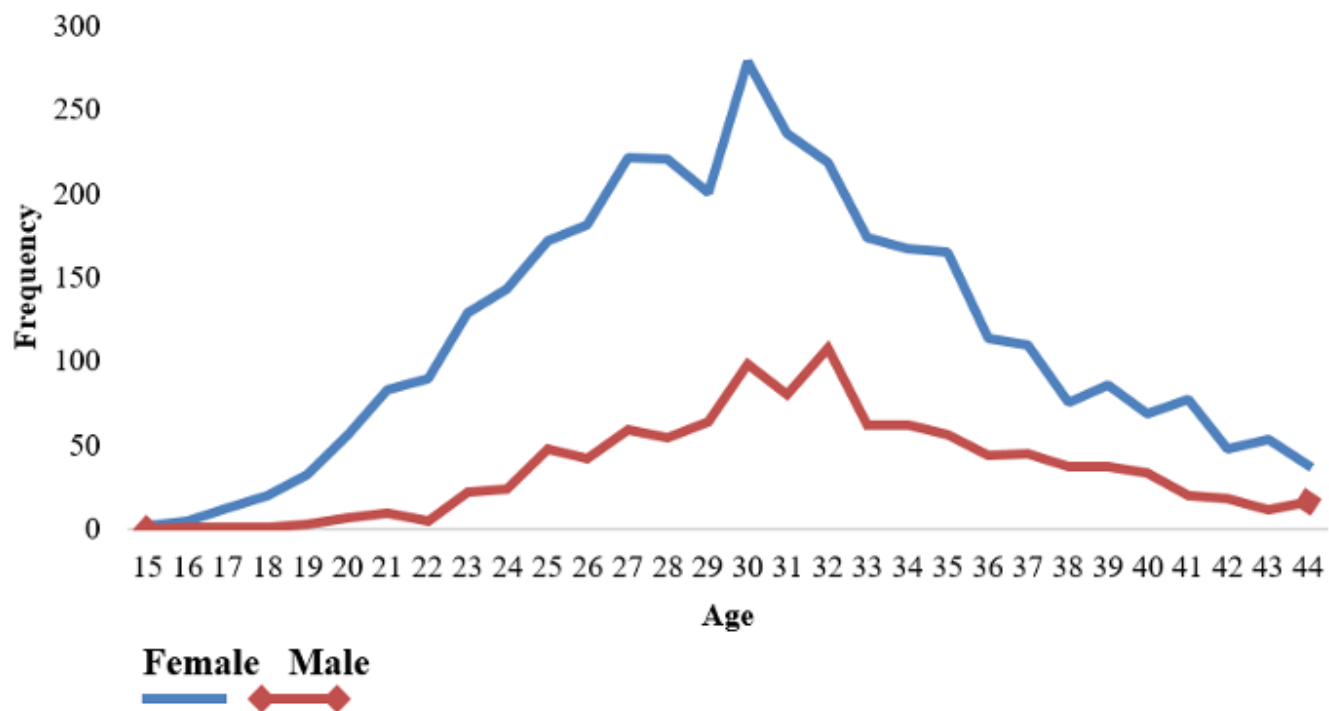


Figure2. The frequency of HPV infection according to the age in the studied males and females

Genotype Distribution: The Key to Tailored Prevention



Relative frequency of high-risk HPV types in Iranian cervical cancer cases.

HPV16:~65%

HPV18:~8%

HPV31/33/45:~12%

Other (52, 58, 35):~15%

HPV18 is less dominant than in some Western populations.

Importance of local genotyping data to monitor for types



Comprehensive National Strategy for HPV Prevention and Treatment in Iran



Shahabodin Babaeifard¹, Maryam Barkhordar^{2*}, Leyla Sharifi Aliabadi², Mohadese Marzban³, Hossein Rouzbahani³, Ghazal Razani⁴, Ghasem Janbabai²

***Correspondence to:** Maryam Barkhordar, Email: barkhordarm.n@gmail.com

Copyright: © 2025 The Author(s); Published by Kerman University of Medical Sciences. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any

variations. For instance, HPV-56 and HPV-39 dominate in Sari, Mazandaran province, while HPV-16 remains prevalent in Tehran.¹² These findings underscore the need for genotype-tailored interventions. HPV-related cancers also impose an

--

Proposed National Strategy

1. Gender-Neutral Vaccination Programs

HPV vaccination is most effective when administered before sexual debut, with efficacy rates of 74%-93% in adolescents aged 9-14.¹⁶ However, Iran's immunization framework lacks structured HPV guidelines, relying on imported vaccines (eg, Gardasil) and limited domestic production (eg, Papilloguard).¹⁷

ALMOST ALL CASES OF
CERVICAL CANCER
ARE CAUSED BY



HPV

HPV vaccination is the best protection against 6 types of cancer.

Cervical Cancer Just the tip of the iceberg.

Cervical cancer is the only type of cancer caused by HPV that has a recommended screening test to detect it at an early stage.

Estimated U.S. Cases Every Year^{1,2}

11,000

Cervical Precancers

While screening can detect precancers before they turn into cancer, treatment for these precancers can lead to **problems during pregnancy.**

196,000

5 Other Cancers Caused by HPV

There are no recommended screening tests for these 5 cancers, so they may not be detected until they cause **serious health problems.**

14,000

Back of the throat

6,500

Anus

2,800

Vulva

900

Penis

700

Vagina

HPV vaccination at ages 11-12 could

**PREVENT
OVER 90%**

of these cancers.

Sources:
1. <https://www.cdc.gov/cancer/hpv/statistics/cases.htm>
2. <https://www.cdc.gov/mmwr/volumes/68/wr/mm6815a1.htm>

Global Epidemiology - The Impact of Vaccination

Vaccine Introduction:

- A major public health milestone.
- **Proven Effectiveness:** >90% reduction in HPV 16/18 infections in vaccinated cohorts.
- Dramatic decrease in anogenital warts and high-grade cervical precancers (CIN2+).
- Evidence of herd protection in countries with high female coverage.
- **WHO Global Strategy:**
 - **The 90-70-90 target by 2030:**
 - **90% of girls fully vaccinated by age 15.**
 - **70% of women screened by age 35 and 45.**
 - **90% of women with pre-cancer treated.**

132 countries reported HPV vaccination coverage estimates for the first dose and 129 countries reported full doses in 2023, and **the weighted average coverage of the first and full dose of HPV vaccination in girls aged 9–14 years were 61.6% (95% CI: 50.9%–71.8%) and 47.6% (39.7%–57.4%) respectively.**

HPV vaccine included in national immunization programme



Disclaimer

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of WHO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.



World Health Organization

© WHO 2023. All rights reserved.



Current Landscape and Future Directions for Iran Progress:

Increased awareness among healthcare professionals.

Growing body of Iranian research on HPV genotyping and epidemiology.

Recent Positive Development:

As of 2023-2024, Iran is going to initiated the introduction of the HPV vaccine into its national program for adolescent girls, a critical step forward.

Remaining Challenges:

Implementing a systematic, population-based cervical cancer screening program.

Combating vaccine hesitancy through public education.



Critical Research Gaps: A Collaborative Agenda

1. **Population-Based Sero-Surveillance:**

Pre- and post-vaccination antibody levels to monitor program impact.

2. **OPSCC Burden Study:**

A multi-center study to definitively establish the proportion of HPV-driven HNSCC in Iran.

3. **RRP Registry & Virology:**

The natural history and viral kinetics of RRP in Iranian children.

4. **Implementation Science:**

Studying the most effective and cost-effective delivery models for the vaccine in the Iranian context.

5. **Molecular Epidemiology:**

Next-Generation Sequencing (NGS) for detecting rare types and monitoring genomic evolution.

Summary & Key Takeaways



- **1. Globally:**
 - HPV is a common, oncogenic virus and a leading cause of cervical cancer, disproportionately affecting LMICs.
- **2. History:**
 - The discovery of HPV's role in cancer was a Nobel Prize-winning breakthrough, leading to effective prophylactic vaccines.
- **3. In Iran:**
 - HPV, particularly type 16, is the primary cause of cervical cancer. Historically, limited screening and vaccine access have been challenges.
- **4. The Future:**
 - The inclusion of the HPV vaccine in Iran's national program is a monumental public health achievement with the potential to drastically reduce the future burden of HPV-related cancers.

