BANISHED from Bhutan

The story of how a small mountain kingdom eliminated measles
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Taking these words to heart, every day Buddhist monks chant prayers for longevity and health (ayuarogyasampatti) to bestow blessings on the people. In Bhutan, this blessing has found many manifestations, but one of the most recent has been the elimination of measles from the country.
Foreword

Bhutan has shown us that when dedicated men and women come together under committed leadership, they can achieve their goals, surely and convincingly. Through visionary leadership and strategic planning, the country has built a fortress against measles, far in advance of the targets set in September 2013, when Member States of the South-East Asia Regional Committee, during the Sixty-sixth Meeting of the Committee, resolved to eliminate measles by 2020.

Bhutan is a country that measures success through the happiness of its people. Ensuring good health is, therefore, germane to its policy. Close to four decades ago, Bhutan, in collaboration with WHO, started its programme of immunization, with the introduction of MCV1 as part of the Expanded Programme on Immunization. As routine immunization has been strengthened and coverage expanded, the country has made remarkable gains not only in increasing the coverage of MCV1 and MCV2 to over 90% in most parts of the country but also in ensuring that surveillance and response are sharpened. Overcoming the challenges of dispersed habitations and mountainous terrain through the enthusiasm and efforts of its well-trained and hard-working health staff, Bhutan has not seen a case of endemic measles since 2012 and in April 2017, the WHO South-East Asia Verification Committee was convinced that endemic measles has been interrupted in the Kingdom, making it one of the first two countries of the Region to achieve this success.

Certainly, it is a time to celebrate and I extend my hearty congratulations to His Royal Highness King Jigme Khesar Namgyel Wangchuck and the people of Bhutan on this remarkable achievement.

Dr Poonam Khetrapal Singh
Regional Director
WHO South-East Asia Region
In 2008, the Royal Government of Bhutan transitioned peacefully from an absolute monarchy to a democratic constitutional monarchy. It follows a unique policy of measuring the country’s well-being through the Gross National Happiness (GNH) index – a measure of human fulfilment that informs the government’s policies. Of the nine domains of GNH, the Bhutanese are reported to have the most satisfaction in health.
INTRODUCTION

Measles – a dreadful disease. The virus hides in the air or on infected surfaces, waiting for as long as two hours to attack an unprotected host. Considered an almost inescapable life event in the age before vaccination, measles, the manifestation of infection by the minuscule, hardy, often deadly paramyxovirus, remained unchallenged, plaguing generation after generation. When did measles first occur? We do not know for sure, but as early as the 11th century CE, Abu Bakr Mohammad ibn Zakariya al-Razi, court physician and director of a large hospital in Baghdad, described measles as a disease “more dreaded than smallpox”.

When the Expanded Programme on Immunization (EPI) was introduced in 1979, the number of measles cases in Bhutan showed a marked decline. Measles did not, however, go away completely and in 2010 and in 2016, it resurfaced in outbreaks that affected more than 66 children and adults totally (21 in 2010 and 45 in 2016). Clearly, business as usual was not effective at keeping the virus at bay.

What could this small, mountainous nation do? If you expected them to shrug off the challenge, read further, and you will find the story of a plucky, determined nation that came together to protect itself from a terrible scourge.
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tr>
<td>1979</td>
<td>Launch of EPI 1st dose of measles-containing vaccine</td>
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<tr>
<td>2006</td>
<td>2nd dose of measles-containing vaccine and rubella vaccine introduced in routine immunization (RI)</td>
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<td>2007</td>
<td>Case-based measles-rubella surveillance initiated</td>
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<td>2010</td>
<td>3 outbreaks of measles</td>
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<td>2012</td>
<td>Last endemic measles case</td>
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<td>2013 &amp; 2014</td>
<td>Zero cases of measles for two years</td>
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<td>2015</td>
<td>Strengthened surveillance</td>
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<td>2016</td>
<td>2 outbreaks of measles and measles-mumps-rubella vaccine (MMR) introduced in routine immunization (RI)</td>
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Fortresses or dzongs have been a part of Bhutanese culture for millennia, not just protecting the people from attack, but also serving as administrative centres, garrisons for the army and gathering places for the celebration of festivities. So, to defeat measles, Bhutan decided to build a dzong. Not a brick and mortar dzong, of course, but a fortress of immunization to protect the people from the onslaught of the measles virus. The leadership and administration came together to strategize within this dzong, an army of health staff and volunteers took on the challenge of administering and operationalizing the plan, and the entire nation came together in unity and celebration to rid the nation of the measles virus.

Before measles vaccination was introduced in Bhutan in the year 1979, most children under the age of 15 years got measles. Treatment did not, and still does not, exist. Once infected, the disease took its untrammelled course, leaving its host victim with a troublesome rash, fever, runny nose, red eyes and other such symptoms.

Progress in eliminating measles was slow, but determined efforts continued in the ensuing decades. Between 1993 and 2002, a total of 3201 cases of measles were reported all over the country, although there were virtually no reports of other vaccine-preventable diseases. In 2000, WHO estimated that globally, 5% of all under-five deaths were caused by measles. Reducing this number was closely linked to the vision of Millennium Development Goal 4, which aimed at a two third reduction of under-five mortality by 2015. The lead strategist of the Bhutan measles elimination plan took this goal very seriously. As a result, Bhutan surged forward to be at the forefront of the fight against measles in the South-East Asia Region.

I always ensure that vaccines are properly handled, temperature and hygiene standards are followed, and everyone is given full information about the importance of maintaining immunization coverage.

A vaccinator
Leadership

The dzong traditionally houses the leadership and administration, in addition to providing a protective fortress for the people. In our anti-measles dzong, the two arms of leadership and administration came together to forge a strong foundation. In 2008, the Constitution of Bhutan, under Article 9, guaranteed that “the State shall provide free access to basic public health services in both modern and traditional medicines”, which is delivered to its citizens through 30 hospitals and 210 basic health units (BHUs).

In May 1998, with the support of WHO, the Royal Government established the Bhutan Health Trust Fund (BHTF) to ensure sufficient finances to meet, among others, all annual expenditure on vaccines, including nationwide introduction of measles–rubella vaccines and provision of essential drugs as well as needles and syringes. A unique feature of the Trust is that a donor contribution to the Fund, whether big or small, is matched by a government contribution on a one-to-one basis.

The foundation for universal health coverage in Bhutan is well established, with legal and policy mandates for universal access, the values of the Gross National Happiness (GNH) concept, and strong investments in development of the health sector by the government since the early 1960s. In fact, the commitment to good health is so high that approximately 88% of health financing in Bhutan comes from the government. For the fiscal year 2016–2017, Nu. 4505.796 million was allocated for the health sector (which is about 8% of the total government expenditure).

Good health of our population is an overwhelming priority of the Royal Government of Bhutan. The health system has invested heavily in prevention. Measles elimination is an important milestone in that direction.

H.E. Lyonpo Tandin Wangchuk
Health Minister
Royal Government of Bhutan
Planning

Protecting a nation against disease requires multiple layers of planning to ensure a coordinated and effective response. Within our dzong, Bhutan put in place multilayered plans, ranging from wider national-level plans to detailed community-level plans, to ensure the successful execution of its immunization programme.

The Ministry of Health, under the able guidance of H.E. Lyonpo Tandin Wangchuk, has taken the lead in converting the entire nation into a measles-resilient dzong. Under the EPI, steps were taken to reduce morbidity and mortality from vaccine-preventable diseases, including measles. A comprehensive Multi-Year Plan (cMYP) 2014–2018 was launched to consolidate several immunization activities. The Ministry of Health has charted effective strategic guidelines to ensure the effectiveness of the National Immunization Policy. Covering various aspects, including provision of quality services such as immunization coverage, documentation of childhood immunization, identification of target groups, reaching the unreached and quality assurance of immunization programmes (cold chain and logistics, safety, and safe disposal of vaccination waste), the Policy has set the bar for quality performance, right from the centre to the thromde.*

Bhutan is also guided by WHO in acting on the Global Vaccine Action Plan (GVAP) and the “Strategic Plan for Measles elimination, and Rubella and CRS Control in the South-East Asia Region”.

With measles elimination, we have achieved another victory in public health in Bhutan.

Dr Ugen Dophu
Health Secretary
Royal Government of Bhutan

*A thromde is the third level of administration, akin to a municipality.
**Infrastructure**

There is a three-tier system of health care in the country that comprises the three regional referral hospitals, district hospitals and the BHUs. The autonomous Jigme Dorji Wangchuck National Referral Hospital is the only national reference hospital, with the Mongar Regional Referral Hospital and Gelephu Regional Referral Hospital being the two referral hospitals functioning under the Ministry of Health.

District health offices are available in each district to look after the domains of curative and preventive health care. There are 30 hospitals, 210 BHUs and 49 sub-posts across the country. The BHUs provide primary health care and conduct outreach clinics for dispersed populations and those located in geographically hard-to-reach areas. All district health centres, including hospitals, provide immunization services through immunization clinics. Measles and rubella surveillance are also undertaken by BHUs.

At the national level, the EPI unit in the Department of Public Health, under the Ministry of Health, is responsible for immunization activities. Surveillance of measles and rubella is a joint responsibility of the Vaccine-Preventable Disease (VPD) Surveillance Programme in the EPI Unit as well as the Measles, Rubella Laboratory, Royal Centre for Disease Control (RCDC), Ministry of Health.

The improved laboratory at RCDC in Serbithang has greatly enhanced disease surveillance and outbreak investigation.

To cover the cost of health-care services that are not available in the country, Nu.200 million is allocated to finance the cost of referrals to India.

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The strategy for elimination of endemic measles is rooted in maintaining high immunization levels in the general public and maintaining meticulous surveillance processes for detection, testing and management of reported cases. Through an active surveillance system, we are able to track every suspected case of measles, no matter where in the country it may occur.

Dr. Karma Lahzeen
Director
Department of Public Health
Partnerships

Partnerships lie at the heart of the successful health structure in Bhutan. WHO and other UN agencies provide technical and financial support to the Ministry of Health in vaccine procurement, surveillance and other training, manual development and relevant quality improvement.

The Bhutan Health Trust Fund of the Ministry of Health also provides support to the EPI programme. The district-level administration (through district health offices) helps in the funding and implementation of district-level programmes.

Active community participation and empowerment in the health-care delivery system are being encouraged to facilitate the achievement of universal health coverage. There is a huge emphasis on inter- and intrasectoral collaboration and coordination, and a need for encouragement of public–private partnerships to address health issues.

Bilateral and multilateral cooperation are always significant, not only for the resources they bring, but also because they help align the country programme with ongoing developments in the world. India provides support as the referral centre for health-care services that are not available in the country. Other important partners include WHO, UNICEF, World Bank, Japan Committee “Vaccines for the World’s Children”, Organization of the Petroleum Exporting Countries (OPEC) and GAVI.
The Vaccine

The garrison working against measles has its roots in 1757 when Francis Home, a Scottish physician, demonstrated that measles is caused by an infectious agent in the blood. Nearly 200 years later, in 1954, John F. Enders and Dr Thomas C. Peebles isolated the measles virus in the blood of a 13-year-old schoolboy, David Edmonston and by 1963, the measles vaccine was licensed in the United States. In 1968, an improved measles vaccine, developed by Maurice Hilleman and his colleagues, began to be distributed. This vaccine, called the Edmonston–Enders vaccine, is usually combined with mumps and rubella and is known as the measles–mumps–rubella (MMR) vaccine.

Elimination of measles was possible due to strong commitment from our leaders, dedicated and hardworking health workers, and support from our development partners.

Mr Tshewang Tamang
Programme Manager
VPDP
The vaccination process

In Bhutan, the warriors of vaccine-preventable diseases were armed when the EPI was launched in 1979. One of the arrows in their quiver was measles vaccination for children at 9 months of age. This was further sharpened when the National Plan of Action for the Acceleration of EPI was made in 1987. In February 1988, the Sixty-sixth National Assembly passed a resolution calling for all children and pregnant mothers to have access to immunization services and to be fully vaccinated. The health system responded effectively and achieved universal child immunization (UCI) in 1991. More than 85% of the target population has been covered by the vaccine since 1994, with an estimate in 2000 pointing to nearly 96% coverage.

As Bhutan waged its battle to banish measles, guidelines on measles and rubella (MR) were updated and health workers trained. In 2006, a second dose of MR vaccine was added to the EPI schedule for children aged
24 months. In the same year, the country ran a special one-time campaign that reached out to 332,041 people in the 15–44 years age group. During the 11 days of this campaign (16–26 March), 1,495 immunization posts achieved a coverage of over 98% of the targeted population. Yet, the year 2010 saw three outbreaks and 21 confirmed cases. With much effort, Bhutan managed to clamp down on the measles virus with zero cases till 2014. But the enemy always tries to strike back – twice in 2016, outbreak situations were experienced in the country. The latest 2016 outbreak in the district of Trashigang (in subdistrict areas of Merak and Sakteng) had 45 cases.

Clearly, more needed to be done to eliminate the virus. Measles continued to make its presence felt, with sporadic incidents and major outbreaks reminding the health authorities that there was still work to be done.

When the MMR vaccine replaced the MR vaccine in 2016, Bhutan was on the home stretch.

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I ensure my family is up to date on all required vaccinations. So I am proud to say, I too have helped banish measles from Bhutan.

Karma Choden
A proud Bhutanese parent
The WHO South-East Asia Regional Office has set the year 2020 as the measles elimination target for the Region.

Bhutan has high immunization coverage, an established surveillance system for timely detection and investigation, and an outbreak preparedness plan. Since WHO’s definition of elimination of measles means zero indigenous cases in a country, how do we say that Bhutan is free of indigenous measles, given that cases were reported as recently as 2016?
Surveillance

Vaccination can prevent a disease but surveillance detects the disease and collects actionable information that helps to contain and eventually stamp it out. Surveillance efforts in Bhutan are meticulous. The warriors in the health system are armed to search and scrutinize every possible case of the enemy virus. Bhutan has devoted time, effort, and human and financial resources to protect its people from the clutches of measles.

Surveillance is a complex activity. It involves detection, notification and investigation of suspected cases using standard case definitions; collection, shipment and testing of specimens at a proficient laboratory, with timely reporting of results; linking laboratory and surveillance data; adequate reporting; data analysis; and taking action on the data.

The most basic tools for surveillance are a set of uniform criteria that define the disease. These help public health officials classify and count cases consistently across reporting areas. Bhutan has strengthened its surveillance through training of all healthcare workers at hospitals and BHUs. It has also broadened the definition of a suspected measles case to a more sensitive surveillance case definition of fever and rash. Health centres notify suspected measles cases, identified as “fever and rash”, to the Royal Centre for Disease Control (RCDC) under the National Early Warning Alert and Response Surveillance (NEWARS) through a web-based, online information system (NEWARSIS), with an SMS alert to the Vaccine-Preventable Disease Surveillance Office and other relevant authorities.
Laboratories

Even a fortress needs an alarm system to ensure early warning and rapid response to an emergency, whether it is external, like a burglary, or internal, like a fire. Laboratories sound the alarm when there is a measles outbreak. In 2016, antibody tests, or serological tests, which were conducted in laboratories on 206 suspected measles cases, detected 42 positive cases of measles. At the same time, virology profiling is run on the blood samples, which detects the type and source of the virus. Such testing has great relevance to identify if the virus is imported or not.

Molecular epidemiology analyses the unique genetic profile of the virus in an infected person. Like fingerprints, these are unique, but when the laboratory finds a pattern that is close, it can draw linkages between the cases and track its origin and movement across borders. This helps surveillance track the movement of the virus from place to place. So accurate is this process that the laboratory was able to confirm that the recent outbreak in 2016 was imported and epidemiologically linked to neighbouring countries, travelling across boundaries with non-vaccinated children of cow-herding families!

Great care is taken to collect specimens from all suspected cases of measles, and ensure swift and safe delivery to the National Measles, Rubella Laboratory at RCDC through controlled transportation with adequate cold chain maintenance. The National Measles, Rubella Laboratory was accredited by WHO in 2006, and provides facilities for investigation of suspected measles and rubella cases for serology and virology to the entire country. Genetic testing support is provided by the Regional Reference Laboratory in Thailand.

The outbreak of 2016 raised concerns about the elimination status of measles. Fortunately, the virology results showed that this was due to importation of the virus and not an endemic strain.

Mr Sonam Wangchuk
Chief Laboratory Officer
RCDC
Getting ready for the festivities

No dzong can be said to have fulfilled its purpose if the people do not joyously celebrate festivities in its protected courtyards. But care must be taken to ensure that the celebrations are safe and the courtyard walls high enough to prevent intrusion by unwanted pests. Bhutan worked hard to achieve the status of “no endemic measles”, but it needed an independent “security pass” certificate before it could celebrate this fact, secure in the knowledge that the measles virus had indeed been eliminated.

Verification Committee

The National Verification Committee (NVC) for Elimination of Measles, Rubella and CRS is an independent five-member committee, formed on 29 September 2015. The Committee monitors the population-level immunity gaps, especially in difficult geographical locations, border areas, and among categories of nomad populations so that supplementary immunization activities (SIAs) are accordingly conducted to plug these gaps.

The NVC is assured and confident that Bhutan’s immunization programmes, recent improvements in and measures taken by the surveillance programme, capacity for early detection and response to importation of cases from neighbouring countries can keep endemic measles at bay, thus acquiring the certification and status from WHO as a measles-free nation.
Closing the door on measles

And so, on 20 April 2017, the South-East Asia Regional Verification Commission for Measles Elimination and Rubella/CRS Control verified that Bhutan is now free of measles. This spirited nation has shown that it is capable of reinventing itself and finding new ways to deal with old problems. It has the ability to protect its people and take them from the high mountains and deep valleys to the forefront of development, overcoming myriad challenges – whether related to scattered populations or disease.
Lessons Learnt

When quality building materials are crafted by experts, the results are bound to be remarkable. In building the fortress of measles elimination, leadership, planning and implementation worked together to energize the entire nation with the common cause of fighting the virus. Some specific learnings that emerged were as follows:

Leadership invigorates a programme. The commitment and involvement of the country’s leadership brought focus to the measles elimination effort and gave it the stature of a national campaign.

Planning pays dividends. Detailed plans made for every level ensured that there was alignment with the national plan. It enabled efficient use of resources – human, financial and material – and prevented both overlap of responsibilities and “falling between the cracks”. Clarity of roles was ensured.

Coordination is the key. In Bhutan, every arm of the system worked together in a seamless fashion. From careful and error-free surveillance at the district level to timely and sensitive laboratory analysis, and from national-level campaign planning to community action on the ground, health workers were able to efficiently manage the elimination process.

Information-sharing ensures appropriate responses. No matter how well individual components work, systems fail when they work in isolation. In Bhutan, the swift flow of information has been pivotal to the successful elimination of measles in the country. In addition, sharing of information across borders forms the basis of a global coordinated response that will one day lead to global eradication of the measles virus.

Today, you can breathe freely in Bhutan without fearing that the sweet mountain breeze or the warm handshake of a Bhutanese carries with it a malicious and often deadly virus.
Protecting the future

The measles virus survives. Hidden in the shadows, this hardy antagonist waits for the battlements to be left unmanned to slip in and spread its malaise once more. Vigil has to be maintained to hold this tiny tyrant at bay. Even when Bhutan has been declared measles-free, the high coverage of measles vaccine must be maintained, always above 95%, but the closer to 100% coverage, the better. Hawk-eyed surveillance and continued testing of suspected cases, combined with an aggressive and well-managed response to import-related cases, are crucial in preventing the epidemic from jumping back into the country. The fortress must remain protected. Not only today, or tomorrow, but for generations to come.
How can this be done?

The same methods used to free Bhutan of measles must continue.

**Epidemiological surveillance.** Rigorous reporting on measles from every health facility in Bhutan must remain a standard practice. Filing the daily/weekly report under the NEWARS ensures that the virus cannot slip unseen into the system. Even a single suspected case must be reported to the RCDC for investigation, classification and follow up according to the existing protocols. Coordination between surveillance and laboratory investigation needs to remain a priority to ensure that there is rapid information flow and action for containment of any measles occurrence.

**Prevention through vigilance at borders and in geographically difficult terrain.** Health-care centres must remain prepared to respond readily to suspected measles cases or outbreaks, especially in labour camps and isolated pockets of low immunization coverage in the country identified by the dzongkhags.

**Continued immunization activities.** Funding support for vaccination is secured through the cMYP to be received through the annual health budget. Bhutan has not experienced any stock-outs for MR/MMR vaccines in the recent past. The Ministry of Health, together with partner organizations, provides regular orientation programmes, and refresher and in-service training to health-care staff so that human resources are developed and health centres are upgraded for better, continued service provision. In addition, the memory and experience of the disease drives the uptake of vaccination. Vigilance is required by public health specialists to ensure that MR vaccination remains a part of routine immunization and supplementary immunization activities are carried out whenever required, not only in the near future but until measles is completely eradicated from the face of the earth.
Our Bhutan –
We helped make it free from measles.