

MEASLES ELIMINATION and RUBELLA/CONGENITAL RUBELLA SYNDROME (CRS) CONTROL

National Strategic Plan
2015-2019



Government of Nepal
Ministry of Health and Population
Department of Health Services
Child Health Division
2015

MEASLES ELIMINATION and RUBELLA/CONGENITAL RUBELLA SYNDROME (CRS) CONTROL

National Strategic Plan
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ABBREVIATIONS AND ACRONYMS

ACSM	Advocacy Communication and Social Mobilization
AEFI	Adverse Events Following Immunization
AFP	Acute Flaccid Paralysis
BCC	Behavior Change Communication
CB IMCI	Community-based Integrated management of Childhood Illness
EPI	Expanded Programme on Immunization
AusAID	Australian Aid
CBNCP	Community Based Neonatal Care Package
CHD	Child Health Division
cMYP	Comprehensive Multiyear Plan
CRS	Congenital Rubella Syndrome
DFID	Department for International Development?
DHO	District Health Office
DICC	District Immunization Coordination Committee
DoHS	Department of Health Services
DoV	Decade of Vaccine
EDCD	Epidemiology and Disease Control Division
EHCS	Essential Health Care Services
ELISA	Enzyme Linked Immunosorbent Assay
FCHV	Female Community Health Volunteer
GAAP	Governance and Accountability Action Plan
GAVI	Global Alliance for Vaccine and Immunization
GIVS	Global Immunization Vision and Strategy
GoN	Government of Nepal
GIZ	German Development Corporation
GVAP	Global Vaccine Action Plan
HMIS	Health Management and Information System
IEC	Information Education and Communication
Ig	Immunoglobulin
IHP	International Health Partnership
JFA	Joint Financial Agreement
JICA	Japan International Cooperation Agency
LMD	Logistic Management Division
MCV	Measles Containing Vaccine
MDG	Millennium Development Goal

MNCH	Maternal Neonatal Child Health
MOE	Ministry of Education
MoHP	Ministry of Health and Population
MR vaccine	Measles and Rubella Vaccine
NHEICC	National Health Education, Information and Communication Center
NHSP	National Health Sector Programme
NHTC	National Health Training Center
NIP	National Immunization Programme
NPHL	National Public Health Laboratory
ORI	Outbreak Response Immunization
PHC	Primary Health Care
PMCC	Passed Multiple Council Chair
REC	Reaching Every Child
RHDs	Regional Health Directorates/Directors
RHTC	Regional Health Training Center
RRT	Rapid Response Team
RTPCR	Reverse Transcriptase Polymerase Chain Reaction
SAGE	Strategic Advisory Group of Experts
SEAR	South East Asia Region WHO
SIA	Supplementary Immunization Activity
SMO	Surveillance Medical Officer
SOP	Standard Operating Procedure
SWOT	Strength Weakness Opportunity and Threat
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
WHO	World Health Organization
WRA	Women of Reproductive Age

FOREWORD



JOINT STATEMENT ON PARTNERSHIP COMMITTED TO ENSURE THAT NO CHILD DIES FROM MEASLES OR IS BORN WITH CONGENITAL RUBELLA SYNDROME (CRS) IN NEPAL.

Kathmandu, Nepal, 18 September 2014

Measles is one of the leading causes of death among children affecting more than 20 million people globally every year, mostly in countries of Asia and Africa. Everyday 330 children die from measles. Similarly, the number of children born with congenital rubella syndrome (CRS) exceeds 100,000. These children suffer from heart defects, blindness and deafness. Measles is a life threatening disease in developing countries where children have limited access to medical treatment and are often malnourished. When a child gets measles, it costs money, time and most importantly lives. The measles and rubella vaccine is safe, effective and inexpensive. It has been available for the last 50 years all across the world. South-East Asia Region Member States have agreed a regional measles elimination target by 2020 and accelerated their activities to achieve measles elimination.

Nepal has achieved the goal of measles control which aimed to reduce deaths by more than 90% between 2003 and 2009. As an accelerated measles control effort, Nepal invested its resources in strengthening routine immunization services and conducted measles supplementary immunization activities during 2005, 2008 and a measles and rubella (MR) campaign in 2012. As a result, the number of measles cases has decreased from 4,823 in 2004 to 634 cases in 2012. There were only 8 cases in 2013, close to elimination. Regarding rubella, studies show that around 6091 pregnant women get infected with this disease and 1400 infants are born with congenital rubella syndrome (CRS) annually in Nepal. Rubella vaccine was introduced as MR first dose at 9 months of age in 2013.

The Government of Nepal is committed to ensure that no child dies from measles or is born with CRS. In order to achieve these objectives, the Government plans to further accelerate the measles and rubella control activities and has developed a strategic plan (2015-2019) for measles elimination and control of rubella/congenital rubella syndrome by 2019.

Therefore, let us make joint efforts to support Nepal's move towards measles elimination and rubella/CRS control. We will consolidate our best efforts in immunization system strengthening, closing immunity gaps by conducting supplementary immunization activities (SIAs), strengthening case-based surveillance for suspected measles cases, responding to outbreaks timely and efficiently including appropriate management of measles cases to support the elimination efforts.

With high political commitment and strong partnership, we commit to eliminate measles and control rubella and congenital rubella syndrome (CRS) in Nepal. Let us make Nepal a better place for our children free from measles, rubella and congenital rubella syndrome.



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Joint efforts to support Nepal's move towards measles elimination and rubella/CRS control, 2015

EXECUTIVE SUMMARY

Before introduction of measles vaccine, measles claimed thousands of lives of children in Nepal. In 1979 for the first time, EPI launched two vaccines (BCG and DPT) in three districts of Nepal. The measles vaccine was introduced only in 1988 and made available in all 75 districts by 1989. In 2003, as accelerated measles control efforts, Nepal adopted the measles mortality reduction strategy of the world health organization aiming to reduce measles deaths by 50% by 2005 compared with 2003. Further, the GoN put efforts to strengthen the routine immunization services and also conducted series of the supplementary immunization activities (SIAs) from 2005 to 2012. A nationwide MR catch up campaign was conducted in 2012/13, followed by introduction of MR vaccine as first routine dose of measles vaccine at 9 month of age since June 2013. It has been noticed that measles cases and outbreaks dropped significantly after each SIA activities; however cases increased two-three years after the SIAs.

In February 2013, during the Regional Consultation on measles in Kathmandu, all 11 Member States of the South-East Asia Region (SEAR) agreed that measles elimination was technically and programmatically feasible and an elimination goal should be set for the Region for 2020 or sooner. During the consultation, Member States presented their goals and target years for achieving measles elimination between 2016 and 2020. Member States also showed their commitment for rubella/CRS prevention and control. Nepal in line with its comprehensive Multi Year Plan (cMYP 2011-2016) of immunization had committed to achieve measles elimination and rubella/CRS control by 2019. It has been expected that measles elimination efforts will provide an opportunity for the control and elimination of rubella and CRS in Nepal.

This strategic document, "Measles Elimination and Rubella/Congenital Rubella Syndrome (CRS) Control 2015-2019" provides an overview of the global, regional and national measles and rubella situation and key strategies for achieving country targets of measles elimination and rubella/CRS control in Nepal. This document has been prepared based on Nepal's experience in interrupting polio virus circulation and establishing a sensitive AFP surveillance system. This strategic plan deals with the ways on how to increase the population immunity against measles and rubella required to interrupt the measles and rubella virus transmission. It contains the six major components/strategies for planning and implementation of the activities at the national, regional and district levels leading towards achieving measles elimination and rubella and CRS control by 2019.

The six components of the strategic plan are:

1. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with first and second doses of measles and rubella-containing (MR) vaccines through routine immunization services in all districts.
2. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with SIAs covering men and women of wide age range

3. Monitor measles, rubella and CRS using sensitive surveillance system with accredited laboratory support and evaluate programmatic efforts to ensure progress
4. Strengthen measles and rubella outbreak preparedness, early response and case management
5. Develop and implement effective advocacy, communication and social mobilization (ACSM) activities for immunization
6. Develop and conduct innovative/cost-effective activities, operational researches to improve immunization, surveillance and diagnosis.

This document also focuses on inter and intra organizational coordination, cooperation and support including partners and community based organizations (CBOs). The government recommends that all stakeholders use this plan and technical guidance and support activities required to make Nepal free of measles and rubella.

INTRODUCTION

Measles is a highly infectious disease, which occurs only in humans. It can cause serious illness, life-long complications and death. Despite the availability of safe and effective measles vaccine, measles occur globally and accounted for 535,000 deaths in 2000 and 139,300 deaths in 2010, the majority in developing countries [1]. India accounted for 47% according to global estimates of mortality in 2010. Clinically almost similar to measles, rubella infections also known as ‘German measles’ causes milder disease than measles. In pregnant women, the virus infects the placenta and developing fetus, rubella causes variety of physical defects, collectively known as congenital rubella syndrome (CRS). Global estimates of the burden of rubella suggest that the number of infants born with CRS in 2008 exceeded 110,000, which make rubella a leading cause of congenital defects which is greatly preventable. The 2008 estimates suggest that the highest CRS burden (approximately 48%) is in the South-East Asia Region [1]. Both measles and rubella is endemic in countries around the world. WHO and UNICEF developed the Global Immunization Vision and Strategy (GIVS) recognizing immunization as the important interventions in disease prevention and control. Launched in 2006, GIVS was the first ever ten-year Framework (2011-2020) aimed at controlling morbidity and mortality from vaccine-preventable diseases and helping countries to immunize more people. In measles front, the WHO Strategic Advisory Group of Experts (SAGE) in April 2009 concluded that worldwide interruption of measles transmission and simultaneous elimination of measles in all WHO Regions would equate to global eradication of measles [2]. In June 2009, the International Task Force on Disease Eradication stated that measles eradication was biologically, technically and financially feasible.

In May 2012, at the World Health Assembly (WHA), the Global Vaccine Action Plan (GVAP) of the decade of vaccines (DoV) was endorsed. The goals were; to achieve a world free of poliomyelitis, meet global and regional elimination targets, meet vaccination coverage targets in every region, country and community, develop and introduce new and improved vaccines and technologies, and exceed the Millennium Development Goal 4 (MDG 4) target for reducing child mortality. One of the four high level goals of GVAP was to meet the global and regional elimination targets and the target for measles and rubella was to achieve elimination in at least 5 Regions by 2020. Improving measles vaccination coverage and reducing measles-related mortality relates to the United Nation’s MDG 4, which aims to reduce the overall number of deaths among children by two-thirds between 1990 and 2015 [7]. In 2012, the Measles and Rubella (MR) Initiative and its five spearheading partners-the American Red Cross, United States Centers of Disease Control and Prevention, United Nations Children’s Fund, United Nations Foundation and World Health Organization – endorsed the Global Measles and Rubella Strategic Plan 2012-2020 with a view to work with donors and partners for supporting countries achieve their measles and rubella elimination goals. As far as measles elimination in the global context is concerned, the WHO region of Americas has achieved

measles elimination in 2002 and rubella in 2010 [3]. The 32 out of 37 countries in Western Pacific Region (WPR) have also achieved elimination of measles in 2012. Further, the WPR aims to eliminate rubella by 2015 [4]. European and Eastern Mediterranean Regions are accelerating their measles control activities in order to eliminate measles by 2015[5]. The African region aims for measles elimination by 2020. The Eastern Mediterranean Region is currently discussing the establishment of target date for rubella elimination [6]. The Africa Region targets for measles elimination by end of 2020.

In February 2013, a Regional Consultation on Measles involving representatives from the 11 Member States of the South-East Asia Region (SEAR) agreed that an elimination goal for measles should be set for the region for 2020 or sooner. In the SEAR, seven countries have reported the routine first dose of measles vaccine coverage of $\geq 95\%$. All countries except Thailand have conducted wide age range SIAs and nine of these have conducted follow up SIAs. Rubella containing vaccine is currently being used by six Member States, including Nepal. Currently, Thailand, Bhutan, DPRK, Maldives and Sri Lanka are providing second dose of measles through routine immunization. After completion of measles catch-up campaigns, Bangladesh, Bhutan, DPRK, Maldives, Myanmar and Sri Lanka are conducting measles case-based surveillance. Timor-Leste conducted a follow-up campaign in 2009. In SEAR, there has been a sharp reduction in measles cases following the campaign in countries that have conducted high quality SIAs.

Nepal adopted the measles mortality reduction goal set at the UN special session on children in the World Health Assembly in May 2003. The same year, Nepal expressed its commitment during Cape Town Declaration on measles elimination. In its policy document, the comprehensive Multiyear Plan of Immunization (cMYP) 2011-2016, Nepal has shown its commitment to initiate measles elimination efforts [8]. Further, guided by the WHO/UNICEF strategies to accelerate measles control, efforts were put to increase measles immunization coverage through routine immunization services and periodic supplementary immunization activities (SIAs). The coverage with first dose of measles vaccine (MCV₁) had increased from 58% in 1988 to 86% in 2012. Similarly, Nepal conducted nationwide measles SIAs in 2004/2005, 2008 and 2012 achieving $>90\%$ coverage [9]. As a result, the measles cases and outbreaks decreased significantly. However, laboratory supported measles surveillance showed prevalence of rubella in the country. The rubella containing vaccine (RCV) was introduced for the first time in Nepal through MR catch up campaign in 2012/2013. Following the MR campaign, the MR vaccine was introduced as first dose of measles vaccine at 9 month of age. Further, to save lives of children and achieve the MDG₄, the government has come up with national measles elimination and rubella/CRS control strategic plan 2015-2019. This Strategic Plan has been built on years of experience in implementing immunization programmes and incorporates lessons learned from accelerated measles control and polio eradication initiatives. The Plan stresses the importance of strong routine immunization systems supplemented by campaigns, laboratory-backed surveillance, outbreak preparedness and case management, as well as research and development.

MEASLES, RUBELLA AND CRS SITUATION IN NEPAL (2003-2013)

Measles is one of the most contagious viral diseases. The virus can be transmitted through respiratory droplets, or by direct or indirect contact with the nasal and throat secretions of infected persons. The infectious period is from four days before to four days after the onset of rash. Following exposure, the incubation period before onset of the first symptoms is usually 10-14 days. The rash usually appears 14 days after exposure (range 7-21 days). Measles-specific immunoglobulin M (IgM) and immunoglobulin G (IgG) are both produced during the primary immune response and can be detected in the serum within days of rash onset, using a sensitive enzyme-linked immune-sorbent assay (ELISA). In addition, measles can be diagnosed using Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) to detect measles virus ribonucleic acid (RNA), or isolation of measles virus.

Rubella is an acute viral illness, characterized by fever and mild maculopapular rash often with post auricular or sub occipital adenopathy. Rubella in adults may be accompanied by low-grade fever, headache and pain in joints. Up to 50% of infections with the rubella virus can be asymptomatic. It is less contagious but route of transmission is similar to measles. Individuals are most infectious when the rash is erupting, but they may shed virus from seven days before to 14 days after the onset of rash. Following exposure, the incubation period before onset of symptoms is usually 14–18 days (range 12–23 days). With natural infection, antibodies (IgM) become detectable within 3–4 days and IgG antibodies within one week of the onset of rash and can be detected using a sensitive enzyme-linked immunosorbent assay (ELISA). This IgG can be maternal antibody if there is no history rubella infection. Following infection, the virus can be isolated from nasopharyngeal secretions from a few days before to up to seven days after the onset of rash. The detection of viral RNA by RT-PCR may be possible for 3–4 days longer. However, the optimal time to collect specimens is within four days of the onset of symptoms.

Infants infected with rubella virus in utero may have a variety of physical defects, known collectively as congenital rubella syndrome (CRS). This is most likely to develop with maternal infection during the first 12 weeks of pregnancy. The clinical features associated with CRS are: ophthalmic (e.g. cataracts, microphthalmia, glaucoma, pigmentary retinopathy and chorioretinitis); auditory (e.g. sensorineural hearing impairment); cardiac (e.g. patent ductus arteriosus, peripheral pulmonary artery stenosis, or ventricular septal defects); and craniofacial (e.g. microcephaly). CRS can also present with neonatal manifestations that include meningoencephalitis, hepatosplenomegaly, hepatitis, thrombocytopenia and radiolucency in the long bones (a characteristic radiological pattern of CRS). Infants with congenital rubella infection will have a positive rubella-specific IgM

test at or shortly after birth, at least through the first three months of life. A second IgM test should be done shortly after an initial negative result. CRS can also be confirmed by serial IgG testing for the sustained presence of IgG over several months. All congenitally infected infants, including those without clinical manifestations of CRS, may shed virus for up to at least one year of age and can transmit rubella to others. The detection of viral RNA by RTPCR is thus possible.

Measles has been endemic in Nepal for last several years affecting thousands of children and young adults. In 2003 Nepal started health facility based measles surveillance integrated with AFP surveillance system in major hospitals of the country. Later in 2004, the laboratory-supported measles surveillance was started covering more hospitals and health institutions. This included public and private health facilities at the central and district levels. As measles surveillance was strengthened, rubella was recognized as a burden and threat particularly for the women of child bearing age. Currently, there are 305 surveillance sites throughout the country providing weekly and monthly information on measles and rubella cases and outbreaks through surveillance medical officer (SMO) networks. The number of suspected measles cases were 13,344 in 2003, 2089 in 2008, 335 in 2013 and 353 in 2014. The number of outbreaks confirmed as measles were +138 in 2004, 6 in 2008 and 22 in 2012. Similarly, the number of confirmed rubella outbreaks was 13 in 2004, 27 in 2008 and 32 in 2012, (Table1).

Table 1

Number of suspected measles cases, outbreaks and mixed outbreaks investigated, 2003-2014

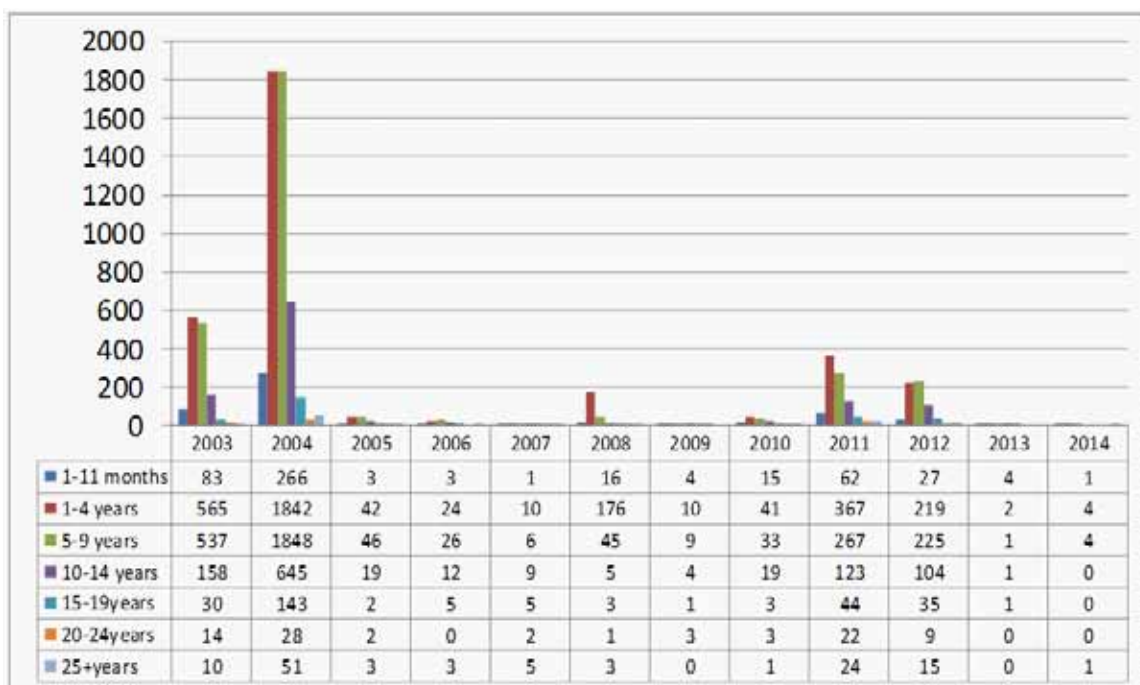
Year	Total no. of reported suspected measles cases*	Number of suspected measles outbreaks investigated	Number (%) of outbreak confirmed as measles outbreaks	Number (%) of outbreak confirmed as rubella outbreaks	Number (%) of outbreak confirmed as mixed measles and rubella outbreaks
2003	13,344	67**	41(61)	**	***
2004	12,047	197	138(70)	13(7)	11(6)
2005	2,023	46	1(2)	36(78)	2(4)
2006	2,838	31	2(6.5)	24(77)	1(3)
2007	1,415	21+	3(14)	11(52)	1(5)
2008	2,089	39	6(15)	27(69)	1(2.5)
2009	4,340	66	2(3)	57(89)	-
2010	2,550	33	7(21)	19(58)	2(6)
2011	734	64	22(35)	31(49)	4(6)
2012	791	68	16(24)	32(48)	7(11)
2013	335	3	0(0)	-	-
2014	353	2	0(0)	-	-

Source: JRF WHO-UNICEF/WHO-IPD, HMIS/DoHS/MoHP; ** Outbreak investigation and laboratory testing started in March 2003 ; ***Lab-confirmed for rubella specific IgM did not started until January 2004; "+" Samples QNS from 2 outbreaks

In 2004, 70% of outbreaks were due to measles, 7% outbreaks were rubella, 6% were mixed measles and rubella and rest 17% outbreaks were neither measles nor rubella. (Table1).

Figure 1

Number of Measles cases, Nepal 2003-2014
(Lab-confirmed and Epi-linked measles cases)



Source: Measles surveillance, WHO-IPD, Nepal

The measles cases (laboratory confirmed and epidemiologically linked) decreased from 1397 cases in 2003 and 4823 cases in 2004 to 634 cases in 2012 ; 9 cases in 2013 and 10 cases in 2014(Fig 1).

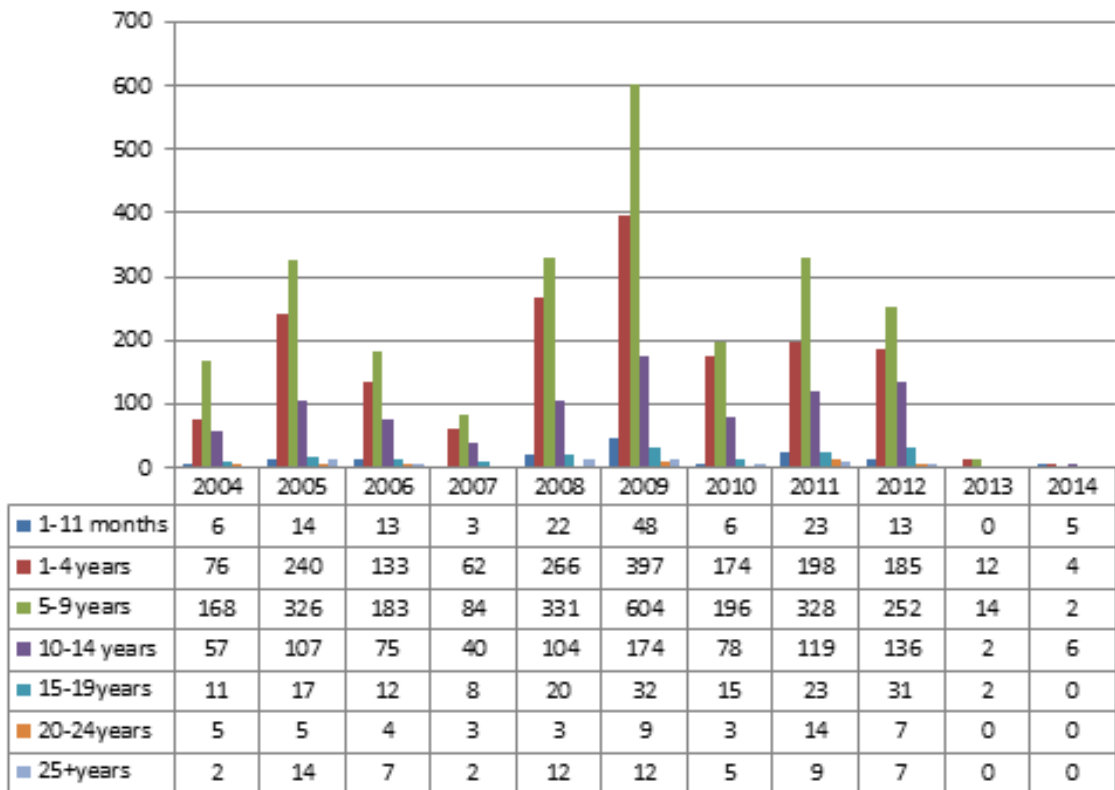


Female Community Health Workers

Figure 2

Confirmed rubella cases and age distribution, 2004-2014

Number of Rubella cases, Nepal 2004-2014
(Lab-confirmed and Epi-linked rubella cases)



Source: Measles surveillance, WHO-IPD, Nepal

Similarly, there were 325 rubella cases reported in 2004, 723 in 2005, 631 in 2012 ; 30 in 2013 and 17 in 2014 (Figure 2). Aggregate data of measles and rubella also showed the occurrence of both measles and rubella were more common in age groups 1-4 and 5-9 compared to higher age groups.

The burden of CRS has not been well documented in Nepal. A cross-sectional study to determine rubella seroprevalence among women of child bearing age was carried in major hospitals of Nepal in 2008. The findings suggested that approximately 91% of women had acquired rubella immunity, 6,091 pregnant women get infected with rubella annually and about 1,400 infants had born with CRS at the rate of 192/100,000 live births in 2008. In August 2009 a cross-sectional study involving 262 students attending Bal Mandir School for the Deaf in Kathmandu was conducted. Out of these students, 243 underwent auditory and ophthalmic testing. It was found that 18 (7.4%) met the clinical criteria for CRS with mean age 13 years [10]. It has been evidenced that measles cases and outbreaks have dropped sharply in 2013 compared to previous years. With introduction of rubella containing vaccine (MR) in 2012, the rubella cases have also declined in Nepal. The circulating genotypes for measles are D8 and D4 and 2B for rubella.

2.1 Nepal's Measles Control Activities

The Expanded Programme on Immunization (EPI) was initiated in 1979 in Nepal in three districts; by 1989, the program had been expanded to all 75 districts. In May 2003, Nepal adopted the measles mortality reduction goal set at the UN special session on children in the World Health Assembly. Nepal also expressed its commitment during Cape Town Declaration on measles elimination in 2003. Nepal's Measles Mortality Reduction Strategic Plan 2003-2007 was developed to reduce measles deaths by 50% by 2009 relative to FY 2002/03 level. Nepal adopted WHO/UNICEF strategies to accelerate measles control and elimination initiatives which were; strengthening and sustaining first dose measles vaccine coverage >90% nationally through routine immunization, providing second opportunity (MCV2) through follow-up/catch-up campaigns (every 3-4 years depending upon measles epidemiology), establish highly sensitive surveillance system including laboratory support and improve management of measles cases with administration of vitamin A.

2.2 Routine Immunization

Immunization is one of the priority programs of government of Nepal. All children get the first dose of MR vaccine at 9 months as first measles dose through routine immunization services free of cost nationally. The vaccine is made available by government through all public hospitals at the central level health facilities at districts and below levels including private hospitals and health institutions. If any child misses the first dose of MR vaccine at 9 month, the child is considered still eligible to get the vaccine until the age of 24 months as first dose and provided the second dose one month later. The government plans to introduce second dose of MR vaccine at 15-24 months through routine immunization services in health facilities and through outreach services at the village and community levels from 2015.



The Nepal Demography Health Survey show gradual improvement in national coverage with first dose of measles vaccine from 71% in 2001, 85% in 2006 and 88% in 2011. The MR coverage increased to > 90% in 34 (45%) districts in 2013.

Figure 3

Administrative and survey coverage of first dose measles vaccine, Nepal 2001-2012

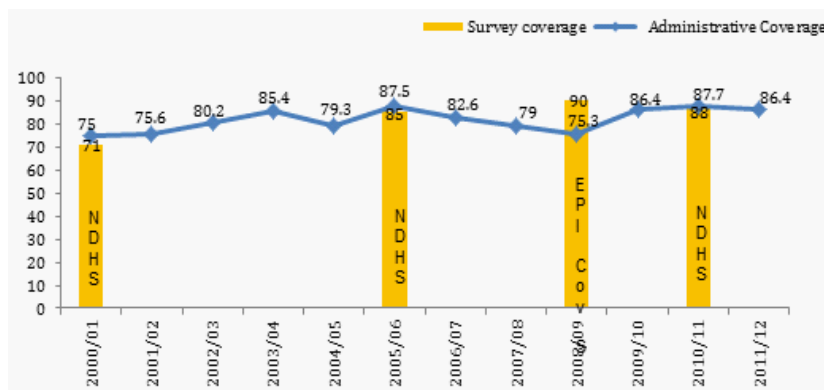
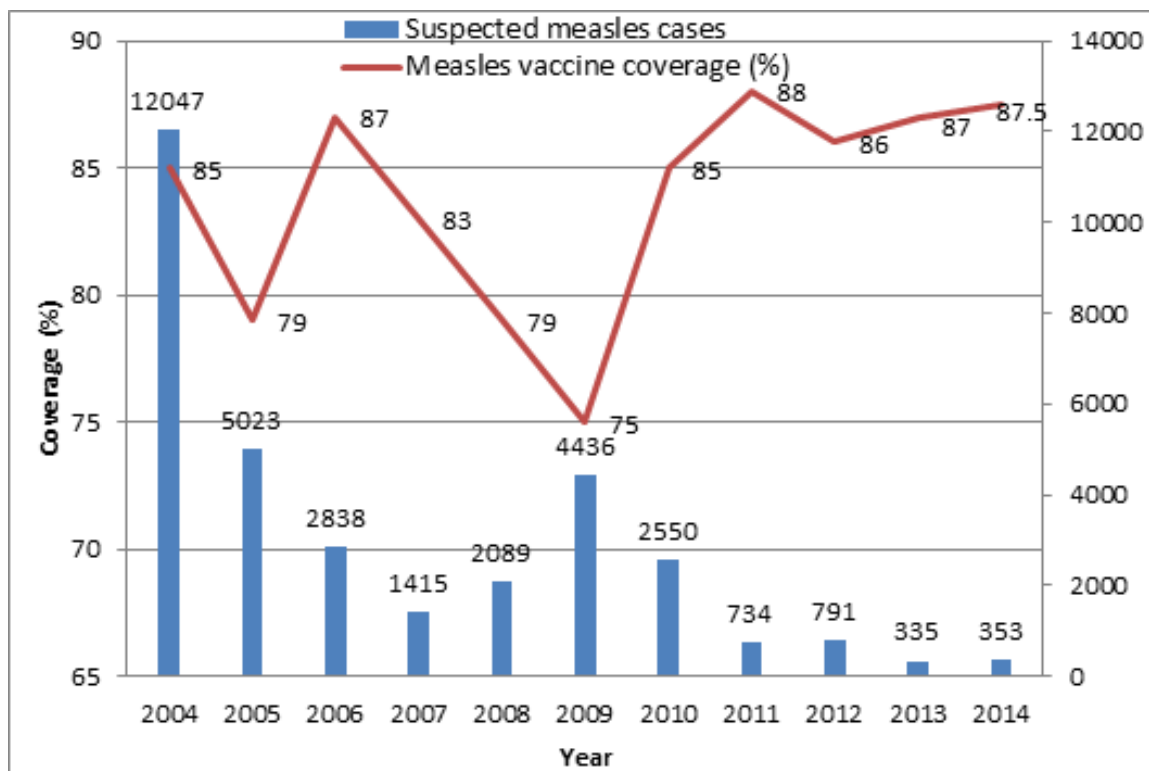


Figure 4

First dose of measles vaccine coverage and suspected measles cases, Nepal 2004-2014



Increasing population immunity, providing first and second dose of MR vaccine is the key to achieve measles and rubella elimination. Efforts are needed to increase public confidence and demand of the vaccine. At the same time, increased accessibility to vaccine hugely contributes to increase the coverage.

2.3 Supplementary Immunization Activities (SIA)

In response to the mortality reduction goal set at the UN special session on children in the World Health Assembly in 2002 and commitment to Cape Town Declaration on measles elimination in 2003, Nepal had its Measles Mortality Reduction Strategic Plan 2003-2007 to reduce measles deaths by 50% by 2009 relative to FY2002/03 level. Nepal adopted WHO/UNICEF strategies to accelerate measles control and elimination initiatives. One of the strategies was providing second opportunity of measles vaccine through follow-up/catch-up campaigns every 3-4 years depending upon measles epidemiology. To fill the immunity gap of the population and to rapidly interrupt virus circulation in the community, measles catch-up campaign was conducted targeting children 9 months to under 15 years of age in 2004/05 reaching >9.8 million children (100%) (Figure5). Similarly, follow-up campaigns were conducted in 2008 targeting children of 9 months to less than 5 years of age throughout the country to encounter buildup of susceptible children. The campaign reached 3,634,590 children (93% coverage). Further, Nepal conducted nationwide MR catch up campaign targeting 9 months to 15 years in 2012/13. The campaign reached to 100% of targeted children. All events of every MR campaign became very successful due to good coordination, team work of health workers, excellent social mobilization, involvement of female community health volunteers (FCHVs) and good leadership from Ministry of Health, with supporting partners.



Vaccination campaign activities

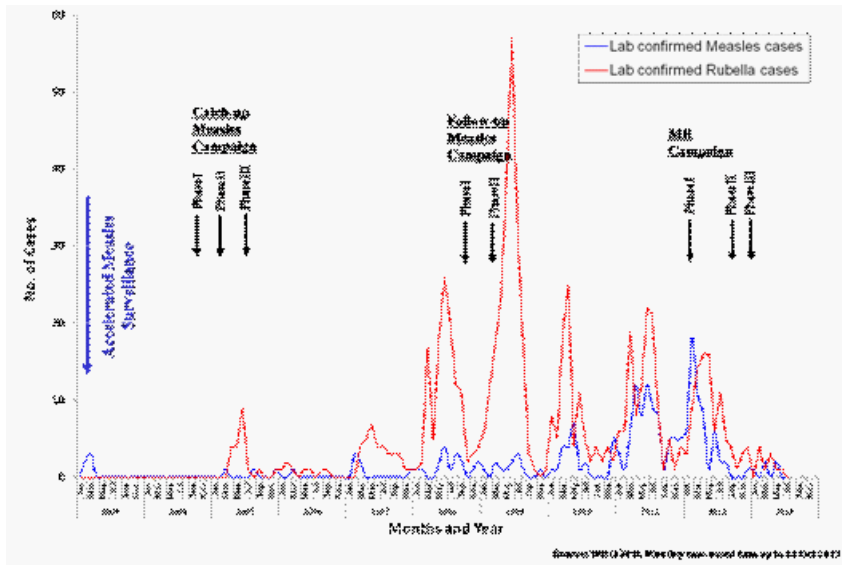
2.4 Initiation of Rubella/CRS control activities

Before 2004, there was not much information on the magnitude of rubella burden in Nepal. In 2004, measles surveillance was integrated with existing AFP surveillance for polio, many of the suspected measles cases were rubella when tested in the laboratory. However, the burden of CRS has not yet been completely known because of initial phase of CRS surveillance activity started very recently in Nepal.

The rubella cases in children, young adults and women of child-bearing age (WCBA) continued to appear throughout the country (Figure 5). It was evidenced that the number of measles cases and outbreaks reduced drastically after measles supplementary immunization activities (SIAs). Moreover, the MR catch up campaign that reached to >95% of children (9 month to 14 years) in 2012 and introduction of MR vaccine into RI programme at 9 months has shown significant impact on reducing rubella cases.

Figure 5

Suspected and confirmed measles/Rubella cases from case-based and routine reporting sites, Nepal, 2003-2013



2.5 Measles and Rubella Surveillance

The Early Warning and Response System (EWARS) within the Department of Epidemiology and Disease Control and the Health Management and Information System (HMIS) within the Department of Health Services collects information on most of the epidemic-prone diseases including measles for response and control purposes. The HMIS collects morbidity data from all the public health care facilities on a monthly basis. The information collected through these two systems is generally based on clinical diagnosis.

In March 2003, with the objectives of collecting evidence based information on measles and as part of accelerated measles control effort, the government of Nepal and WHO initiated a more comprehensive measles surveillance system which included field investigations and laboratory testing of blood specimens of suspected measles cases. This was supported by surveillance medical officers (SMOs), who conducted health facility visits for active acute flaccid paralysis (AFP) surveillance since 1998. Integrated case-based surveillance network provides weekly and monthly detailed data on AFP, Japanese encephalitis, and measles cases through weekly reports from major health-care centers and hospitals throughout all 75 districts of the country (i.e., covering approximately >10% of all government health facilities), including all inpatient facilities. In addition, SMOs conduct weekly visits to >84 active surveillance sites within this network.

In 2007, the measles case-based surveillance supported by the National Public Health Laboratory (NPHL) was initiated by identifying major hospitals and other health care facilities. Efforts were made to collect blood samples from each and every suspected measles case who attended the health facilities identified as case based sites. The blood/serum samples were sent to NPHL maintaining cold chain and tested for measles and rubella. Initially 31 health facilities were included as case-based surveillance sites which expanded to 212 sites by 2010 and 299 by 2013. The measles surveillance also unfolded previously unknown rubella in Nepal.

The surveillance data showed that the annual incidence of non-measles suspected measles cases was 4.1 per 100,000 population in 2008 and 3.7 (target of >2) in 2012 and 1.2 in 2013. Similarly, the percentage of districts reporting at least one non-measles suspected measles case per 100,000 population reached to 41% in 2008 and 57% in 2012 and 76% in 2013 and in 2014 against the target of >80%. The percentages of outbreaks fully investigated were 92% in 2008 and 94% in 2012 and all outbreaks (100%) in 2013 and in 2014 against the target of >80%. The annualized incidence rate of confirmed measles cases per 1000,000 population were 9.2 in 2008 and 22.2 in 2012 and 0.3 in 2013 and in 2014 as well against the target of <1. However, the annualized incidence rate of confirmed rubella cases was 2.8 per 100,000 populations in 2008 and 2.2 in 2012 and 0.1 in 2013 and less than 0.1 in 2014 (Table 2). It has been learnt that only severe and complicated measles and rubella patients present at the health facilities and there is high chances of under reporting of measles and rubella.

Table 2

Status of measles surveillance indicators, Nepal, 2008-2014

Indicators	Target	2008	2009	2010	2011	2012	2013	2014
Annualized incidence of non-measles suspected measles cases per 100,000 population	>2	4.1	6.6	2.9	4	3.7	1.2	0.8
Percentage of districts reporting at least one non-measles suspected measles case per 100,000 population	>80	41	79	67	57	57	76	76
Percentage of suspected measles cases adequately investigated	80	77	82	79	86	89	93	100
Percentage of outbreaks fully investigated	100	92	97	97	98	94	100	100
Annualized incidence of confirmed measles cases per 1,000,000 population	<5	9.2	1.1	4.0	32.4	22.2	0.3	0.3
Annualized incidence of confirmed rubella cases per 100,000 population	-	2.8	4.7	1.7	2.5	2.2	0.1	0.07

Source: Measles surveillance, WHO-IPD, Nepal

The health facility-based measles surveillance had been crucial to identify, investigate and respond to measles and rubella outbreaks in the country. Nepal conducted periodical supplementary immunization activities every 3-4 years starting from 2005. As a result, measles outbreaks went down from 138 in 2004 to 16 in 2012 and there was no any outbreak in 2013 and in 2014 (Table 1).

2.6 Gaps and Challenges

2.6.1 Measles Immunization

Though Nepal has been successful to reduce measles burden in the country, measles is still endemic and there is potential threat of spreading the disease with big outbreaks. As the country is moving towards achieving measles elimination and rubella/CRS control goals by 2019, the programme gaps related to increasing population immunity will need to be addressed timely. The coverage with first and second routine dose of measles/MR vaccine should reach to >95% of the eligible population. Similarly, in order to fill up the immunity gaps, periodic quality measles/MR SIAs should be conducted. In 2013, the national coverage with first routine dose of MR vaccine was around 87%. The district level coverage showed >95% in 24 districts, 90%-94% coverage in 9 districts, 80%-89% in 28 districts and <80% in 14 districts. It showed that 51 districts needed to increase their MR coverage to >95% and rest of the districts needed to sustain the gains.

Similarly, introduction of second dose of measles/MR vaccine in routine immunization is crucial. In order to achieve high population immunity with >95% coverage and sustaining it is a challenge. In order to achieve desired level of population immunity to achieve measles elimination, the strategies mentioned in this document will need to be strictly followed and implemented.

2.6.2 Case-Based Measles and Rubella Surveillance

Currently, Nepal is conducting health facility based measles surveillance. Suspected measles cases are notified and reported from all weekly zero reporting sites throughout the country. These case-based sites include major medical college hospitals, central level public hospitals, regional level hospitals, private hospitals and health centers with laboratory facility. The laboratory specimen/blood is collected when a suspected measles case of any age present to the health facility and reported to surveillance focal person or SMOs. However, information of other cases that attends any other health facility/clinic besides these specified sites or not attending any health care facility will be missed to notify and investigate. Therefore, case identification, notification of each and every suspected measles case with blood specimen appears as a major challenge due to difficult geographical terrain and scarce trained human resource in the periphery.

2.6.3 Human Resources (HR)

Health workers are the key to success the immunization programme. Without adequate number of work force meeting programme targets will not be possible. For implementing measles elimination strategies, adequate HR will be required for providing vaccination, maintaining cold chain, monitoring coverage and quality of immunization services.

2.6.4 Vaccine, Cold Chain and Supply

In country like Nepal, transportation and maintenance of cold chain equipment, storage of vaccine at the district and sub district levels are also a challenge. Moreover, transportation of vaccine to the session sites in diverse geographical condition adds further challenge to the programme.

2.6.5 Funding

Funding support is the key for the achieving measles and rubella elimination and for the sustenance of the achievements. Most of the vaccines provided through RI services are funded by national government. However, there resource constraints to conduct activity like periodic follow SIAs, programme monitoring and evaluation, coverage surveys, research and surveillance activities. Supports from international community, WHO HQ, SEARO and partners will help to boost the activities towards achieving measles elimination and rubella control in Nepal.

STRATEGIC GUIDELINE FOR ACHIEVING ELIMINATION OF MEASLES AND CONTROL OF RUBELLA AND CONGENITAL RUBELLA SYNDROME (CRS) IN NEPAL

Nepal has achieved the measles mortality reduction goal of decreasing measles deaths by > 90% compared to 2003 estimates. Further, Nepal has taken steps to move from measles mortality reduction to measles elimination mode. This document includes key strategic objectives and related activities for delivering two doses of MR vaccine, conducting periodic SIAs to close immunity gaps, strengthening laboratory supported measles case-based surveillance, outbreak investigation and response including advocacy and social mobilization activities. Timely implementation of these activities will be important to achieve the country's measles elimination and rubella/CRS control goals by 2018. The country vision, goals and milestones are:

3.1 Vision and Goal

Vision

Achieve and maintain elimination of measles, rubella and congenital rubella syndrome (CRS) in Nepal.

Goal

Achieve measles elimination and rubella/CRS control by 2019

Milestones

By end 2015

- Reduce national measles mortality by at least 95% compared with 2003 estimates and sustain that level.
- Reduce measles annual incidence <5 cases per million populations and sustain that level.
- Reduce >50% rubella/CRS cases compared to 2008 estimates.

By end 2019

- Achieve “Zero” endemic measles transmission in a defined geographical area/country for at least 12 months in presence of a well performing surveillance system and sustain the gains.
- Achieve >90% reduction of rubella/CRS cases compared to 2008 estimates.

3.2 The six components of the strategic plan, 2015-2019:

- 1 Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with first and second doses of measles and rubella-containing (MR) vaccines through routine immunization services in all districts.
- 2 Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with SIAs covering men and women of wide age range.
- 3 Monitor measles, rubella and CRS using sensitive surveillance system with accredited laboratory support and evaluate programmatic efforts to ensure progress
- 4 Outbreak preparedness, response and case management.
- 5 Develop and implement effective advocacy, communication and social mobilization (ACSM) activities for immunization.
- 6 Develop and conduct innovative/cost-effective activities, operational researches to improve immunization and surveillance.

Milestones for achieving each strategic component, 2015-2019

Goal: Achieve measles elimination and rubella/CRS control					
1. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with first and second doses of measles and rubella-containing (MR) vaccines through routine immunization services in all districts.	Timeline				
	2015	2016	2017	2018	2019
1.1. Achieve and maintain at least 90% coverage with first doses of MR vaccine through RI	50 Districts	60 Districts	75 Districts		
1.2. Achieve and maintain at least 95% coverage with first doses of MR vaccine through RI	25 Districts	40 Districts	60 Districts	75 Districts	Sustain
1.3 Achieve and maintain at least 90% coverage with second doses of MR vaccine through RI	50 Districts	55 Districts	60 Districts	75 Districts	
1.4 Achieve and maintain at least 95% coverage with second doses of MR vaccine through RI	25 Districts	35 Districts	55 Districts	70 Districts	75 Districts

1. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with SIAs	MR campaign (9M-5Y)		MR SIA (9M- 15Y)	
2. Monitor measles, rubella and CRS using sensitive surveillance system with accredited laboratory support and evaluate programmatic efforts to ensure progress	Achieve elimination standard surveillance performance indicators of measles and rubella to achieve the goals	Sustain elimination standard surveillance performance indicators of measles and rubella to achieve the goals		
3. Strengthen measles and rubella outbreak preparedness, early response and case management	100% outbreaks fully investigated			
4. Develop and implement effective advocacy, communication and social mobilization (ACSM) activities for immunization.	Develop ACSM strategy	Implementation of ACSM strategy		
5. Develop innovative/ cost-effective activities and operational researches to improve immunization, surveillance and diagnosis.	MR coverage survey	Operation research promoted		

3.2.1 Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with first and second doses of measles and rubella-containing (MR) vaccines through routine immunization services in all districts

Increasing population immunity against measles and rubella is essential to achieve measles and rubella elimination. A strong system for providing the first and second doses of measles and rubella vaccine serves as a corner stone for the elimination programme. One dose of vaccine confers immunity in about 85% of cases when given at 9 months and there is need to provide two doses of measles vaccine to make sure that the child is well protected. Introduction of second dose of measles containing vaccine (MR) in routine immunization is required once the vaccination coverage with first dose is high ($\geq 80\%$). As Nepal has achieved measles first dose coverage of $>80\%$ and

sustained it, the government plans to give MR to children at the age of 15-18 months [11] through RI services. For those children who missed the first dose at 9 months or at 9-12 months, MR vaccine given at 15-18 months will be considered as the first measles dose and the child again called one month later for the second dose.

Strategic interventions/activities

1. Ensure implementation of “REC Strategy” to achieve and maintain >95% coverage with routine MR vaccine in every districts
2. Provide second dose of MR vaccine at through routine immunization services
3. Strengthening immunization services in municipalities
4. Ensuring quality routine immunization to ensure high coverage
5. Promote inter-programme and inter-sectoral collaboration for immunization services
6. Ensure adequate community mobilization and use of local resources for immunization
7. Strengthen monitoring and supervision for increasing immunization coverage at all levels
8. Develop and strengthen effective AEFI surveillance and case management system
9. Use innovations for increasing measles coverage

Time line of each strategic intervention/activities, 2015-2019

1. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with first and second doses of measles and rubella-containing (MR) vaccines through routine immunization services in all districts						
Strategic interventions/Activities		Timeline				
		2015	2016	2017	2018	2019
1	Ensure implementation of “REC Strategy” to achieve and maintain >95% coverage with routine MR vaccine in every districts					
1.1	Yearly update reaching every child (REC) plans in districts and health facilities annually					
1.2	Monitoring and on-site mentoring of implementation of RED/REC micro plans using standard monitoring checklist					
1.3	Prepare line lists of target children by ward/VDC to be immunized					
1.4	Prepare line list of target children by ward/VDC to be immunized					
1.5	Ensure availability/request of MR vaccine at the central, regional and district cold rooms					
1.6	Fill vacant posts of vaccinators/AHWs/ ANMs to ensure adequate number of well trained health workers for immunization and cold chain in all districts and Municipalities					

1.7	Increase cold chain capacity				
1.8	Organize refresher trainings for EPI and cold chain staff in coordination with NHTC/RHTCs				
1.9	Introduce second routine dose of MR vaccine to children at 15-18 months				
1.10.	Conduct "Mop Up" activities in VDCs where MR vaccine coverage with first and or second dose is <80%				
2.	Strengthen immunization services in municipalities				
2.1	Review immunization coverage in Municipalities by monitoring the implementation of the "REC Strategy" and using standard checklists				
2.2	Collaborate with local authorities for immunization and ownership				
2.3	Perform detailed mapping of hard to reach areas/populations for immunization				
2.4	Conduct coverage surveys (when needed) in collaboration with Municipality and technical support from MoHP,				
2.5	Establish networking with urban health clinics, private and public hospitals for immunization				
3	Ensuring quality routine immunization to ensure high coverage				
3.1	Implement cold chain and vaccine management SOPs at all levels				
3.2	Capacity building for delivering immunization (vaccine storage/ transportation/vaccination/AEFI identification and management etc.)				
4	Promote inter-programme and inter-sectoral collaboration for immunization services				
4.1	Integrate immunization related activities with other public health intervention programmes (e.g. MNCH, Nutrition, CBNCP etc.) to develop synergism				

4.2	Coordination with education sector to include immunization related information in secondary school level curriculum					
4.3	Coordination with education sector for pre-school and school entry immunization requirement (immunization law)					
5	Ensure adequate community mobilization and use of local resources for immunization					
5.1	Mobilize and engage public and private sectors, FCHVs to increase their participation for local resources mobilization for immunization					
5.2	Involve of local authority for planning, monitoring and evaluation					
5.3	Recruit local health worker at community level to support immunization (if needed)					
5.4	Expand declaration of "Full Immunization" VDCs country wide (appreciative inquiry)					
5.4	Organize immunization reviews and planning meetings at local levels					
6	Strengthen monitoring and supervision for increasing immunization coverage at all levels					
6.1.	Conduct supportive supervision and programme monitoring activities from central level to regional and district levels using appropriate tools every six months					
6.2.	Organize supportive supervision and programme monitoring from Regional level to district and HF level every six months					
6.3	Organize supportive supervision and programme monitoring from District to HF level quarterly					
6.4	Organize supportive supervision and programme monitoring from HF to community/Outreach/Mobile camp sites every month					
6.5	Conduct Data Quality Self Assessments (DQSAs)					

6.6	Conduct third-party monitoring/ assessment of immunization coverage and quality					
7.	Strengthen effective AEFI surveillance and case management system					
7.1.	Review AEFI reporting and feedback system in every district					
7.2.	Review serious AEFI reporting system monthly (CHD, AEFI Committee, WHO, UNICEF)					
7.3.	Review minor AEFI reporting system quarterly (CHD, AEFI Committee, WHO, UNICEF)					
7.4.	Create a post of cold chain assistants for vaccine sub-stores and their recruitment					
8.	Use innovations for increasing measles coverage					
8.1	Conduct operational researches to increase vaccination coverage (when needed)					
8.2.	Mark and celebrate Immunization Weeks and Immunization Months					
9.	Ensure human resource for immunization service management					
9.1.	Identify the vaccinator with the revised job description for VDCs and municipalities					
9.2.	Fulfill the vacant post of vaccinator					
9.3.	Create a post of cold chain assistants for vaccine sub-stores and their recruitment					

3.2.2. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with SIAs.

High level of population immunity which is uniform is required to stop measles and rubella outbreaks. Generally, the first and second doses of measles/MR vaccine are provided to eligible children through routine immunization programme. However, in situations when achieving high and homogenous coverage through routine immunization is unlikely, measles supplemental immunization activities (SIAs) are required [1]. The “follow up” SIAs are conducted targeting children born since the previous SIA regardless the previous vaccination status. The interval between the “follow up” SIAs are determined by epidemiological evidences of disease, vaccination coverage and accumulated susceptible populations. The SIAs are important to improve measles vaccination coverage and equity targeting broad age groups and the most susceptible children. Why we need to target wider age group?

Strategic interventions/activities

1. Conduct follow up MR campaign based on measles epidemiology and accumulated susceptible populations.
2. Identify high risk populations, hard to reach areas and conduct small scale campaigns

Time line of each strategic intervention/activities, 2015-2019

2. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with SIAs					
Strategic intervention/activities	Timeline				
	2015	2016	2017	2018	2019
2.1 Orient different cadres of health staff for providing second dose of MR based on updated guideline					
2.2 Increase cold chain capacity					
2.4 Conduct nationwide MR follow up campaign targeting children 9 months to under 5 years of age and monitor for coverage and quality					
2.1.1. Conduct MR campaign targeting men and women of wide age group (9M -15Y)					
2.4 Identify high risk populations, hard to reach areas and conduct small scale campaigns (when needed)					

3.2.3. Strengthen measles, rubella and CRS surveillance system with accredited laboratory support

The primary goal of measles surveillance is to detect and investigate all suspected measles and rubella cases, including imported ones, and to implement activities which prevent or limit secondary transmission. Surveillance and prompt investigation of cases and contacts contribute to halting the spread of disease. Besides the rapid detection of cases, a surveillance system that maintains a satisfactory record over several years will be crucial to the eventual verification of measles elimination. The three main components of a measles/rubella and CRS surveillance system are: 1) detection and notification of suspected cases, including active case searches 2) investigation, including contact tracing, timely collection of blood samples and laboratory workup and final classification, and 3) timely using appropriate surveillance data for action.

In September 2013, the regional workshop on “Surveillance Standards for measles and other priority vaccine-preventable diseases in South-East Asia” the case definition for the purpose of case-based measles and rubella surveillance was suggested [12].

Strategic interventions/Activities

1. Strengthen measles and rubella case-based surveillance nationally
2. Strengthen CRS surveillance as integrated VPD surveillance system
3. Provide support for measles and rubella diagnostic services at national and sub national levels with assured quality
4. Evaluate programmatic effectiveness to ensure progress.

Time line of each strategic intervention/activities, 2015-2019

3. Monitor measles, rubella and CRS using sensitive surveillance system with accredited laboratory support and evaluate programmatic efforts to ensure progress					
Strategic interventions/activities	Timeline				
	2015	2016	2017	2018	2019
3.1. Strengthen measles and rubella case-based surveillance nationally					
3.2. Orientation of health staff on case-based surveillance and collect relevant information on measles and rubella in case investigation form (CIF)					
3.3. Review HMIS data for reporting suspected measles cases reported from health facilities other than IPD reporting sites					
3.4. Continuing support to NPHL for measles and rubella diagnosis and strengthening it for virus isolation/detection and genetic characterization					
3.5. Establish sub national measles and rubella laboratories					
3.6. Phase wise expansion of measles and rubella case-based surveillance sites					
3.7. Capacity building in measles and rubella diagnosis, genetic characterization and virus isolation/ detection					
3.8. Participation of national and regional laboratories in the annual proficiency testing for measles and rubella diagnosis					
3.9. Strengthen CRS sentinel surveillance					
3.10. Orientation of staff on measles, rubella and CRS surveillance					

3.11. Line listing and follow up of pregnant women possibly exposed to rubella during suspected measles outbreaks for pregnancy outcome					
3.12. Rubella screening in antenatal checkup clinics in coordination with FHD and NPHL					
3.13. Coordination with other line agencies for CRS/birth defect surveillance (NESOG, NEPAS, Ophthalmologic and ENT service societies)					
3.3. Provide support for measles and rubella diagnostic services at national and sub national levels with assured quality					
3.3.1. Support and coordination with NPHL for measles and rubella diagnosis, virus isolation and genetic characterization					
3.3.2. Establish sub national measles and rubella laboratories (3 labs) outside Kathmandu					
3.3.3 Support national capacity building through training and innovations for measles and rubella diagnosis, molecular diagnosis, genetic characterization and virus isolation					
3.3.4. Support periodic accreditation of national and sub national laboratories					
3.3.5. Support maintaining quality control (QC) of national laboratories by participation in the annual proficiency tests					

3.2.4 Strengthen measles and rubella outbreak preparedness, early response and case management

Outbreaks help to identify immunization gap that may not be evident through monitoring vaccine coverage. The outbreaks usually generate community awareness and help to effectively mobilize resources to correct the immunization gaps (low coverage, heterogeneity of coverage with pockets of missed children, migrants, community resistance, and poor quality of vaccine related services). Effective and timely response can be ensured when suspected measles outbreaks are reported and investigated. Therefore, timely notification, reporting and full investigation of suspected measles cases and outbreak is very important activity for achieving elimination of measles and rubella. There need to be adequate vaccine and vitamin A stock in place to appropriately respond

in outbreak situations. Following a rubella outbreaks, attention should be given to evaluate the rubella immunization status of pregnant women in outbreak affected areas. The birth outcome follow-up activity should be started for the pregnant women possibly exposed to rubella infection. This will also help to understand the impact of MR vaccination and rubella epidemiology in Nepal.

Strategic interventions/activities

1. Early identification and timely response to all suspected measles and rubella outbreaks
2. Vaccinating the high risk population and contacts residing in the area of outbreak
3. Adequate management of cases

Time line of each strategic intervention/activities, 2015-2019

4. Strengthen measles and rubella outbreak preparedness, early response and case management					
Strategic interventions/activities	Timeline				
	2015	2016	2017	2018	2019
4.1. Update measles and rubella outbreak investigation and response guidelines					
4.2. Capacity building for outbreak preparedness and response of RRT in districts for measles/ rubella outbreak identification, investigation and case management					
4.3. Conduct rapid outbreak assessment and adequate investigation of all suspected measles/ rubella outbreaks as per the outbreak response plan					
4.4. Involve community and create public awareness for additional case detection during the outbreak					
4.5. Conduct vaccination response during outbreaks in VDCs and adjoining VDCs within 72 hours (not exceeding 7 days) targeting 9 months to <15 years or as indicated by epidemiological data					
4.6. Conduct vaccination response to outbreak in congregate settings (eg. Military camps, hostels, refugee camps etc) within 72 hours (not exceeding 7 days) targeting all ages					
4.7. Case management as per the standard protocol on integrated management of childhood illness (IMCI)					
4.8. Develop case management protocol and distribute					

3.2.5 Develop and conduct effective advocacy, communication and social mobilization (ACSM) activities for immunization

Effective social mobilization and advocacy communication is an integral part for successful implementation of the programme and is required at various levels. This is all the more important when the programme embarks to elimination. Communication and social mobilization efforts aim to promote community ownership, to increase coverage and to help achieve measles, rubella, and CRS elimination. Community awareness of immunization benefits, safety and available services will promote public acceptance and participation.

Strategic interventions/activities

1. Conduct advocacy meetings at central, Regional and district levels for continued commitment for achieving and sustaining measles elimination
2. Mobilize social society groups
3. Develop IEC, BCC materials that ensures immunization drive to sustain high coverage (Radio/TV/FM, poster/pamphlets, SMS text messages)

Time line of each strategic intervention/activities, 2015-2019

5. Develop and implement effective advocacy, communication and social mobilization (ACSM) activities for immunization					
Strategic interventions/activities	Timeline				
	2015	2016	2017	2018	2019
5.1.Hgh-level advocacy (parliamentarian) meetings					
5.2. Advocacy meeting with professional organizations (NEPAS, Public Health Association, NESOG, NMA, Nepal Nursing Association)					
5.3. Advocacy meeting with district and community stakeholders (religious leaders, community leaders etc.)					
5.4. Nomination of Measles and rubella elimination ambassador					
5.5. Community mobilization to create demand for immunization and reduce drop-outs					
5.6. Involving communities for outbreak detection, investigation, prevention and control					
5.7. Community mobilization for routine immunization					
5.8. Strengthening health facility management committee for immunization and surveillance					

5.8. Assessment of effectiveness of different IEC and BCC materials required for measles and rubella elimination (as per the need)					
5.9. Assessment of behavior of parents for not opting immunization and drop-outs for their children(as per the need)					
5.10. Assess and update National Communication Strategy for Maternal, Newborn and Child health (as per the need)					
5.11. Develop IEC and BCC materials based on measles elimination and rubella control national strategic plan 2014-2018					

3.2.6 *Develop and conduct innovative/cost-effective activities, operational researches to improve immunization, surveillance and diagnosis*

Research is one of the important components of any disease control/elimination programme which enables implementation of evidence-based interventions. In measles and rubella front, immunization coverage, population immunity, effectiveness of vaccine, perception of the people to immunization, AEFI are some of the areas that will need attention

Strategic interventions/activities

1. Conduct studies to support immunization, surveillance and diagnosis of measles and rubella

Time line of each strategic intervention/activities, 2015-2019

6. Develop and conduct innovative/cost-effective activities, operational researches to improve immunization, surveillance and diagnosis					
Strategic interventions/activities	Timeline				
	2015	2016	2017	2018	2019
6.1. Conduct operational research on epidemiology of measles and reaching unreached children with two doses of MR vaccine					
6.2. Conduct MCV1 and MCV2 coverage surveys as part of immunization coverage survey					
6.3. Conduct other studies as per the need of the programme					

MONITORING, EVALUATION AND VERIFICATION

4.1 Recording and Reporting System

The immunization and surveillance data from all outreach sessions, health facilities including private hospitals and clinics will be systematically collected and compiled. The health facilities from the periphery will continue to reports to the district every month. The District Health Office (DHO) will compile, analyze, and send coverage reports to the Health Management Information System (HMIS) and the Regional Health Directors (RHDs) every month. Currently, the quarterly review meetings of all immunization related activities takes place at the district level, where the programme manager's discusses on various issues related to measles immunization coverage and disease status. The DHO categorizes Village Development Committee (VDC) data by coverage, dropout rates and number of unimmunized children to identify high- and low-performing VDCs. At each level, monthly coverage data are entered in an immunization-monitoring chart, which will be filled every month and displayed for the use of health workers and community people for monthly monitoring purposes. Data recording, reporting and feedback system will be effectively implemented and used for programme planning.

4.2 Indicators

Impact indicators

Absence of endemic measles and rubella cases for a period of 12 months or more, in the presence of well-established surveillance

Immunization coverage indicators

Achieving and maintaining of a >95% immunization coverage with routine first dose of measles/rubella containing vaccine in all districts and nationally

Achieving and maintaining of >95% immunization coverage with routine second dose of measles/rubella containing vaccine in all districts and nationally

Achieving and maintaining >95% immunization coverage with SIAs in all intervention areas
These indicators will be measured using administrative coverage and national coverage survey

Measles and rubella surveillance indicators

Reporting rate:

To detect at least two non-measles non-rubella suspected measles cases per 100,000 populations at national level

More than 80% of districts to report at least one non-measles suspected measles case per 100,000 populations annually that has a population of at least 100,000.

Laboratory confirmation

At least 80% of the suspected measles and rubella cases (exclude epidemiologically linked cases) tested for measles IgM and rubella IgM.

Viral detection

At least 80% of outbreaks have samples collected from confirmed cases for virus detection and genetic characterization in WHO accredited laboratory.

Adequacy of investigation

At least 80% of all reported suspected measles cases have an adequate investigation within 48 hours of notification.

(Adequate investigation: at least following data collected from suspected measles case; name of identifier, name of case, age (date of birth), sex, address, date of onset of rash, date of specimen collection, vaccination status, date of last vaccination)

4.3 Other indicators for monitoring measles and rubella surveillance performance

Indicators	Targets
Percentage of outbreak fully* investigated	100%
Percentage of suspected case notified ≤7 days of rash onset	≥80%
Percentage of reporting sites that report weekly	≥90%
Percentage of measles and rubella suspected cases investigated within 48 hours of notification	≥80%

Laboratory indicators

Indicators	Targets
Percentage of suspected cases with a blood specimen received at the laboratory within 7 days of collection	≥80%
Percentage of suspected cases with urine/throat swab received at the laboratory within 48 hours of collection	≥80%
Percentage of serum and urine specimens coming to NPHL in good condition	≥80%
Percentage of suspected cases with blood specimen processed within 7 days of laboratory receipt	≥80%
Percentage of suspected cases that were laboratory discarded	≥90%
Percentage of representative samples at NPHL sent to Regional Reference Laboratory for reconfirmation, virus detection and genetic characterization as part of quality assurance	≥10%

Percentage of representative samples at regional laboratories sent to NPHL for reconfirmation as part of quality assurance	≥10%
Percentage of concordance of measles and rubella IgM results between NPHL and RRL	≥90%
Percentage of concordance of measles and rubella IgM results between RRL laboratories and NPHL	≥90%
Percentage of concordance of measles and rubella virus detection and genetic characterization results between NPHL and RRL	≥90%
Percentage of results sent to NPHL within 14 days of specimen receipt at RRL	≥80%

4.4 CRS surveillance Indicators

Aggregate/case-based data from routine reporting

- Number of CRS cases and incidence per 1,000 live births by month, year and geographic area
- District specific CRS incidence rates per 1,000 live births per year
- CRS cases by age and sex

(*An outbreak is fully investigated when i) house-to-house survey is conducted, ii) at least five suspected cases are serologically tested for measles and rubella IgM and urine is collected for virus isolation, and iii) case investigation form or line list with basic epidemiological information like, address, age, vaccination status, date of last vaccination, date of onset of rash, and outcome of illness is completed.)

4.5 Outbreak preparedness and response indicators

Percentage of suspected measles and rubella outbreaks fully investigated	100%
Percentage of cases adequately investigated is	≥80%
Percentage of confirmed cases with infection source identified	≥80%
Percentage of 5-10 blood samples collected for virus detection and genetic characterization outbreaks	≥80%
Percentage of outbreak investigated within 48 hours	≥80%
Percentage of vaccination response in outbreaks within 72 hours of exposure	100%

4.6 Advocacy

National Communication strategy for maternal, child health and immunization developed and key stakeholders oriented

4.7 Monitoring progress towards measles elimination and rubella/CRS control

To monitor progress towards elimination, there is a need to closely monitor the measles incidence and population immunity. One suggested indirect measure of population immunity is vaccination coverage at national and sub national levels. The incidence of measles cases per million populations should be monitored to assess progress towards reaching elimination goals, and is another indirect

measure of population immunity. Incidence monitoring is reliable only when surveillance is of high quality and when thorough outbreak investigation is carried out. Countries should conduct thorough outbreak investigations of all outbreaks that include active case-finding, contact tracing and determining the size, duration and origin of the outbreaks. As country approaches to elimination goals, the size and duration of the outbreaks will be diminished with majority of outbreaks will be import-related in origin. Following measures below will be monitored at the national and sub national level against targets set for measles elimination and rubella/CRS control by 2015-2019.

1. Vaccination coverage indicators with routine and SIAs: Vaccination coverage with RI services and SIAs should be continuously monitored to ensure population immunity.

Monitoring RI coverage indicators and targets:

- > 90% coverage with first doses of MR vaccine in 50 districts in 2015, 60 districts in 2016, 75 districts in 2017.
- > 95% coverage with first doses of MR vaccine in 25 districts in 2015, 40 districts in 2016, 60 districts in 2017, 75 districts in 2018 and 2019.
- > 90% coverage with second doses of MR vaccine in 50 districts in 2015, 55 districts in 2016, 60 districts in 2017, 75 districts in 2018.
- > 95% coverage with second doses of MR vaccine in 25 districts in 2015, 35 districts in 2016, 55 districts in 2017, 70 districts in 2018 and 75 districts in 2019.

Monitoring SIA coverage indicators and targets:

- Indicator: Conduct nationwide MR follow up campaign targeting children 9 months to under 5 years of age and monitor for coverage and quality
 - Target: Conducted and achieved > 95% MR coverage in all districts and nationally by end 2015.
 - Indicator: Conduct MR campaign targeting men and women of wide age group
 - Target: Conducted and achieved > 95% MR coverage in all districts and nationally by end 2018.
2. Monitoring measles and rubella surveillance indicators and targets: Reduction in incidence of measles, rubella and CRS are the basic measures of progress towards disease elimination.
 - Indicator: Reduction in annual measles incidence of <5 cases of per million population per year, excluding cases confirmed as imported by 2015.
 - >50% reduction in rubella/CRS cases in 2015 compared to 2008 estimates.
 - Achieve reduction incidence/transmission of endemic measles cases to “Zero” in a defined geographical area/ country for at least 12 months in presence of a well performing surveillance system by 2019.
 - Reduction in incidence of rubella/CRS to >90% compared to 2008 estimates by 2019.
 3. Monitoring measles and rubella outbreak indicators and targets: Monitoring the outbreak size demonstrates that the chain of transmission is self limited as a result of very high population immunity to measles and rubella.

- Indicator: Monitoring of outbreak size of all outbreaks including outbreaks in closed settings and outbreaks where interventions have taken place to stop the outbreak
 - Target: 100% outbreaks got fully investigated through 2015 and beyond. At least 80% of the outbreaks having less than 10 confirmed measles cases.
4. Monitoring measles and rubella endemic measles virus strains and targets:
Efforts for determining measles and rubella virus genetic sequence of all chains of transmission and providing evidence of absence of endemic measles and rubella virus transmission and or confirm importation.
- Indicator: The number of endemic measles virus strains.
 - Target: Achieving zero cases of measles caused by an endemic strain for at least 12 months by 2019.

4.8 Sustaining elimination and initiating verification

Sustaining measles elimination is a challenge, especially when there are other competing priorities and importation of the disease remains as a potential threat. After the elimination is achieved, there are chances of developing over confidence among the programme managers, diversion and or decrease in funding sources and laxity in the programme eventually contributing to reemergence of measles and rubella. The government will need to put every effort to sustain the gains in measles and rubella front. The vaccine coverage against measles and rubella through RI services and periodic SIAs will need to maintain as high as coverage of 95% and more and sustain elimination level measles and rubella surveillance indicators. During the post elimination periods, the role of active surveillance will be of paramount importance for timely and effectively outbreak investigation and response. Once the elimination goal is achieved, Nepal will need to establish a national verification committee and with WHO technical support will formally initiate verification process in 2023.

GUIDING PRINCIPLES TO ELIMINATE MEASLES AND CONTROL RUBELLA AND CRS

The regional and country experiences in interrupting polio virus transmission and controlling several other communicable diseases show that identification of key factors promoting success to guide measles elimination and efforts to control rubella and CRS are:

5.1. Sustainability and Ownership

Increasing and maintaining high population immunity against measles and rubella will require joint efforts of the government, civil society and health professionals and partners. It is essential that the government and health professionals maintain and build full ownership for the well being of the children. The cMYP 2011-2016 will need to be supplemented with adequate budget for all activities and interventions as mentioned in the measles elimination and rubella/CRS control strategic document 2015-2019. High-level advocacy and commitment will be the most essential element to achieve and sustain measles elimination goals.

5.2. Immunization and Health Care System Strengthening

To achieve and sustain measles elimination and rubella/CRS control country goals, an effective immunization and health care system must be in place. The quality and coverage of the first and second doses of measles and rubella vaccine (MR) should be ensured at the district and national levels. In addition, periodic MR SIAs need to be conducted (till it reaches $\geq 95\%$ coverage with first and second dose of MR vaccine) to protect the children and population at risk.

5.3. Equity

All people, without distinction of gender, race, religion, age, political belief or social condition should benefit from disease prevention programme, and vaccination against measles and rubella. Immunizing all children and susceptible other population help in disease elimination.

5.4. Coordination and Linkage

Coordination and linkage of measles elimination activities with other health interventions will save scarce resources of the country and help boosting programme towards achieving goals. For example, end-game strategy for polio eradication, creating new opportunities for linkages between polio and measles relating routine delivery of inactivated polio vaccine (IPV), strengthens measles surveillance, opportunities with new vaccine introduction and other child survival interventions like deworming programme, Integrated Management of Childhood Illness (IMCI) and others.

PERFORMANCE LOGICAL FRAMEWORK FOR MEASLES ELIMINATION AND RUBELLA/CRS CONTROL, 2015-2019



Advocacy meeting for Measles Campaign

Logical framework for monitoring measles elimination and rubella/CRS control programme in Nepal, 2015-2019.

Logical Interventions	Objectively verifiable indicators	Baseline	Target	Verification means	Timeline	Responsibility	Assumptions
<p>Goal</p> <p>Achieve and maintain measles elimination and rubella/CRS control by 2018.</p>	<ul style="list-style-type: none"> - Absence of endemic measles cases for a period of 12 months or more, in the presence of well-established surveillance - Reduction in rubella/CRS cases compared to 2008 estimates 	<ol style="list-style-type: none"> 1. Measles incidence: 32.4 2. Rubella incidence: 2.2 	<ul style="list-style-type: none"> - Measles elimination and rubella/CRS control by 2019 - Reduction of > 90 cases of rubella/CRS compared to 2008 estimates by 2019 	<p>Surveillance reports, Annual reports and surveys</p>	<ul style="list-style-type: none"> - Verification of measles elimination in 2023 (36 months after measles elimination) 	<p>CHD, WHO</p>	<p>Measles, elimination and rubella/CRS control remains priority 1 programme of MoH&P, GoN</p>
<p>Component 1. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with first and second dose of measles-and rubella-containing vaccines (MR) through routine immunization services in all districts and nationally.</p>	<ol style="list-style-type: none"> a. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with first routine dose of measles-and rubella-containing vaccines (MR) in all districts and nationally. b. Achieve and maintain high level of population immunity by providing high vaccination coverage (at least 95%) with second dose of measles and rubella (MR) containing vaccine at 15-18 months through routine immunization in all districts and nationally. 	<p>First dose MR coverage: >90% in national; >90% in 34 districts</p>	<p>MCV1 coverage ≥90% at national and >80% at district level</p> <ol style="list-style-type: none"> 1. ≥90% in 50 districts 2. ≥90% in 60 districts 3. ≥90% in 75 districts and nationally 	<p>Annual reports and surveys</p>	<ol style="list-style-type: none"> 1. 2015 2. 2016 3. 2017 	<p>MoH&P, CHD, LMD, NHEICC, UNICEF, WHO, SABIN</p>	
		<p>Government plans to introduce the second dose MR vaccine from 2015</p>	<p>MCV2 coverage ≥90% at national and 80% at district level</p> <ol style="list-style-type: none"> 1. ≥90% in 50 districts 2. ≥90% in 55 districts 3. ≥95% in 60 districts 4. ≥95% in 75 districts 	<p>Annual reports and surveys</p>	<ol style="list-style-type: none"> 1. 2015 2. 2016 3. 2017 4. 2018 	<p>MoH&P, CHD, LMD, NHEICC, UNICEF, WHO, SABIN</p>	
<p>1.1. Update reaching every child (REC) plans in districts and health facilities annually</p>	<p>RED/REC micro plans updated yearly</p>	<p>None</p>	<p>MCV2 coverage ≥95% at national and 80% at district level</p> <ol style="list-style-type: none"> 1. ≥95% in 25 districts 2. ≥95% in 35 districts 3. ≥95% in 55 districts 4. ≥95% in 70 districts 5. ≥95% in 75 districts 	<p>Annual reports and surveys</p>	<ol style="list-style-type: none"> 1. 2015 2. 2016 3. 2017 4. 2018 5. 2019 	<p>MoH&P, CHD, LMD, NHEICC, UNICEF, WHO, SABIN</p>	
<p>1.2. Monitoring and on-site mentoring of implementation of RED/REC micro plans using standard monitoring checklist</p>	<p>Check list developed, regular monitoring and mentoring reports available</p>	<p>None</p>	<p>Updated micro plan in 75 districts and health facilities through 2015-2019</p>	<p>Annual report RCS report</p>	<p>throughout</p>	<p>CHD, LMD, NHEICC, UNICEF, WHO</p>	
<p>1.3. Prepare line lists of target children by VDC/ ward to be immunized</p>	<p>Line list available</p>	<p>None</p>	<p>≥80% of planned monitoring and mentoring reports available</p>	<p>Monitoring and mentoring reports</p>	<p>throughout</p>	<p>CHD, UNICEF, WHO</p>	
<p>1.4. Provide MR vaccine to children in hard to reach areas by organizing mobile clinics/camps 4 times a year</p>	<p>Mobile clinics/camps planned and organized based on needs</p>	<p>None/Limited</p>	<p>Line list of target children available in all 75 districts</p>	<p>Reports</p>	<p>throughout</p>	<p>CHD, UNICEF, WHO</p>	
<p>1.5. Ensure availability of MR vaccine at the central, regional and district cold rooms</p>	<p>MR vaccine made available at all levels</p>	<p>Inventory</p>	<p>Coverage and reports at national and sub national levels available</p>	<p>Reports</p>	<p>2015 through 2019</p>	<p>CHD, UNICEF, WHO</p>	
<p>1.6. Fill vacant posts of vaccinators/AHMs/ANMs to ensure adequate number of well trained health workers for immunization and cold chain in all districts and Municipalities</p>	<p>Lists of vacant posts by district available</p>	<p>Inventory</p>	<p>Review of inventory</p>	<p>Reports</p>	<p>2015 through 2019</p>	<p>CHD, LMD, NHEICC, MOE, UNICEF, WHO</p>	
<p>1.7. Increase cold chain capacity</p>	<p>Review of cold chain capacity at central, regional and district levels</p>	<p>Limited information</p>	<p>>90% of vacant posts filled</p>	<p>Reports</p>	<p>2015 through 2019</p>	<p>CHD, LMD, NHEICC, MOE</p>	
			<p>Cold chain capacity increased</p>	<p>Reports</p>	<p>2015 2017</p>	<p>CHD, LMD, NHEICC, MOE, U</p>	

Logical Interventions	Objectively verifiable indicators	Baseline	Target	Verification means	Timeline	Responsibility	Assumptions
1.8. Organize refresher trainings for EPI and cold chain staff in coordination with NHTC/RHTCs	No. of training programmes organized	None	At least one training in all 75 districts	Reports	2015 2017	CHD, LMD, NHTC, RHTCs, UNICEF, WHO	
1.9. Introduce second routine dose of MR vaccine to children at 15-18 months	Implementation at national level	None	75 districts	Annual coverage reports	2015	CHD, LMD, UNICEF, WHO	
1.10. Conduct "Mop Up" activities in VDCs where MR vaccine coverage with first and or second dose is <80%	No. of "Mop Up" activities conducted	None	All district	Reports	2015 through 2019	CHD, LMD, UNICEF, WHO	
1.11. Review immunization coverage in Municipalities by monitoring the implementation of the "REC Strategy" and using standard checklists	No. of review meetings conducted in municipalities	Limited information	All municipalities	Reports	2015 through 2019	CHD, LMD, UNICEF, WHO, Municipality	
1.12. Collaborate with local authorities for immunization and ownership	No. districts collaborating immunization activities with local authorities	Limited information	All districts	Reports	2015 through 2019	DPHO, CHD, UNICEF, WHO	
1.13. Perform detailed mapping of hard to reach areas/populations for immunization	No. districts with mapping of hard-to-reach populations	District micro plans available	All districts	Reports	2015 through 2019	DPHO, CHD, UNICEF, WHO	
Logical Intervention	Objectively verifiable indicators	Baseline	Target	Means of verification	Timeline	Responsibility	
1.14. Conduct coverage surveys (when needed) in Municipalities with technical support from MoHP	No. municipalities conducting coverage surveys	None	All municipality	Reports	2015	CHD, Municipality UNICEF, WHO	
1.15. Establish networking with urban health clinics, private and public hospitals for immunization	No. urban private and public health clinics coordinated	None	All municipality	Reports	2015 through 2019	DPHO, CHD	
1.16. Implement cold chain and vaccine management SOPs at all levels to ensure quality and high coverage of RI	SOPs available at health facilities	SOPs available	Nationally	Reports	2015 through 2019	DPHO, CHD	
1.17. Capacity building for delivering immunization (vaccine storage/transportation/vaccination/AEFI identification and management etc.)	No. of capacity building activities conducted for delivering immunization services	Capacity building activities are not conducted on a regular basis	All the identified capacity building activities are conducted	Training reports	2015	CHD, LMD, WHO, UNICEF	
1.18. Promote inter-programme and inter-sectoral collaboration by integrating immunization related activities with other public health intervention programmes (e.g. MNCH, Nutrition, CBNPC etc.) to develop synergism	Inter-programme and inter-sectoral collaboration initiated for immunization at central, regional and district levels	Weak collaboration	Nationally	Reports	2015 through 2019	CHD, DPHO, WHO, UNICEF	
1.19. Coordination with education sector to include immunization related information in secondary school level curriculum	Incorporation of immunization related information in secondary level education	None	Secondary level curriculum has incorporated immunization related information	Reports	2015	NHEICC, CHD, MOE, UNICEF, WHO	
1.20. Coordination with education sector for pre-school and school entry immunization requirement (immunization law)	Immunization checks at pre-school and school entry established	Does not exist	1. ≥30 districts 2. ≥45 districts 3. ≥55 districts 4. ≥65 districts 5. ≥ 75 districts	Monitoring visits/reports	1. 2015 2. 2016 3. 2017 4. 2018 5. 2019	CHD, MOE, NHEICC, WHO, UNICEF	
1.21. Mobilize community level organizations and FCHVs for immunization	Participation of local organizations and FCHVs for immunization	Weak participation	Local organization and FCHVs take active part in immunization programs	Monitoring visits/reports	throughout	DPHO, CHD	
1.22. Involvement of local authority for review, planning, monitoring and evaluation of immunization program	100% involvement of local authority for planning, monitoring and evaluation of immunization program	Weak involvement	At least one local authority is present during each planning, monitoring and evaluation of immunization program	Planning meeting minutes, monitoring reports/visits	throughout	DPHO, CHD	
1.23. Identify the health workers with the revised job description for vaccination for VDCs and municipalities	No. of health workers with revised job description	Job description of health workers being revised	100% of health workers follow the revised job description	Revised Job description, Monitoring visits	2015	CHD	

Logical Interventions	Objectively verifiable indicators	Baseline	Target	Verification means	Timeline	Responsibility	Assumptions
1.24. Recruitment of local health workers at community level	No. of locally recruited health worker at community level	Low recruitment of local health workers	Local health worker recruited as per need	Monitoring visits	throughout	CHD, D/PHO, DoHS	
1.25. Use local resources for raising community awareness on immunization. Expand declaration of "Full Immunization" VDCs country wide (appreciative inquiry)	% of Awareness activities on immunization conducted using local resources e.g. VDC funds	Poor utilization of VDC funds for awareness activities for immunization	>50% of awareness activities in the districts are conducted from local resources	Monitoring reports/visits	throughout	CHD, NHEICC, WHO, UNICEF	
1.26. Conduct supportive supervision and programme monitoring activities from central level to regional and district levels using appropriate tools every six months	No. and % of supportive supervision taken place	Exists. Proper documentation lacking	>50% of activities	Monitoring reports/visits	throughout	CHD, DPHO, WHO, UNICEF	
1.27. Conduct supportive supervision and programme monitoring from Regional level to district and HF level every six months	No. and % of supportive supervision taken place	Exists. Proper documentation lacking	>50% of activities	Monitoring reports/visits	throughout	CHD, DPHO, WHO, UNICEF	
1.28. Conduct supportive supervision and programme monitoring from District to HF-level quarterly	No. and % of supportive supervision taken place	Exists. Proper documentation lacking	>50% of activities	Monitoring reports/visits	throughout	CHD, DPHO, WHO, UNICEF	
1.29. Conduct supportive supervision and programme monitoring from HF to community/Outreach/ Mobile camp sites every month	No. and % of supportive supervision taken place	Exists. Proper documentation lacking	>50% of activities	Monitoring reports/visits	throughout	CHD, DPHO, WHO, UNICEF	
1.30. Conduct Data Quality Self Assessments (DOSAs)	No. of DOSAs conducted	Exists. Proper documentation lacking	>70% of activities	Reports	throughout	CHD, DPHO, WHO, UNICEF	
1.31. Conduct third-party monitoring/assessment of immunization coverage and quality	Activity conducted	Conducted in 2010	All	Reports	2015 and 2017	CHD, WHO, UNICEF	
1.32. Strengthen AEFI (serious and minor) reporting and feedback system in every district	No. and % of AEFIs reviewed	AEFI reporting and feedback system exists	All	Reports	throughout	CHD, AEFI committee, WHO, UNICEF	
1.33. Create a post of cold chain assistants for vaccine sub-stores and their recruitment	No. districts creating posts of cold chain assistant for the vaccine sub-stores	None	All districts	Reports	2015 and 2016	CHD, DPHO	
1.34. Use innovations, operational researches to increase vaccination coverage	Innovations/operational researches conducted	Limited. Post MR campaign coverage and sero prevalence study 2013 and appreciative enquiry	Need based	Reports	throughout	CHD, WHO, UNICEF	
1.35. Mark and celebrate Immunization Weeks and Immunization Months	No. districts celebrating Immunization Weeks and Immunization Months	Weak implementation	All districts	Reports	throughout	CHD, DPHO	
1.36. Ensure human resource for immunization service management by identifying the vaccinator with the revised job description for VDCs and municipalities	No. VDCs and municipalities identifying vaccinators with the revised job description	None	Need based	Reports	2015 and 2016		
1.37. Fulfill the vacant post of health workers for vaccination and organize orientation on immunization including MR second dose introduction	% of vacant post of health workers fulfilled and oriented	Half of the existing vaccinators' positions are vacant	100% fulfillment of the vacant posts and oriented	Recruitment reports, monitoring visits	throughout	CHD	
1.38. Create a post of cold chain assistants for vaccine sub-stores and their recruitment	No. of cold chain assistant posts created	None	100% of the sub-stores have cold chain assistants	Recruitment reports, monitoring visits	2015	LMD, CHD, UNICEF, WHO	

Logical Intervention	Objectively verifiable indicators	Baseline	Target	Means of verification	Timeline	Responsibility	Assumptions
Component 2. Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with SIAs covering men and women of wide age range (when required)	Achieve and maintain high level of population immunity by providing high vaccination coverage (> 95%) with measles-and rubella-containing vaccines (MR) with periodic SIAs	2005: Measles campaign (9 M-15Y) coverage of 95% 2008: Measles campaign (9 M-5Y) coverage of 93% 2012/13: MR campaign coverage of 100%	100%	Immunization review meetings/Coverage surveys	2015 to 2018	CHD, WHO	Measles elimination remain as priority 1 programme for MoH&P,
2.1. Orient different cadres of health staff for providing second dose of MR based on updated guideline	% of health staff oriented on providing second dose MR	None	100%	Orientation reports, Monitoring visits	2015 to 2018	CHD, LMD, WHO, UNICEF	
2.2. Increase cold chain capacity	% increase in cold chain capacity	Adequate cold chain capacity for first dose MR vaccines	30% increase in cold chain capacity for second dose MR vaccine	EVM assessment report	2015 through 2017	CHD, LMD, UNICEF, WHO	
2.3. Conduct nationwide follow up MR campaign (9 months to <5 years and 9 months to 15 years children) based on measles epidemiology and accumulated susceptible populations.	Follow up MR campaign conducted	Measles SIA in 2005, 2008/09 and MR in 2012	100%	Reports	2015 and 2018	CHD, LMD, NHEICC, MOE, UNICEF, WHO	
2.4. Conduct small scale MR campaigns in high risk populations	No. of small scale campaign conducted	None	100 % in low coverage areas	Campaign reports	throughout	CHD	
Component 3. Monitor measles, rubella and CRS using sensitive surveillance system with accredited laboratory support and evaluate programmatic efforts to ensure progress	Incidence of measles, rubella and CRS reduced	Measles incidence 3.7 per 100,000 populations, rubella incidence 2.2 per 100,000 populations. Incidence of CRS not known. Studies in deaf school showed that approximately 1426 infants were born (192/100,000 live birth) in 2008.	Achieve measles elimination Achieve >90% reduction in rubella/CRS cases compared to 2008	Surveillance reviews	Throughout	CHD,WHO	Measles elimination remain as priority 1 programme for MoH&P, GoN
1.1. Strengthen measles/rubella case based surveillance nationally	Health facilities of all levels oriented on Measles/rubella case based surveillance	299 health facilities	Strengthen case-based surveillance to achieve and sustain the performance indicators towards measles elimination and rubella/CRS control	Reports	Throughout	CHD, WHO	
1.2. Orientation of health staff on case-based surveillance and collect relevant information on measles and rubella in case investigation form (CIF)	No. of health staff oriented	None	CIF used from 2015	Orientation report, monitoring CIFs	From 2015 and on wards	CHD,WHO	

Logical Intervention	Objectively verifiable indicators	Baseline	Target	Means of verification	Timeline	Responsibility	Assumptions
1.3. Review HMIS data for reporting suspected measles cases reported from health facilities other than IPD reporting sites	HMIS report no. of suspected measles cases	None	All suspected measles cases reported from health facilities other than IPD reporting sites	HMIS report	Throughout	CHD,WHO,UNICEF	
1.4. Continuing support to NPHL for measles and rubella diagnosis and strengthening it for virus isolation/detection and genetic characterization	Services for measles and rubella virus isolation/detection and genetic characterization initiated	None	Services initiated	Reports	Throughout	WHD, NPHL, WHO	
1.5. Establish sub national measles and rubella laboratories	No. Regional measles and rubella laboratory established	none	One measles and rubella laboratory in BPKIHS Dharan One laboratory in western Nepal	Reports	2015 2016	CHD, NPHL, WHO	
1.6. Phase wise expansion of measles and rubella case-based surveillance sites	No. new HF's included	299 sites in 2014	>90% of health facilities with blood sample collection facility included in surveillance network	Reports	Throughout	CHD, NPHL, WHO	
1.7. Capacity building in measles and rubella diagnosis, genetic characterization and virus isolation/detection	No. of staff trained in measles and rubella diagnosis, virus isolation/detection and genetic characterization	None for virus isolation/detection and genetic characterization	At least 2 staff in each regional laboratory and NPHL for measles and rubella serology, at least 2 staff at NPHL for virus isolation/detection and genetic characterization	Training Reports	Throughout	CHD, NPHL, WHO	
1.8. Participation of national and regional laboratories in the annual proficiency testing for measles and rubella diagnosis	% of tests maintaining external quality control	NPHL continues to maintain	Continue to maintain external quality control	Reports	Throughout	CHD, NPHL, WHO, RRL, SEARO	
3.9. Strengthen CRS sentinel surveillance	No. CRS surveillance sentinel sites to determine the burden	None	Identify major hospitals as CRS surveillance sentinel sites	Reports	2015 through 2018	CHD, NPHL, WHO	
3.10. Orientation of staff on measles, rubella and CRS surveillance	No. of health staff oriented to initiate case identification and reporting	None	Neonatology units, major pediatric hospitals, Eye hospital, ENT departments	Orientation report, monitoring visits	Throughout	CHD, NPHL, FHD,WHO,UNICEF	
3.11. Linelisting and follow up of pregnant women possibly exposed to rubella during suspected measles outbreaks for pregnancy outcome	% of suspected measles/rubella outbreaks where line listing of pregnant women completed and followed up for pregnancy outcomes	Practiced, but weak	>80%	Surveillance reports	Throughout	CHD NPHL,WHO	
3.12. Rubella screening in antenatal checkup clinics in coordination with FHD and NPHL	No. of pregnant women screened for rubella in ANC	None	>80%	ANC record/reports	2015 and onwards	CHD NPHL,WHO	
3.13. Sensitization of health care professional on initiation of CRS surveillance (NESOG, NEPAS etc.)	No of health professional sensitized on CRS surveillance	None	All members of NESOG and NEPAS	Meeting reports	Throughout	CHD NPHL,WHO, UNICEF	

Logical Intervention	Objectively verifiable indicators	Baseline	Target	Means of verification	Timeline	Responsibility	Assumptions
Component 4. Strengthen measles and rubella outbreak preparedness, early response and case management	Outbreaks fully investigated All cases managed	--	>80% of outbreaks fully investigated	Reports	throughout	CHD, NPHL, WHO	
4.1 Update measles outbreak investigation and response guidelines	updated guidelines in place	none	Guidelines updated	Guideline available	2015	CHD, NPHL, WHO	
4.2.Capacity building for outbreak preparedness and response of RRT in districts for measles/ rubella outbreak identification, investigation and case management	No. of dRRT trained in outbreak preparedness and response	none	All RRT	Training report	Throughout	CHD, WHO	
4.3.Conduct rapid outbreak assessment and adequate investigation of all suspected measles/ rubella outbreaks as per the outbreak response plan	% of outbreak fully investigated	94%	>80% outbreaks fully investigated	Outbreak investigation report	throughout	CHD, WHO	
4.4.Involve community and create public awareness for additional case detection during the outbreak	% of outbreaks where community is involved and public are mad aware for additional case detection	none	≥80%	Outbreak reports	throughout	CHD, WHO	
4.5.Conduct vaccination response during outbreaks in VDCs and adjoining VDCs within 72 hours (not exceeding 7 days) targeting 9 months to <15 years or as indicated by epidemiological data	% of outbreaks with vaccination response	none	Vaccination response in 100% of outbreaks and response not exceeding 7 days	Outbreak reports	2015 and onwards	CHD, WHO	
4.6. Conduct vaccination response to outbreak in congregate settings (eg. Military camps, hostels, refugee camps etc) within 72 hours (not exceeding 7 days) targeting all ages	% outbreaks in congregate settings responded by vaccination	none	100%	Outbreak reports	2015 and onwards	CHD, WHO	
4.7.Case management as per the standard protocol on integrated management of childhood illness (IMCI)	% of cases managed as per the guidelines	Yes	100%	Reports	throughout	CHD, WHO	
4.8.Develop case management protocol and distribute	% of sites with case management protocol	none	100% of sites with case management protocol	Case management protocol available, monitoring visits	2015	CHD, WHO	

Logical Intervention	Objectively verifiable indicators	Baseline	Target	Means of verification	Timeline	Responsibility	Assumptions
Component 5. Develop and implement effective advocacy, communication and social mobilization (ACSM) strategy for immunization							
5.1. High level advocacy (parliamentarian)	No. of advocacy meeting with parliamentarian	none	At least 1 per year	Meeting report	throughout	CHD, WHO, UNICEF Lions, NEPAS	
5.2. Advocacy meeting with professional organizations (NEPAS, Public Health Association, NESOG, NMA, Nepal Nursing Association)	No. of meeting with professional organization	none	At least 1 per year	Meeting report	throughout	CHD, WHO UNICEF Lions, NEPAS	
5.3. Advocacy meeting with district and community stakeholders (religious leaders, community leaders etc.)	No. of meeting with district and community stakeholders	none	At least 1 per year	Meeting report	throughout	CHD, WHO UNICEF Lions, NEPAS	
5.4. Nomination of Measles and rubella elimination ambassador	Nomination of Measles, rubella and CRS elimination ambassador	none	Ambassador nominated	Report	2015	CHD, WHO UNICEF, Lions, NEPAS	
5.5. Community mobilization to create demand for immunization and reduce drop-outs	No. of districts with community mobilization for immunization	none	Community mobilized in 75 districts	Reports	throughout	CHD, WHO UNICEF, Lions, NEPAS	
5.6. Involving communities for outbreak detection, investigation, prevention and control	% of outbreaks in which communities are involved	none	100%	Outbreak reports	throughout	CHD, WHO UNICEF, Lions, NEPAS	
5.7. Community mobilization for routine immunization	No. of districts where communities are mobilized for routine immunization	none	75 districts	Reports	throughout	CHD, WHO UNICEF, Lions, NEPAS	
5.8. Strengthening health facility management committee for immunization and surveillance	% of health facility management committee strengthened	none	100%	Reports	throughout	CHD, WHO UNICEF, Lions, NEPAS	
5.8. Assessment of effectiveness of different IEC and BCC materials required for measles and rubella elimination	Assessment done for effectiveness of IEC and BCC materials	none	once	Assessment report	2015 and onwards	CHD, WHO UNICEF, Lions, NEPAS,	
5.9. Assessment of behavior of parents for not opting immunization and drop-outs for their children	Assessment of behavior of parents for not opting immunization and drop-outs for their children	none	once	Assessment report	2015 and onwards	CHD, WHO UNICEF, Lions, NEPAS	
5.10. Assess and update National Communication Strategy for Maternal, Newborn and Child health	National Communication Strategy for Maternal, Newborn and Child health updated	none	once	National Communication Strategy for Maternal Newborn and Child health	2015 and onwards	CHD, WHO UNICEF, Lions, NEPAS	
5.11. Develop IEC and BCC materials based on measles elimination and rubella control national strategic plan 2014-2018	IEC and BCC materials developed	none	IEC and BCC materials available	IEC and BCC materials	Throughout	CHD, WHO UNICEF, Lions, NEPAS	Measles elimination continues to remain as priority 1 programme for MoH&P

Logical Intervention	Objectively verifiable indicators	Baseline	Target	Means of verification	Timeline	Responsibility	Assumptions
Strategic Objective 6. Develop and conduct innovative/cost-effective activities, operational researches to improve immunization, surveillance and diagnosis	No. of researches/ studies/surveys conducted	Post campaign MR searo survey 2013	Immunization coverage,	Study reports	Throughout	CHD, WHO, UNICEF	Measles elimination continues to remain as priority 1 programme for MoH&P
6.1. Conduct operational research on epidemiology of measles and reaching unreached children with two doses of MR vaccine	No. of researches/ studies/surveys conducted	none	At least 1 per year	Study reports	Throughout	CHD, WHO, UNICEF	
6.2. Conduct MCV1 and MCV2 coverage surveys as part of immunization coverage survey	MCV1 and MCV2 coverage in the hard to reach areas including municipalities	none	At least 1 per year	Survey reports	2016 and 2018	CHD, WHO, UNICEF	
6.3. Conduct other studies as per the need of the programme	No. of researches/ studies/surveys conducted	none	At least 1 per year	Study/survey reports	Throughout	CHD, NPHL, WHO UNICEF NEPAS	

FINANCING

Expenditure in health remains low at 5.3 percent of GDP and per capita health expenditure at USD 18.09 in 2006. More than 55 percent (USD 9.0) of total health expenditures is financed through out-of-pocket expenditures by households at the time of service. External Development Partners finance nearly half of Government spending on health, and the substantial gains achieved in reducing child and maternal mortality. The Government consistently increased the health sector's budget during NHSP-IP1, from NRs. 6.5bn (US\$ 88mil) in 2004-05 to NRs. 17.8bn (US\$228 mil) in 2009-10. The cMYP has examined the current status of funding for the NIP and projects for years, 2011-2015. Currently the NIP focuses on eight primary series antigens: BCG, DPT-HepB-Hib, OPV, and Measles is one of them. NIP introduced MR as MCV-1 in 2013. Similarly, the current NIP program envisions MR campaign in 2016.

In accordance with the Paris Declaration, the Accra Accord for Action and the IHP Nepal Compact, Nepal does have a mature SWAP since 2005 and a number of partners are progressively joining the pool-fund and currently World Bank, DFID, GAVI, AusAID are the major pool partners. The partners have also jointly agreed and signed a Joint Financial Agreement (JFA) and agreed on a Governance and Accountability Action Plan (GAAP) for harmonization and aid effectiveness. Historically, the main multilateral agencies active in the NIP are UNICEF and WHO. The MR Initiative and its five spearheading partners – the American Red Cross, United States Centers for Disease Control and Prevention, United Nations Children Fund, United Nations Foundation and World Health Organization is expected to work with countries and international donors on implementation of country strategic plan on measles and rubella elimination. The bilateral external development partners are JICA, USAID, DFID, GTZ, IFRC/Red Cross of Nepal and Rotary International. In addition, various NGOs and INGOs are also supporting immunization program activities at the district level. At present most of EDP funds for health go directly to the MOHP or are self-executed by partners; the government has mandated that all the funds should be routed through the MoH&P, so this proportion is likely to increase even further.

As long-term partners, WHO and UNICEF will continue to support the NIP. GAVI is expected to continue its support with Immunization Systems Strengthening, and introduction of underused and new vaccines. For immunization, currently the GAVI vaccine fund remains the major contributor to immunization (60%), and contribution from the government of Nepal being the second largest (34%). WHO contributes to about 5% percent and UNICEF at around one percent of the total expenditure. There will be need of significant amount of resources to implement activities as planned in this strategic plan for measles elimination and rubella/CRS control. Therefore, support from global community, partners and civil society will be important in achieving country goals.

Some of the areas of support are as follows:

1. Strengthening routine immunization to achieve high vaccination coverage (> 95%) with first and second doses of measles and rubella-containing (MR) vaccines
2. Conducting MR campaign and monitoring quality
3. Strengthening measles, rubella and CRS case-based surveillance including lab. sample collection and transportation
4. Outbreak investigation and response activities
5. MR vaccine procurement and cold chain at the district and peripheral level



CONCLUSION

After eradication of small pox and stopping polio virus circulation in most of the countries of the world, measles elimination has become a global concern. The Member States of SEAR have concluded that measles elimination is biologically and programmatically feasible and achieving measles elimination by 2020 is feasible. Nepal has shown its commitment to eliminate measles and control rubella/CRS in various national and international forums. Nepal aligned with the policy of the government of Nepal (cMYP 2011-2016) plans to initiate measles elimination and rubella/CRS control activity soon in near future. The government has also a plan to introduce measles second dose (as MR) into routine immunization services. This strategic plan provides clear direction to plan and implement activities for achieving country goals. Moreover, support from national and international partners, Lion's Club International, Nepal Pediatric Society (NEPAS), volunteers and international community will be crucial.



Hand washing before vaccination

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ANNEXES

Annex 1

Definitions

A suspected measles case:

A suspected measles case is any person in whom a health worker suspects measles, or any person with fever and maculopapular rash (non-vesicular) with cough, coryza or conjunctivitis

1. A suspected measles outbreak:

A suspected measles outbreak is the occurrence of 5 or more suspected measles cases over a period of one month in a population size of at least 100,000. [However, countries that are already advanced in their measles elimination activities, lower than 5 suspected cases may be used]

2. A confirmed measles outbreak:

A confirmed measles outbreak is the occurrence of three or more laboratory confirmed measles cases over a period of one month in a population size of at least 100,000, and even in situation where less than 3 laboratory cases are confirmed, if epidemiologically linked, it would still be considered an outbreak.

[In a large outbreak, in order to manage the pressure on laboratories, 10 cases will be tested by serology. If an outbreak has less than 10 cases, all should be tested]

3. An adequately investigated measles outbreak: An outbreak is considered adequately investigated when following activities are completed:

1. Initial visit to the cases within 48 hours
2. House to house search for cases within one week
3. Information collected on all core epidemiological data variables
4. Samples for serology from 10 suspect cases, or all suspected cases if <10 cases, collected
5. Urine and nasopharyngeal samples are collected from at least 5 suspected cases

4. Case classification

- a. Laboratory-confirmed: A case that meets the clinical case definition and is laboratory-confirmed
- b. Epidemiologically confirmed: A case that meets the clinical case definition and is linked to a laboratory-confirmed case
- c. Clinically confirmed: A case that meets the clinical case definition and for which no adequate blood specimen was taken

Annex 1

Basic minimum indicators for the purpose of case-based surveillance and immunization

INDICATOR	TARGET	DEFINITION
1 Disease Incidence (i) Annual incidence of confirmed measles case (ii) Annual incidence of confirmed rubella cases	Absence of indigenous measles transmission	The numerator is the confirmed number of measles or rubella cases for the year and the denominator is the population in which the cases occurred multiplied by 1,000,000. When numerator is zero, the target incidence would be zero.
2 Adequacy of investigation (i) Proportion of all suspected measles and rubella cases that have had an adequate investigation initiated within 48 hours of notification	≥ 80%	The numerator is the number of suspected cases of measles or rubella for which an adequate investigation was initiated within 48 hours of notification and the denominator is the total number of suspected measles and rubella cases, multiplied by 100
3 Outbreak investigation (i) Percentage of suspected measles outbreaks fully investigated (ii) Percentage of suspected outbreaks tested for virus detection	≥ 80% ≥ 80%	(i) The numerator is the number of confirmed outbreaks that meet the fully investigated outbreak criteria and the denominator is the total number of suspected outbreaks multiplied by 100 (ii) The numerator is the number of confirmed outbreaks tested for virus detection and the denominator is the total number of suspected outbreaks multiplied by 100
4 Immunization coverage (i) MCV1 & MCV2 coverage nationally and by sub-national administrative units	95% nationally, 90% sub-nationally	The numerator is the number of infants who received MCV1 & MCV2 and the denominator is the surviving birth cohort multiplied by 100
5 Timeliness of reporting (i) Proportion of surveillance units reporting to the national level on time (ii) Proportion of countries reporting to their WHO Regional level on time	≥ 80% 100%	(i) The numerator is the number of surveillance units reporting on time and the denominator is the total number of surveillance units in the country multiplied by 100 [Remember each reporting unit will report 52 times a year] (ii) The numerator is the number of countries reporting on time to the Regional Office and the denominator is the total number of countries multiplied by 100

<p>6 Laboratory confirmation (i) Proportion of suspected cases with adequate specimens for detecting acute measles or rubella infection collected and tested in a proficient laboratory</p>	<p>≥ 80%</p>	<p>The numerator is the number of suspected cases from whom adequate specimens for detecting measles or rubella were collected and tested and the denominator is the total number of suspected measles or rubella cases multiplied by 100 [Epi linked cases should be removed from the denominator]</p>
<p>7 Timeliness of specimen transport (i) Proportion of specimens received at the laboratory within 5 days of collection</p>	<p>≥ 80%</p>	<p>The numerator is the total number of specimens received in the laboratory within 5 days of collection and the denominator is the total number of specimens received by the laboratory multiplied by 100</p>
<p>8 Timeliness of reporting laboratory results (i) Proportion of results reported by the laboratory within 4 days of receiving the specimen</p>	<p>≥ 80%</p>	<p>The numerator is the total number of specimens for which laboratory results were available within 4 days of receiving the specimen and the denominator is the total number of specimen received for testing multiplied by 100</p>

Annex 3

Glossary

Measles elimination: The absence of endemic measles transmission in a defined geographical area (e.g. region or country) for a period of 12 months or more in the presence of a well performing surveillance system.

Rubella elimination: Is the absence of endemic rubella virus transmission in a defined geographical area (e.g., region or country) for >12 months and the absence of CRS cases associated with endemic transmission in the presence of a well performing surveillance system

Note: There may be a lag (up to 9 months) in occurrence of CRS cases after interruption of rubella virus transmission has occurred. Evidence of the absence of rubella transmission from CRS cases is needed because CRS cases excrete rubella virus for up to 12 months after birth.

Measles and rubella eradication: worldwide interruption of measles, or rubella, virus transmission in the presence of a surveillance system that has been verified to be performing well.

Outbreak: One or more laboratory confirmed measles case

Imported case: A case exposed outside the country during 7-21 days prior to rash onset as supported by epidemiological and or/virological evidence

Measles import-related cases are locally acquired infections occurring as part of a chain of transmission originated by an imported case as supported by epidemiologic and/or virological evidence.

Endemic measles transmission: The existence of continuous transmission of indigenous or imported measles virus that persists for a period of 12 months or more in any defined geographical area.

Re-establishment of endemic transmission: Presence of a chain of transmission of laboratory-confirmed virus that continues uninterrupted for a period of 12 months or more supported by epidemiological and laboratory evidence.

Supplementary immunization activity (SIA): This activity targets all people in a defined age- or risk-group, with the objective of reaching a high proportion of all susceptible individuals. Each activity is usually conducted over a wide geographical area (such as a province or country) to reduce the number of people at risk of infection. Screening for vaccination status and/or history of prior disease is not necessary.

Measles-containing vaccine (MCV): A vaccine containing measles vaccine alone or in combination with rubella (MR vaccine) or rubella and mumps (MMR vaccine).

Measles-containing vaccine (MCV) coverage: First dose coverage (MCV1) and second dose coverage (MCV2) are reported on the WHO/UNICEF annual reporting form. MCV1 is usually reported at 24 months of age.

Measles control: The routine, regular and ongoing use of measles vaccine to reduce measles morbidity and mortality, done in accordance with targets.

Routine immunization: The regular provision of immunization services to successive cohorts through vaccination at fixed sites, outreach activities and mobile sites. This includes the routine screening of immunization records.

Rubella control: The routine, regular and ongoing use of rubella vaccine to reduce rubella-associated morbidity and mortality in accordance with targets.

Surveillance: The ongoing, systematic collection, analysis, interpretation, and dissemination of data about a health-related event for use in public health action to reduce morbidity and mortality and to improve health.

Adequate sample: A single clinical sample obtained at the first contact with the health-care system at any time within 28 days after rash onset is considered adequate for surveillance purposes.

Accredited laboratory: A laboratory is one that uses a validated assay and participates in the laboratory quality assurance programme of the WHO Global Measles and Rubella Laboratory Network.

An adequate investigation: This includes the collection of all of the following data elements from each suspected measles/rubella case: case identifier, age (or date of birth), sex, date of rash onset, date of specimen collection, vaccination status, date of last vaccination, travel history and contacts.

