

**Cervical cancer** is the second most common cancer in women worldwide. A woman dies every two minutes from cervical cancer<sup>1</sup> with about 500,000 new cases and 275,000 deaths each year.

Cervical cancer incidence and death are increasingly concentrated among the poor: nearly **90% of those deaths occur in developing countries** where cervical cancer is the most common cancer in women and women lack access to cancer screening and treatment services.

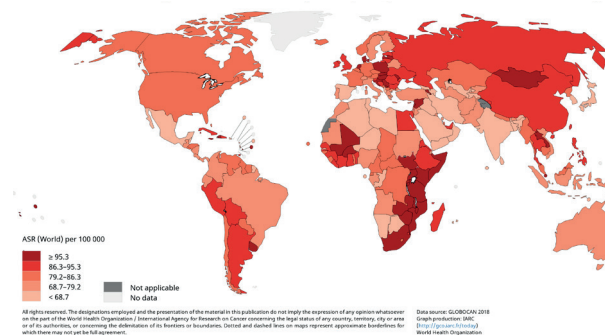
Virtually all cervical cancer cases (99%) are linked to genital infection with **human papillomavirus (HPV)**, which is the most common viral infection of the reproductive tract.



There are 40 different genotypes of HPV that can infect the genital area of men and women. **Two “high-risk” genotypes (HPV 16 and 18)** are responsible for the majority of HPV-related cancers.

The **peak incidence of HPV infection** generally occurs between the ages of 16 and 20 years. HPV infection usually resolves spontaneously, but it may persist, and precancerous cervical lesions may follow. If untreated, these may progress to cervical cancer over a period of 20–30 years.

## Estimated age-standardized mortality rates (World) in 2018, all cancers, females, all ages



Source: © International Agency for Research on Cancer 2019

During the period of persistent HPV infection, precancerous changes may be detected in the cervix; **early detection** of these changes is an effective strategy for prevention of cervical cancer. Ensuring universal access to cervical cancer **prevention, screening and treatment services is key to reducing the burden of cervical cancer worldwide.**

However, in developing countries there are **many barriers** that hinder successful implementation of cervical cancer screening programs. Besides the lack of necessary equipment and human resources, competing healthcare priorities (e.g. maternal and perinatal mortality, AIDS or TB), or the low level of education of women and limited access to health information. As a result most women in developing countries are not screened and adequate treatment for cervical cancer is largely unavailable.

Countries with well-organized programmes to detect and treat precancerous abnormalities and early stage cervical cancer can prevent up to 80% of these cancers.

<sup>1</sup> Calculated on 275,000 deaths in 2008. <http://globocan.iarc.fr/factsheets/cancers/cervix.asp>.

Today, **new technologies** are available like the **Visual Inspection with Acetic Acid (VIA)** screening system that are appropriate for developing country settings as they are a highly effective, low-cost approach to early treatment.

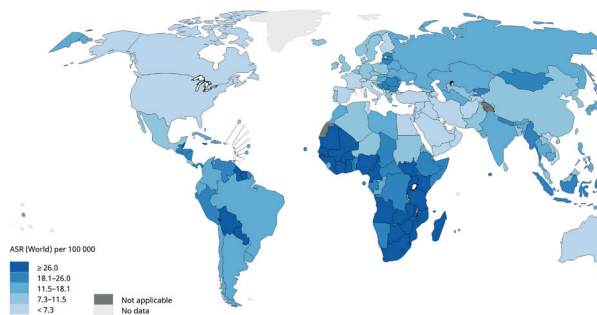
However, effective **screening programmes and follow-up** of women with abnormal screening tests have been difficult to implement in low-and middle-resource settings. Mortality rates from cervical cancer are therefore much higher in the developing world.

Thus, the **women at higher risk** of death from cervical cancer have the least access to secondary prevention and their only hope to prevent cancer of the cervix is through an **HPV vaccine**.

## HPV immunization

HPV vaccines that prevent against 16 and 18 infections are now available<sup>2</sup> and have the potential to reduce the incidence of cervical and other anogenital cancers. The HPV vaccine addresses a critical public health need, and is one element of a comprehensive cervical cancer control strategy.

### Estimated age-standardized incidence rates (World) in 2018, cervix uteri, females, all ages



Source: *International Agency for Research on Cancer 2019*

In defining the **target population** for immunization, a key consideration is that HPV infection is sexually transmitted and is usually acquired within the first few years following sexual debut. Ideally, therefore, the vaccine should be administered before sexual debut, i.e. before any risk of exposure to HPV.

On 17 November 2011, **GAVI, the Vaccine Alliance** announced its decision to take first steps

to introduce vaccines against cervical cancer for eligible countries, responding to projected demand from countries and recommendations by the **World Health Organization (WHO)**.

WHO recommends “HPV vaccination of girls aged 9-13 years through national immunisation programmes in countries where cervical cancer constitutes a public health priority and where vaccine introduction is feasible, sustainable financing can be secured, and the vaccines are considered cost-effective”.

### HPV global facts and figures<sup>4</sup> ...

- **500,000 new cases of cervical cancer annually**
- **311,000 women deaths each year**
- **90% of deaths occur in developing countries**
- **In developing countries, most women are not screened or do not receive early treatment**
- **The HPV vaccine protects against types 16 and 18 that cause about 70% of cervical cancer cases**

Since the first human papillomavirus (HPV) vaccine demonstration programme in Kenya in 2013, **1.5 million girls have been vaccinated with Gavi support**.

In 2013 Gavi announced a **record low price** for HPV vaccines (US\$ 4.50 per dose), thus creating an opportunity for developing countries to vaccinate millions of girls against cervical cancer. In 2016, the Gavi Board approved an acceleration of the HPV vaccine programme aimed to protect around 40 million girls from cervical cancer by 2020, averting an estimated 900,000 deaths.

By the end of 2017, Gavi had helped 30 countries to conduct HPV vaccine demonstration programmes – the first step towards national introductions. **Six countries, Bolivia, Guyana, Honduras, Rwanda, Sri Lanka and Uganda, had introduced the HPV vaccine into their national immunisation programmes.**

The **service delivery strategy and promotion**

<sup>2</sup> In June 2006, Merck’s Gardasil received approval from the US Food and Drug Administration and, shortly afterwards, was provisionally recommended by the US Advisory Committee on Immunization Practices for girls and women aged 9 to 26. The quadrivalent vaccine gives 100% protection against infection from HPV types 16 and 18, which are responsible for around 70% of all cervical cancers. It also protects against HPV types 6 and 11 that cause genital warts. GlaxoSmithKline Biologicals applied to the European Agency for the Evaluation of Medicinal Products for international regulatory approval in March 2006 to market its bivalent vaccine Cervarix for HPV types 16 and 18.

<sup>3</sup> Gavi is an international organisation created in 2000 to improve access to new and underused vaccines for children living in the world’s poorest countries. Gavi supports the 73 poorest countries in the world. Gavi is funded by the following governments, as well as private, corporate and foundation donors: Absolute Return for Kids, Anglo American plc, Australia, Bill & Melinda Gates Foundation, Brazil, Canada, The Children’s Investment Fund Foundation (UK), Comic Relief, Denmark, European Commission, France, Germany, His Highness Sheikh Bin Zayed Al Nahyan, Ireland, Italy, JP Morgan, Japan, ‘la Caixa’ Foundation, LDS Charities, Luxembourg, Netherlands, Norway, Republic of Korea, Russian Federation, South Africa, Spain, Sweden, United Kingdom, United States of America, and other private donors.

<sup>4</sup> WHO/ICO HPV Information Centre, 2010.

of HPV vaccines needs to be based on country-specific considerations of what is affordable, feasible and culturally acceptable.

## HPV in Mozambique: Context

With a population of 22,894,000 Mozambique has 6.18 million women aged 15 years and older who are at risk of developing cervical cancer. Current estimates indicate that every year 3,690 women are diagnosed with cervical cancer and 2,356 die from the disease.<sup>5</sup>

**Cervical cancer ranks as the first most frequent cancer in Mozambique**, and the first most frequent cancer among women between 15 and 44 years of age. The **incidence rates of cervical cancer** in the country are among the highest in the world, with 42-60/100,000 women/ year.

About 32% of women in the general population are estimated to harbour cervical HPV infection at a given time, and 79% of invasive cervical cancers are attributed to HPVs 16 or 18.



Men and women in Mozambique face a variety of **threats to their sexual and reproductive health**. About half of Mozambique's population is younger than the age of 18. More than 1.4 million<sup>6</sup> people in Mozambique are living with HIV, and many are unaware of their status. More than 520 women die in childbirth each year for every 100,000 women who experience live births<sup>7</sup>. Forty-two percent of the country's women aged 20-24 reported having given first birth before the age of 18<sup>8</sup>.

Given that the **HPV vaccine is primarily intended for young adolescent girls prior to sexual initiation**; it is worth noting that the median age at first sex intercourse among young men and women (15-24 years) for women is approximately 16.1 years of age. And 28% of young women (15-24 years) reported having had sex before the age of fifteen<sup>9</sup>.

### HPV in Mozambique<sup>10</sup>...

- **6.18 million women at risk for cervical cancer (Female population aged >=15 years)**

- **Incidence rate: 42-60/100,000 women/year**

- **Annual number of new cervical cancer cases: 3,690**

- **Annual number of cervical cancer deaths: 2,356**

- **Projected number of new cervical cancer cases in 2025: 5,401**

- **Projected number of cervical cancer deaths in 2025: 3,509**

Although primary school enrolment figures have improved, many young adolescent girls, especially those in rural areas, have little or no education. Only 4% of adolescent girls are enrolled in secondary school in Mozambique. Female young women (15-24 years) literacy rate is 47.5%<sup>11</sup>.

Knowledge about the **burden of HPV infections** in Sub-Saharan Africa is very limited. A study<sup>12</sup> conducted among women in the Manhiça district of Mozambique reported a percent prevalence of HPV infection of 75.9%.

The **distribution of HPV types** in cervical cancers is essential for design and evaluation of HPV type-specific vaccines. While HPVs 51 and 35 were the two most common types in cytologically normal women in Mozambique, HPVs 16 and 18 remained the two most frequently identified types in cervical cancer.

<sup>5</sup> WHO/ICO Information Centre on HPV and Cervical Cancer (HPV Information Centre). Human Papillomavirus and Related Cancers in Mozambique. Summary Report 2010. Available at [www.who.int/hpvcentre](http://www.who.int/hpvcentre)

<sup>6</sup> UNAIDS, 2009.

<sup>7</sup> WHO, UNICEF, UNFPA and the World Bank, 2007.

<sup>8</sup> Best data available during the 2000-2009 period Mozambique Demographic and Health Survey 2003.

<sup>9</sup> Mozambique Demographic and Health Survey 2003.

<sup>10</sup> WHO/ICO HPV Information Centre, 2010

<sup>11</sup> UNESCO, Institute for Statistics Data Centre Institute for Statistics, 2007. <http://stats.uis.unesco.org>

<sup>12</sup> Vaccine-related HPV genotypes in women with and without cervical cancer in Mozambique: burden and potential for prevention. Castellsague X, Klaustermeier J, Carrilho C, Albero G, Sacaral J, Quint W, Kleter B, Lloveras B, Ismail MR, de Sanjose S, Bosch FX, Alonso P, Menendez C. *Int J Cancer*. 2008;122:1901-1904.

According to a study<sup>13</sup> the most common world-wide major oncogenic HPV types 16 and 18 were present in 69% of cervical cancers, suggesting that a vaccine targeting HPV-16 and -18 would hence have a substantial impact on cervical cancer also in Mozambique.

Type-specific vaccines against HPV may be an **efficacious strategy** to combat invasive cervical cancer in African high-risk countries such as Mozambique where there is a high incidence of invasive cervical cancer and where there are no effective screening programs in place.

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## Our work in cervical cancer

Since 2001, the **Centro de Investigação em Saúde de Manhiça (CISM)**, a Mozambican biomedical research centre, in collaboration with **ISGlobal** and other organizations<sup>14</sup> has conducted studies in Mozambique in order to:

- Determine the prevalence of HPV infection among women
- Identify the Vaccine-related HPV genotypes in women with and without cervical cancer
- Describe the prevalence and the etiology of Sexually Transmitted Infections and the prevalence of cervical neoplasia among women.



The abovementioned institutions along with the **Fundação para o Desenvolvimento da Comunidade (FDC)** have supported the **Mozambican Ministry of Health (MISAU)** in conducting operational research in order to inform decisions about how to introduce the HPV vaccine in the country.

During 2013–2016 the CISM in collaboration with ISGlobal and FDC have assessed the **feasibility and acceptability** of implementing the HPV vaccination program among adolescent girls in rural and urban areas of Mozambique<sup>15</sup> through

a collaborative project funded by Barcelona city's council department of International Cooperation in two districts in Southern Mozambique (Ka-Mavota and Manhiça in Maputo province), and the Aga Khan Foundation in a district in Mocimboa da Praia, Cabo Delgado Providence.

In addition, an **economic evaluation** of the economic costs associated with HPV vaccination during the vaccine demonstration project in the district of Manhiça is being undertaken. Finally, ISGlobal in collaboration with the CISM undertook a project aimed to **strengthening health professionals' capacities** in Mozambique with a view to the future nationwide implementation of the HPV vaccine in pre-adolescent girls that was funded by "la Caixa" Banking Foundation.

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## Demonstration project to implement an HPV vaccination program to pre-adolescent girls through schools in Mozambique (HPVvax Project)

CISM, ISGlobal, and the FDC provided technical support to the Ministry of Health of Mozambique to carry out the first demonstration project for HPV vaccination in the country.

CISM was appointed by the MISAU as the managing organization for HPV demonstration programme, following GAVI's approval of a HPV demonstration project in Mozambique.

The target group of the vaccination program were 10 year old girls enrolled in primary schools and a strategy was implemented with community-based mobile brigades to target those girls not in school.

The **HPVvax project**, funded by GAVI, started in 2014 in the semi-rural district of Manhiça (n=2396 girls vaccinated, 71% vaccine coverage), and included three doses. Subsequently, Mozambique's MoH funded the Demonstration project in Manica and Cabo Delgado. Second round was conducted in April 2015 and included two doses according to last recommendations. Coverage increased up to 79.3% in the second round for 2 complete doses.

Most vaccinated girls were reached at the school. **GAVI** has recommended to expand demo in the country in order to gain a better understanding on how to reach at the community level those girls who were not vaccinated.

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<sup>13</sup> Human papillomavirus genotypes in cervical cancers in Mozambique Naucier P, Flora Mabota da Costa F, Ljungberg O, Bugalho A and Dillner J. J Gen Virol 2004; 85:2189-90.

<sup>14</sup> IDIBELL, Institut Català d'Oncologia (ICO), L'Hospitalet de Llobregat, Barcelona, Spain; Department of Pathology, Maputo Central Hospital, Maputo, Mozambique; Department of Pathology, Faculty of Medicine, University Eduardo Mondlane, Maputo, Mozambique; The Manhiça Health Research Center (CISM), Manhiça, Mozambique; DDL Diagnostic Laboratory, Voorburg, The Netherlands; Institut d'Investigacions Biomediques August Pi i Sunyer (IDIBAPS), Universitat de Barcelona, Barcelona, Spain.

<sup>15</sup> Feasibility and acceptability of HPV vaccine introduction in the districts of Manhiça and KaMavota, Mozambique.