Adapting Nepal’s polio eradication programme
Krishna P Paudel,a Lee M Hampton,b Santosh Gurung,c Rajendra Bohara,d Indra K Rai,c Sameer Anaokar,c Rachel D Swifta & Stephen Cribib

Problem Many countries have weak disease surveillance and immunization systems. The elimination of polio creates an opportunity to use staff and assets from the polio eradication programme to control other vaccine-preventable diseases and improve disease surveillance and immunization systems.

Approach In 2003, the active surveillance system of Nepal’s polio eradication programme began to report on measles and neonatal tetanus cases. Japanese encephalitis and rubella cases were added to the surveillance system in 2004. Staff from the programme aided the development and implementation of government immunization policies, helped launch vaccination campaigns, and trained government staff in reporting practices and vaccine management.

Local setting Nepal eliminated indigenous polio in 2000, and controlled outbreaks caused by polio importations between 2005 and 2010. Relevant changes In 2014, the surveillance activities had expanded to 299 sites, with active surveillance for measles, rubella and neonatal tetanus, including weekly visits from 15 surveillance medical officers. Sentinel surveillance for Japanese encephalitis consisted of 132 sites. Since 2002, staff from the eradication programme have helped to introduce six new vaccines and helped to secure funding from Gavi, the Vaccine Alliance. Staff have also assisted in responding to other health events in the country.

Lesson learnt By expanding the activities of its polio eradication programme, Nepal has improved its surveillance and immunization systems and increased vaccination coverage of other vaccine-preventable diseases. Continued donor support, a close collaboration with the Expanded Programme on Immunization, and the retention of the polio eradication programme’s skilled workforce were important for this expansion.

Introduction
National immunization systems are important for reducing vaccine preventable diseases.1 However, in many resource-constrained countries, such systems need to be improved. This paper describes how Nepal’s polio eradication programme expanded its work to aid efforts to control other vaccine-diseases and improve Nepal’s disease surveillance and immunization systems.

Local setting
Nepal eliminated indigenous polio in 2000 and controlled outbreaks caused by polio importations between 2005 and 2010. The country participated in the certification of wild poliovirus elimination in the World Health Organization (WHO) South-East Asia Region in 2014.2 Nepal’s polio eradication programme, created in 1998, is funded by the Global Polio Eradication Initiative and is affiliated with WHO’s Nepal country office. The original aim of the programme was to conduct active surveillance for possible polio cases and to provide technical assistance and support on polio vaccination to the country’s Expanded Programme on Immunization (EPI), which is the national immunization programme. In 2002, the polio eradication programme had 14 field-office based surveillance medical officers, who actively searched for people with acute flaccid paralysis (AFP), i.e. suspected polio cases.3 The programme used these surveillance data to guide polio immunization activities, especially mass campaigns with oral poliovirus vaccine.

Nepal’s EPI began as a pilot project in three districts in 1979, and by 1988 had expanded into a nationwide immunization system providing Bacillus Calmette–Guérin, diphtheria-tetanus-pertussis, polio, tetanus and measles vaccines.4,5 In 2000, EPI was obtaining information on vaccine-preventable disease cases, except polio, mainly from Nepal’s health management information system. This information system collects reports of infectious disease cases from all government health facilities in Nepal,4,5 but like many other passive surveillance systems, it has problems with underreporting, delayed reporting or incomplete reporting.4,5

Approach
The elimination of indigenous polio created an opportunity to use resources from the polio eradication programme to strengthen the efforts to control other vaccine-preventable diseases.

In 2003, the polio eradication programme’s AFP surveillance system began collecting data on measles and neonatal tetanus cases.4,5 The data collection initially involved weekly reports to the polio eradication programme from the staff at 413 hospitals and major health facilities, including all inpatient hospitals, located throughout the country. Surveillance medical officers made weekly visits to 84 active surveillance sites among the 413 health facilities to review records of illnesses treated at those facilities and to interview health facility staff regarding possible new preventable disease cases. During their visits, they also compared their findings to the contents of the weekly reports, helped to ensure that blood and stool
samples were collected and sent to the appropriate laboratories, and trained and motivated health workers regarding the identification, documentation, and reporting of new preventable disease cases. Blood samples were collected for measles confirmatory testing during investigations of suspected measles outbreaks. In 2004, the surveillance system expanded to include rubella, acute encephalitis syndrome and Japanese encephalitis.5–7 Due to the similarity in clinical presentation between rubella and measles, surveillance for rubella began by testing for rubella immunoglobulin (Ig) M in blood samples from suspected measles cases that tested negative for measles IgM. 5 To detect acute encephalitis syndrome cases, a system of 45 sentinel medical facilities, located primarily in districts suspected to have the highest Japanese encephalitis risk, was established through a joint effort of the polio eradication programme, the Government of Nepal and several domestic and international laboratories and technical agencies. This sentinel system used the same database and reverse cold chain for shipping laboratory samples as the AFP surveillance system. Laboratory testing of blood or cerebrospinal fluid samples confirmed Japanese encephalitis cases.6–7

Since 2002, the staff from the eradication programme have used their experience to help improve multiple aspects of EPI. They have provided continuous training and support to EPI staff on issues such as vaccine cold chain management, data management, and assessment of adverse events. They aided the development and implementation of policy guidelines. They have also assisted in supervising and monitoring routine immunization activities; assisted in microplanning to reach every district; enhanced research and grant writing capabilities; and piloted innovations, such as electronic immunization records and immunization training centres.

Relevant changes

Surveillance
In 2014, the surveillance system activities had expanded to 299 sites, with active surveillance for measles, rubella and neonatal tetanus, including weekly visits from 15 surveillance medical officers. The sentinel system for acute encephalitis syndrome consisted of 132 sites. Information from the expanded surveillance has helped to guide the development and implementation of immunization policies. For example, in 2003, the surveillance system detected 1536 confirmed measles cases, which indicated the need of a vaccination campaign for people younger than 15 years (Fig. 1).5 EPI acted on this information and with the help of the eradication programme launched a measles vaccination campaign in 2004–2005. Following the campaign, 45 confirmed measles cases were identified in 2006.5 In 2008, an increase in measles cases, a total of 394 confirmed cases, prompted a follow-up vaccination campaign in 2008, targeting children aged 9 months to 4 years.8 The detection of additional measles cases in 2011, along with several years of data indicating a substantial burden of rubella, led to a combined measles–rubella vaccination campaign in 2012–2013 targeting all children between the ages of 9 months and 14 years. Afterwards, EPI introduced rubella vaccine into the country’s routine immunization schedule. Subsequently, the numbers of confirmed measles and
rubella cases have fallen, with only 19 measles and 37 rubella cases in 2013 and 2014 combined. However, further efforts are needed to achieve the goal of eliminating measles in Nepal.8

In 2005, the data from the surveillance system confirmed the finding from the health management information system that Nepal had met the criteria for the elimination of neonatal tetanus (<1 case of neonatal tetanus per 1000 live births in every district).3 The surveillance system has continued to monitor for any increase in neonatal tetanus cases.

The data from the surveillance system also aided the planning of Nepal’s first Japanese encephalitis vaccination campaign in 2006, by identifying the high-risk districts.4 After the campaign, surveillance data demonstrated an 84% drop (from 864 to 141) in Japanese encephalitis cases in these districts.5 By 2011, EPI had completed Japanese encephalitis vaccination campaigns in 31 high- and moderate-risk districts and they had introduced the vaccine into routine immunization in those districts. In 2016, EPI included nationwide Japanese encephalitis vaccination in the routine immunization schedule.

Immunization system strengthening

Since 2002, staff from the eradication programme have helped EPI to introduce hepatitis B vaccine (2003), *Haemophilus influenzae* type b vaccine (2009), inactivated polio vaccine (2014) and pneumococcal conjugate vaccine (2015), in addition to rubella vaccine and Japanese encephalitis vaccine. For example, for the introduction of inactivated polio vaccine, staff from both programmes worked together on an application for support from Gavi, the Vaccine Alliance.7 They planned together how to roll out the vaccine, develop training materials, and supervise and monitor the introduction of the vaccine. In 2014, Nepal became the first country, among those receiving support from Gavi, to introduce this vaccine.7 They also planned, organized and executed the replacement of trivalent inactivated oral polio vaccine with bivalent inactivated vaccine on 17 April 2016. By monitoring the replacement, they could confirm by 11 May 2016 that all trivalent oral polio vaccine had been removed from the country’s vaccine storage sites and health facilities providing immunizations.

The staff from the eradication programme have assisted in the development of the Comprehensive multiyear plan 2068–2072 (2011–2016)10 and the national plan of action on intensification of routine immunization.

Between 2001 and 2015, the eradication programme’s work contributed to the increase in vaccination coverage among Nepalese children aged 12–23 months. WHO and the United Nations Children’s Fund estimated that the proportion of children who received three doses of diphtheria-pertussis-tetanus containing vaccine rose from 72% to 91% and the estimated proportion who received one dose of measles vaccine rose from 71% to 85%.11

The staff from the eradication programme have also assisted in responding to other health events, such as dengue fever and cholera outbreaks and natural disasters. Following the major earthquake and subsequent aftershocks in April 2015, the staff assisted in monitoring for potential disease outbreaks, assessed damage to health facilities and helped identify needs for disaster relief.12

Discussion

The polio eradication programme in Nepal has transitioned from focusing solely on polio to working on preventing other vaccine-preventable diseases. This transition has shown how staff and assets from an eradication programme can both strengthen a country’s immunization system and reduce disease incidence (Box 1). Several factors contributed to this successful transition, including the eradication programme’s ability to collaborate with EPI, international technical agencies and donors; the level of support received from donors for the expanded activities; and the eradication programme’s well-trained, highly capable and motivated staff. Nepal’s immunization system has benefited from external assistance. For example, Gavi has funded 60–70% of the costs of vaccine purchases in the country. The total vaccine cost in 2014 was approximately 6.5 million United States dollars. The immunization system has also been strengthened by the January 2016 enactment of the national immunization law that requires that the government allocate adequate funding for immunizations and establishes a fund for collecting national private sector donations for support of EPI.13

Other countries have also enlisted their polio eradication programmes in their work on other diseases. For example, in 2007, Bangladesh and India initiated surveillance of Japanese encephalitis with the aid of polio surveillance officers.14 In Nigeria, polio staff and their organizational experience were used to quickly end an outbreak of Ebola virus disease in 2014.15 The possibility that polio may be eradicated in the next few years suggests that staff and assets currently funded by the Global Polio Eradication Initiative may increasingly become available in other areas. Countries should carefully manage the transition from polio eradication to other immunization and public health priorities to ensure that they effectively use valuable experience and assets from the Global Polio Eradication Initiative after the initiative ends.16

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Lessons from the field
Addressing vaccine-preventable diseases in Nepal

Krishna P Paudel et al.

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Implementing the Polio Eradication Programme in Nepal

Problem
The implementation of the Polio Eradication Programme in Nepal

Method
In 2003, the active surveillance system of the Nepalese Polio Eradication Programme started reporting cases of measles and neonatal tetanus. Cases of Japanese encephalitis and rubella were added to the surveillance system in 2004. The programme staff supported the formulation and implementation of government vaccination policies, helped launch vaccination campaigns, and provided training to government staff on reporting practices and vaccine management.

Local context
Nepal achieved polio eradication in 2000 and controlled polio outbreaks due to imported cases in 2005 and 2010.

Significant changes
In 2014, surveillance activities were expanded to cover 299 districts, including measles and newborn tetanus, and rubella and congenital rubella syndrome. Since 2002, programme staff helped introduce six new vaccines and secure funding from Gavi, the Vaccine Alliance, and supported the response to other health incidents in the country.

Lessons learned
By expanding the scope of the Polio Eradication Programme, Nepal improved its surveillance and vaccination systems, increasing the coverage of other vaccine-preventable diseases. Continued donor support, close cooperation with the Expanded Programme on Immunization (EPI), and the retention of skilled workforce were important for expanding the programme.

Résumé

Adaptation du programme d'éradication de la poliomyélite au Népal

Problème
De nombreux pays ont des systèmes de vaccination et de surveillance des maladies défectueux. L'élimination de la poliomyélite crée l'occasion d'employeur le personnel et les ressources du programme d'éradication de la poliomyélite pour contrôler d'autres maladies évitables par la vaccination et améliorer les systèmes de vaccination et de surveillance des maladies.

Approche
En 2003, le système de surveillance active du programme népalais d'éradication de la poliomyélite a commencé à rendre compte des cas de rougeole et de tétanos néonatal. Les cas d'encéphalite japonaise et de rubéole ont été ajoutés au système de surveillance en 2004. Le personnel du programme a soutenu la création et la mise en œuvre de politiques gouvernementales de vaccination, a aidé à lancer des campagnes de vaccination et a formé du personnel gouvernemental sur les pratiques de signalisation et la gestion des vaccins.

Environnement local
Le Népal a éradiqué la poliomyélite autochtone en 2000 et a mis en place un programme de vaccination à large échelle pour surveiller et améliorer les systèmes de vaccination et de surveillance des maladies.

Changements significatifs
En 2014, les activités de surveillance ont été étendues à 299 districts, avec une surveillance active de la rougeole, de la rubéole et du tétanos néonatal. En 2014, le réseau de surveillance des cas d'encéphalite japonaise couvrait 132 districts. Depuis 2002, le personnel du programme d'éradication a aidé à introduire six nouveaux vaccins et à pérenniser les financements provenant de Gavi-L'Alliance du vaccin.

Leçons tirées
En élargissant les activités de son programme d'éradication de la poliomyélite, le Népal a amélioré ses systèmes de
surveillance et la couverture vaccinale d’autres maladies évitables par la vaccination. Pour cet élargissement, la pérennisation des aides des donateurs, une étroite collaboration avec le Programme élargi de vaccination et la mobilisation du personnel qualifié du programme d’éradication de la poliomylite ont joué un rôle clé.

Resumen

Adaptación del programa de erradicación de la poliomielitis de Nepal

Situación Muchos países tienen sistemas deficientes de supervisión e inmunización de enfermedades. La eliminación de la poliomielitis ofrece la oportunidad de utilizar el personal y los activos del programa de erradicación de la poliomielitis para controlar otras enfermedades prevenibles mediante vacunación, así como para mejorar los sistemas de supervisión e inmunización de enfermedades.

Enfoque En 2003, el sistema de supervisión activa del programa de erradicación de la poliomielitis de Nepal comenzó a informar sobre casos de sarampión y tétanos neonatal. En 2004 se añadieron casos de rubéola y encefalitis japonesa al sistema de supervisión. El personal del programa contribuyó al desarrollo y a la implementación de políticas gubernamentales de inmunización, ayudó a lanzar campañas de vacunación y formó a personal público para informar sobre las prácticas y la gestión de las vacunas.

Marco regional Nepal eliminó la poliomielitis indígena en el año 2000, y controló los brotes provocados por la importación de la poliomielitis entre 2005 y 2010.

Cambios importantes En 2014, las actividades de supervisión se ampliaron a 299 localizaciones, con supervisión activa del sarampión, la rubéola y el tétanos neonatal, incluidas visitas semanales de 15 médicos de vigilancia. La vigilancia centinela de encefalitis japonesa se realizó en 132 localizaciones. Desde 2002, el personal del programa de erradicación ha contribuido a la introducción de seis nuevas vacunas y ha ayudado a obtener una financiación garantizada por parte de la Gavi, la Vaccine Alliance. El personal también ha ayudado a responder ante otros sucesos sanitarios acaecidos en el país.

Lecciones aprendidas Mediante la ampliación de las actividades de su programa de erradicación de la poliomielitis, Nepal ha mejorado sus sistemas de supervisión e inmunización y ha aumentado la cobertura de vacunación de otras enfermedades prevenibles mediante vacunación. El continuo apoyo de los donantes, una estrecha colaboración con el Programa Ampliado de Inmunización y la retención del personal cualificado del programa de erradicación de la poliomielitis han sido muy importantes para esta ampliación.

References

1. Global vaccine action plan 2011–2020. Geneva: World Health Organization; 2013.
2. Bahl S, Kumar R, Menabde N, Thapa A, McFarland L, Swezy V, et al. Polio-free certification and lessons learned–South-East Asia region, March 2014. MMWR Morb Mortal Wkly Rep. 2014 Oct 24;63(42):941–6. PMID: 25340910
3. Centers for Disease Control and Prevention (CDC). Progress toward poliomyelitis eradication–India, Bangladesh, and Nepal, January 2001–June 2002. MMWR Morb Mortal Wkly Rep. 2002 Sep 20;51(37):831–3. PMID: 12353744
4. Wierzba TF, Ghimire P, Malla S, Banerjee MK, Shrestha S, Khanal B, et al. Laboratory-based Japanese encephalitis surveillance in Nepal and the implications for a national immunization strategy. Am J Trop Med Hyg. 2008 Jun;78(6):1002–6. PMID: 18541784
5. Centers for Disease Control and Prevention (CDC). Progress in measles control–Nepal, 2000–2006. MMWR Morb Mortal Wkly Rep. 2007 Oct 5;56(39):1028–31. PMID: 17914331
6. Wierzba TF, Ghimire P, Malla S, Banerjee MK, Shrestha S, Khanal B, et al. Laboratory-based Japanese encephalitis surveillance in Nepal and the implications for a national immunization strategy. Am J Trop Med Hyg. 2008 Jun;78(6):1002–6. PMID: 18541784
Lessons from the field
Addressing vaccine-preventable diseases in Nepal

Krishna P Paudel et al.

7. Upreti SR, Janusz KB, Schluter WW, Bichha RP, Shakya G, Biggerstaff BJ, et al. Estimation of the impact of a Japanese encephalitis immunization programme with live, attenuated SA 14–14–2 vaccine in Nepal. Am J Trop Med Hyg. 2013 Mar;88(3):464–8. doi: http://dx.doi.org/10.4269/ ajtmh.12-0196 PMID: 23358643

8. Khanal S, Sedai TR, Choudary GR, Gir JN, Bohara R, Pant R, et al. Progress toward measles elimination – Nepal, 2007–2014. MMWR Morb Mortal Wkly Rep. 2016 Mar 04;65(8):206–10. doi: http://dx.doi.org/10.15585/mmwr.mm6508a3 PMID: 26937619

9. Hasman A, Raaijmakers HC, Noble DJ. Inactivated polio vaccine launch in Nepal: a public health milestone. Lancet Glob Health. 2014 Nov;2(11):e627–8. doi: http://dx.doi.org/10.1016/S2214-109X(14)70324-9 PMID: 25442682

10. Comprehensive Multi-Year Plan 2068-2072 (2011–2016). Katmandu: Department of Health Services; 2011. Available from: http://dohs.gov.np/wp-content/uploads/chd/Immunization/cMYP_2012_2016_May_2011.pdf [cited 2016 Nov 4].

11. Immunization, vaccines and biologicals: data, statistics and graphics. Geneva: World Health Organization; 2015. Available from: http://www.who.int/immunization/monitoring_surveillance/data/env/ [cited 2016 Aug 28].

12. Guilland A. Remote districts are still inaccessible five days after second Nepal earthquake. BMJ. 2015 May 18;350:h2691. doi: http://dx.doi.org/10.1136/bmj.h2691 PMID: 25985347

13. Gnawali D. The making of Nepal’s immunization law. Health Affairs Blog. Washington: Project HOPE; 2016. Available from: http://healthaffairs.org/blog/2016/03/07/the-making-of-nepals-immunization-law/ [cited 2016 Aug 28].

14. Centers for Disease Control and Prevention (CDC). Expanding poliomyelitis and measles surveillance networks to establish surveillance for acute meningitis and encephalitis syndromes—Bangladesh, China, and India, 2006–2008. MMWR Morb Mortal Wkly Rep. 2012 Dec 14;61(49):1008–11. PMID: 23235298

15. Shuaib F, Gunnala R, Musa EO, Mahoney FJ, Oguntimehin O, Nguku PM, et al.; Centers for Disease Control and Prevention (CDC). Ebola virus disease outbreak - Nigeria, July–September 2014. MMWR Morb Mortal Wkly Rep. 2014 Oct 3;63(39):867–72. PMID: 25275332

16. Cochi SL, Freeman A, Guirguis S, Jafari H, Aylward B. Global polio eradication initiative: lessons learned and legacy. J Infect Dis. 2014 Nov 1;210 Suppl 1:S40–6. doi: http://dx.doi.org/10.1093/infdis/jiu345 PMID: 25316878