

How can we prevent cervical cancer in Mongolia?



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Abstract

Have you ever heard of cervical cancer? It's one of the most common forms of cancer among women. Most of the cases occur in countries with lower incomes and fewer resources. The leading cause of cervical cancer is human papillomavirus (HPV). There are several effective vaccines against HPV. But introducing them in the vaccination calendar could cost a lot. Would it be worth it? We used a mathematical model to

see if HPV vaccination would be cost effective in Mongolia. It helped us estimate the benefits and costs of introducing an HPV vaccine there. We found out that it would cost between \$2.4 and \$3.1 million (USD) but could save nearly 4,000 lives! We believe that introducing HPV vaccines in Mongolia would be cost effective.

Introduction

Cancer is a scary word. It's a leading cause of death worldwide and kills millions of people each year. It can start almost anywhere in our body. But do you know what cancer is? The cells in our body grow and divide. They also know when to stop growing and usually die. Afterward, new cells take their place. Cancer interrupts this normal process. Cells start to grow and spread very fast and out of control. These abnormal cells can form a mass, called a **tumor**. It can spread to other parts of the body. This can lead to a lot of damage and even death.

One of the most common cancers among women worldwide is **cervical cancer**. Most of the cases occur in countries without a lot of resources, like Mongolia. But what causes cervical cancer? Usually, **human papillomavirus** (HPV) is responsible. HPV is a group of many related viruses. Some of them spread through sexual contact. Most infected people don't even know they have HPV because they show no symptoms. But they can still infect others. This makes HPV prevention very important.

There are several **vaccines** against HPV. But because there are many types of HPV, vaccines can't protect people against

all of them. Usually, the vaccines target the most dangerous types (HPV 16 and 18). They are responsible for most cases of cervical cancer. **HPV vaccines have proven to be effective**



The human papillomavirus causes cervical cancer.
Photo: [scientificanimations.com](https://www.scientificanimations.com/), (CC BY-SA 4.0).

and reduce cases of cervical cancer. But not all countries can afford them. Still, the cost of medical treatment for cancer patients is not low either. So, what if governments in countries

like Mongolia introduce HPV vaccines? Will it be the best use of money to improve health? That's what we wanted to find out.

Methods

We used a mathematical model to see if HPV vaccines would be **cost effective** in Mongolia. Our model evaluated what would happen if all 9-year-old girls receive vaccines for a period of 10 years. To work this out, we collected some important information.

- The price of the vaccine (we compared two available vaccines – one against four types of HPV and one against two types).
- How many cases of cervical cancer there are each year in Mongolia.
- How many people die of this disease.

- Which types of HPV are most common in Mongolia.
- The **vaccines' efficacy** against these types of HPV.
- How much the government pays for cervical cancer treatment.

To assess the benefits of vaccination, we calculated how many cases and deaths it would prevent. We also used a statistical measure called **DALYs (disability-adjusted life years)**. This measures the number of healthy years lost due to the disease. We calculated all costs and compared the vaccination scenario with a no-vaccination one.

Results

The vaccine's efficacy depends on the HPV types common in Mongolia. HPV 16 and 18 are two of the most common and most serious, and vaccines against them do a little better. Overall we calculated vaccine efficacy to be around 65%, rising to 90% against the most serious kinds of HPV. Vaccination would also prevent between 5,692 and 6,832 cases of cervical cancer (Figure 1). Plus, it would prevent

between 11,886 and 14,256 DALYs. We therefore estimated that vaccination would save between 3,240 and 3,890 lives!

Vaccination would cost between \$2.4 and \$3.1 million (USD) more than no vaccination at all. If the government is willing to pay \$747 per DALY prevented, it would very likely be cost effective.

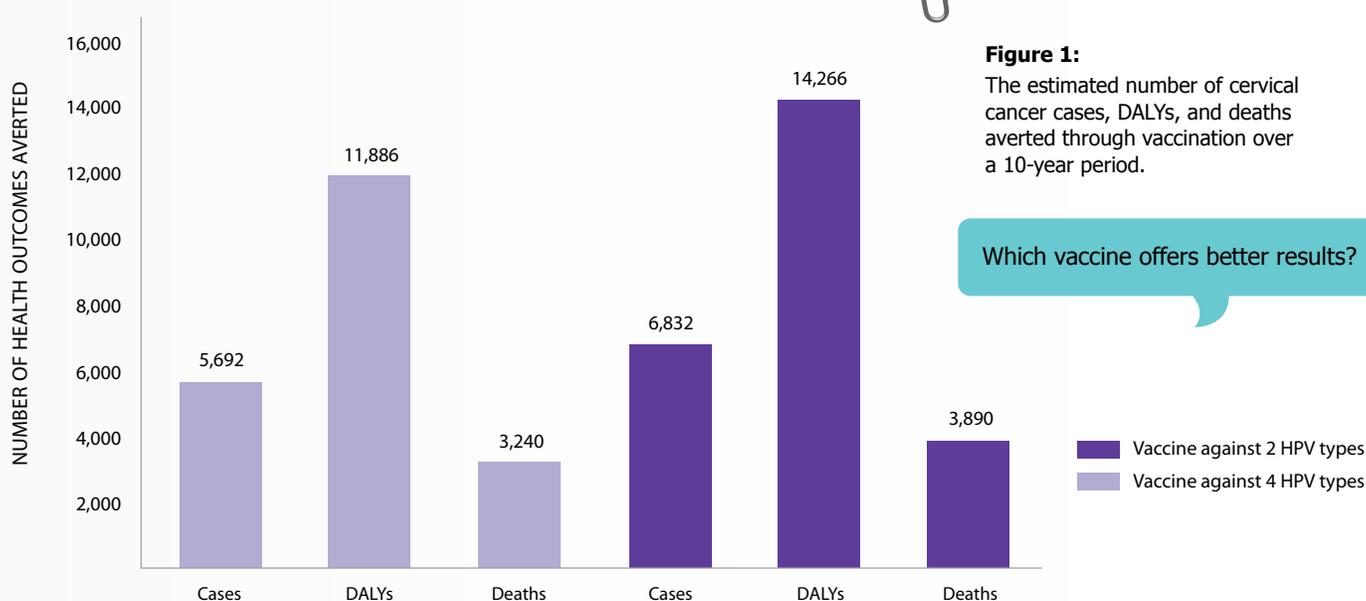


Figure 1: The estimated number of cervical cancer cases, DALYs, and deaths averted through vaccination over a 10-year period.

Which vaccine offers better results?

Discussion

So is it worth introducing HPV vaccination in Mongolia? We strongly believe so! Our model shows that both vaccines could save thousands of lives. The DALYs prevented are also significant. Plus, we didn't even consider other positive effects. One of the vaccines, for example, also protects against genital warts.

Even though the costs of vaccination are high, we believe

it would be a cost-effective investment. Putting a price on human lives seems a bit cold. But all countries, and especially ones with fewer resources, have limited budgets. Governments must weigh up all the costs and benefits and choose the best option to improve health. We hope that our model and results can help the Mongolian government to make a decision.

Conclusion

Talking about cancer can seem overwhelming and scary. But cervical cancer is one of the most preventable and treatable forms of cancer. Find out about vaccination options and the screening schedule in your country. Very often someone can have HPV without realizing it. And sometimes it can take years for it to show up. But the sooner you know you have

HPV, the less dangerous it is. So it's really important to get vaccinated if your doctor recommends it and also to get screened regularly. Thus, you take care of yourself but also protect others!

Glossary of Key Terms

Cervical cancer - cancer of the cervix. The cervix is the opening between the vagina and the uterus, also called the womb.

Cost-effectiveness - an economic analysis that compares the costs and outcomes of different courses of action (in this case – the comparison between HPV vaccination versus no vaccination).

DALYs (disability-adjusted life years) - a statistical measure of the impact of a disease that shows the years lost due to illness or early death.

Genital wart - small bumps in the genital area. Some types of HPV cause genital warts. They spread through sexual contact.

Human papillomavirus (HPV) - a group of over 200 related viruses. Some of them (especially types 16, 18, 31, 33, and 35) can cause cancer. Others can cause genital warts.

Tumor - an abnormal mass of tissue. Cells grow and divide fast and sometimes do not die when they are supposed to. Tumors can be benign (not cancerous) or malignant (cancerous).

Vaccine - an injection of a killed or weakened pathogen (or even just a piece of the pathogen's genetic code), in order to stimulate the immune system against it. (A pathogen is something that makes you sick.) This means that the immune system can recognize those pathogens if they ever come back, and destroy or disable them, preventing disease.

Vaccine efficacy - a measure of how well the vaccine protects the person who gets it.

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Check your understanding

1 What is the difference between normal and cancerous cells?

2 Can you think of any other diseases that spread through sexual contact?

3 The introduction of vaccination is expensive. Can you think of other costs it might include other than the vaccines themselves?

4 Get in a small group and discuss: what kinds of cancer have affected people you know? This could be family members, friends, or even some of you personally.

5 What is the situation with cervical cancer in your country? Is there a prevention program there? If not, discuss as a group whether you think one is necessary.

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