

PROGRESS TOWARD MEASLES ELIMINATION IN KYRGYZSTAN

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ABSTRACT

Measles is one of the most severe infectious diseases of childhood, and one of the major causes of mortality, especially in developing countries. Despite rare measles outbreaks in recent years, Kyrgyzstan seeks to show its commitment towards the global anti-measles campaign. The aim of this article is to summarize the scattered information on the recent status of measles, valid surveillance system, and measles elimination strategies in Kyrgyzstan, based on sources that include non-confidential but usually inaccessible governmental data. Information was extracted from the reports to the Ministry of Health and documents on the national surveillance system, in addition to outbreak cases extracted from the Republican Infectious Diseases Hospital's archive. To tackle the worsening measles situation in Kyrgyzstan, the Ministry of Health established the Republican Center for Immunoprophylaxis in 1994. Measles related death, which was rampant up until 1992, has not been registered since 2000 due to improved routine vaccination coverage, increasing from 88% in 1994 to 97% and over in 1997. The national surveillance system was modernized thanks to the World Health Organization, helping to detect measles cases and prevent major outbreaks. The system identified 222 cases in the outbreak of 2011, and the case cards in the hospital provided the findings of 69 admitted cases (42 infants, 22 children aged 1 to 14 years, and 5 aged 15 years or over), including 32 severe cases. This article provides a whole view on measles in Kyrgyzstan, which would be useful to control measles worldwide.

Key Words: Measles, surveillance, vaccination, elimination, Kyrgyzstan

INTRODUCTION

Measles is one of most severe infectious diseases of childhood, remaining an important cause of morbidity and mortality in developing countries.¹⁻³⁾ The World Health Organization (WHO) has stated "In 1980, before widespread vaccination, measles caused an estimated 2.6 million deaths each year in the world".⁴⁾ In 2003, there had been over 30 million measles cases registered, of which 530,000 had a death outcome.⁵⁾

Kyrgyzstan is located in Central Asia with a population of 5.6 million. It was a part of the former Soviet Union before its independence in 1991. There are 9 administrative units in Kyrgyzstan: 7 oblasts (regions) and the 2 cities (Bishkek capital and Osh city). Each oblast is

Received: September 1, 2014; accepted: December 9, 2014

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subdivided into several rayons (sub-regions).

In 2000 the United Nations established the Millennium Development Goals, which included goal 4: to achieve two-thirds overall reduction of child deaths by 2015 compared with the 1990 level.⁶⁾ From 2000 to 2008, global measles mortality declined by 78%, from an estimated 733,000 deaths in 2000 to 164,000 in 2008, but the reduction in measles mortality has leveled off since 2007.⁷⁾ In 2010, the World Health Assembly (WHA) established three milestones toward global measles eradication to be reached by 2015: 1) increase routine coverage with the first dose of measles-containing vaccine (MCV1) for children aged 1 year to 90% or greater nationally and 80% or greater in every district, 2) reduce and maintain annual measles incidence at less than 5 cases per million, and 3) reduce measles mortality by 95% from the 2000 estimate.⁸⁾ After the member states of South-East Asia Region adopted the goal of measles elimination by 2020, elimination goals have been set by member states of all six WHO regions, and reaching measles elimination in four WHO regions by 2015 is an objective of the Global Vaccine Action Plan (GVAP).^{9, 10)} After 3 years of historically low measles incidence,¹¹⁾ the number of reported measles cases increased sharply in late 2009. 30,639 measles cases were reported in 2010, the most since 2006. As of October 26, 2011, a total of 26,074 cases had been reported in the WHO European Region. The Western European sub-region reported 21,724 cases (83.3%), the Central and Eastern European sub-regions 3,570 cases (13.7%), and the Newly Independent States of the former Soviet Union 780 cases (3.0%).¹²⁾

The healthcare system of the former Soviet Union achieved what many countries strive to achieve – universal access to health services.^{13, 14)} In Kyrgyzstan the incidence of measles was extremely high, ranging from 703.96 to 1736.43 per 100,000 populations during outbreaks (1954–1960). However, after the introduction of vaccination against measles in 1968, the incidence dropped.¹⁵⁾ Kyrgyzstan, as a part of the WHO European Region, committed to the WHA's milestones and had recently been stable for measles incidence until 2011, when there was an outbreak of 222 cases.¹⁶⁾

The information on measles elimination in Kyrgyzstan has not been unified, and the available review articles are limited. This paper aims to summarize the scattered information on the recent status of measles, valid surveillance system, and measles elimination strategies. To make the level of sources clear, we classified the documents and data into four categories here: Category 1 (C1) for internationally available statistics, Category 2 (C2) for domestically available national statistics, Category 3 (C3) for data accessible for domestic researches, and Category 4 (C4) for not confidential, but usually inaccessible governmental data.

MATERIALS AND METHODS

Policy documents

There are a number of regulatory and legal documents that determine the activity of the immunological service in Kyrgyzstan and major ones that were analyzed are as follows: WHO European Region Strategic Plan for 2005–2010 “Measles and Rubella Elimination and Congenital Rubella Syndrome Prevention” (C1), WHO Global Measles and Rubella Strategic Plan 2012–2020 (C1); the Law of the Kyrgyz Republic (official name of Kyrgyzstan) “Health protection of the citizens of the Kyrgyz Republic”, as of January 9, 2005 N 6 (C2), the Law of the Kyrgyz Republic “Immunoprophylaxis of infectious diseases”, as of June 26, 2001 N56 (amended as of June 18, 2005 N77 and July 30, 2005 N118) (C2); National healthcare reform program “Den sooluk” (C3), National Programs “Immunoprophylaxis 1994–2000, 2001–2005, 2006–2010, 2013–2017” (C3), other Laws of Kyrgyz Republic (C2) and orders of the Ministry of Health

(MOH) regarding immunization (C3). The statutory national surveillance system is conducted according to the Guidance on Integrated Surveillance Measles, Rubella and Congenital Rubella Syndrome, which was approved by order N 841 of the Kyrgyz MOH on December 25, 2009 (C4).

Outbreak cases

The case cards of 69 patients admitted to the Republican Infectious Diseases Hospital (RIDH) during the last outbreak in 2011 were retrospectively analyzed. Information on their anamnesis, disease course, laboratory findings, treatment and home release history were collected from RIDH and then analyzed. Data were made available from the patients registration book at the RIDH (C4).

Ethical issues

All the tables and figures were made by the author based on the collected information. The case cards used for information extraction contained no patients' names. Since all of the data were summarized statistics or anonymized information, this descriptive study is not subject to approval of an ethical committee nor any guidelines for human subject research.

RESULTS

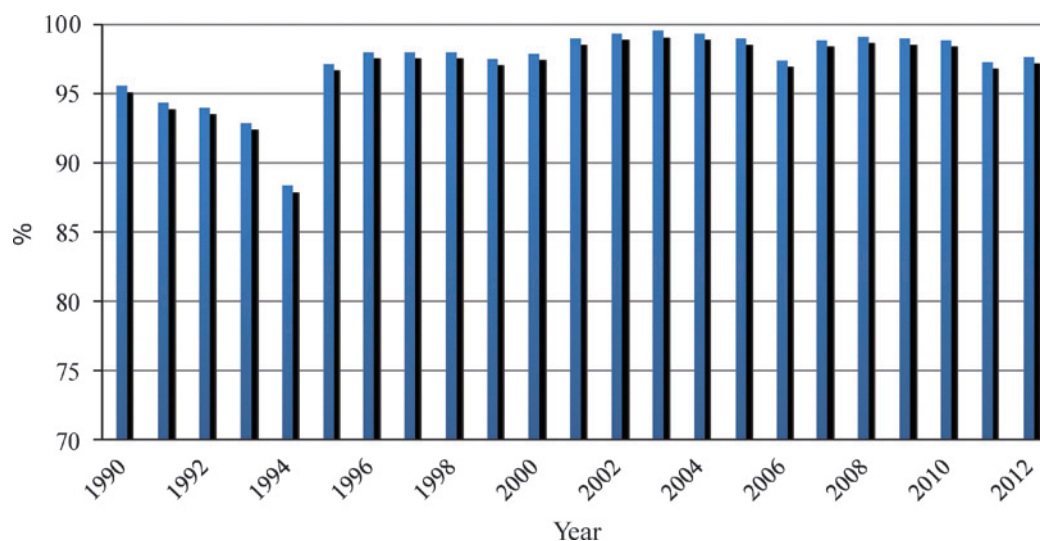
Government measures against measles

Measles vaccination was first introduced in Kyrgyzstan in 1968, after which the incidence of the disease dramatically dropped from 375.01 per 100,000 populations in 1971 to 0.02 in 2009 (C3). After the collapse of the Soviet Union in 1991, Kyrgyzstan and its overall healthcare sector, particularly its immunization program, were severely affected, resulting in a drop of the routine vaccination coverage (Fig. 1). In response to the deteriorating routine vaccination coverage, the wide spread of measles related deaths (500 in 1989–1992 from C3 category document) and other concomitant vaccine preventable diseases' challenges, the MOH established the Republican Center for Immunoprophylaxis (RCI) in 1994. In their 1994–2000 work plan, RCI prioritized improving the information system for immunization services, specifically to simplify recording and reporting procedures, collect only relevant information, and decentralize decision making. In the same year, RCI developed the first National Program, "Immunoprophylaxis 1994–2000", approved by the government decree N 328 on May 16, 1994. The objectives of this program, as far as measles is concerned, were to reduce measles morbidity by the year 2000 to less than 1 per 100,000 populations and prevent deaths from measles through ensuring of high routine vaccination coverage (C3). Thus, by the end of 1997 routine measles vaccination coverage reached 95% and over nationally and 90% at the rayon (district) level. The measles vaccine, which is integrated into the MMR vaccine, is given according to the WHO recommendations at the age of 1 and 6 years.

Operation of the surveillance system

As of July 1, 2002, with the technical support of the WHO, Kyrgyzstan developed and introduced integrated surveillance system for measles, rubella and congenital rubella syndrome. To date, all national laboratories and 17 rayon laboratories have been accredited by the WHO. They use the definition of measles case adopted by the WHO: clinically confirmed cases, epidemiologically linked case, and laboratory confirmed cases, as shown in Table 1. Apart from that, the statutory national surveillance system was improved, involving the following functions:

- Identification and registration of certain diseases and outbreaks



(Source: Republican Medical Information Center)

Fig. 1 Measles routine vaccination coverage in Kyrgyzstan

In 1990, vaccination coverage was more than 95%. The coverage dropped after the collapse of the Soviet Union in 1991, affecting a number of aspects of the healthcare sector in Kyrgyzstan, particularly its immunization program. In 1994, the coverage fell to its lowest point. Since then it has risen again to the level of more than 95% due to effective activities by the Republican Center for Immunoprophylaxis, founded in 1994.

Table 1 Measles case definition according to the guidance on integrated surveillance measles, rubella and congenital rubella syndrome in Kyrgyzstan

Category	Definition
Clinically confirmed cases	Clinical manifestation is characterized by a generalized maculopapular rash persisting ≥ 3 days, fever $\geq 38.5^{\circ}\text{C}$ and one of the following symptoms: cough, coryza, koplik's spots, and conjunctivitis
Epidemiologically linked cases	Clinically confirmed case linked to a laboratory-confirmed case within the incubation period
Laboratory confirmed cases	Positive results using at least one the following methods: Virus isolation from cells of the nasopharynx, conjunctivae, urine or blood IgM antibodies (ELISA)

(Source: Guidance on Integrated Surveillance of Measles, Rubella and Congenital Rubella Syndrome in Kyrgyzstan)

- Investigation of certain diseases and outbreaks and confirmation of the diagnosis
- Collection, processing and interpretation of data
- Communication of the data to higher levels
- Analysis and preparation of scheduled reports
- Feedback to lower levels

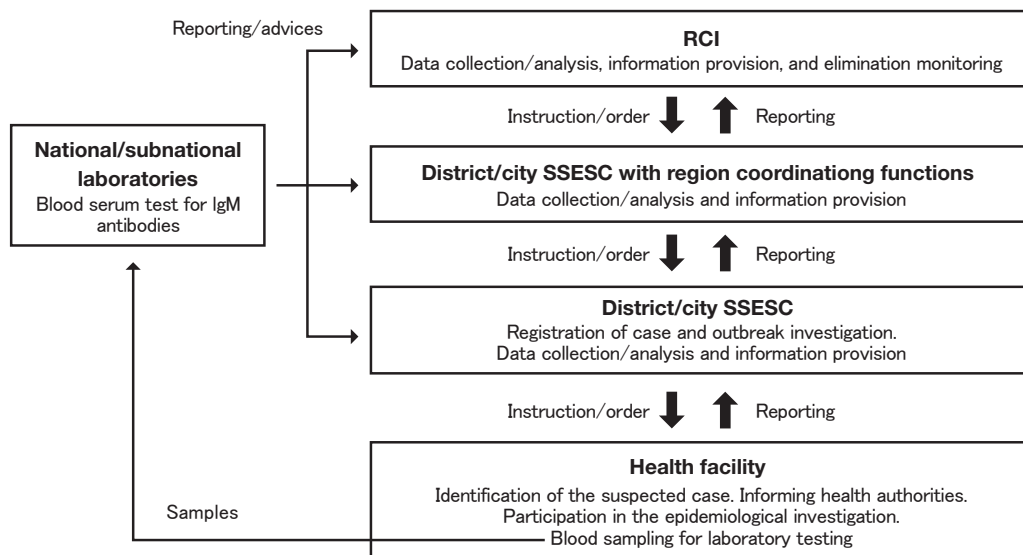


Fig. 2 Coordination of the integrated surveillance of measles

* RCI - Republican Center for Immunoprophylaxis

* SSESC - State Sanitary and Epidemiological Surveillance Center

(Source: Guidance on Integrated Surveillance of Measles, Rubella and Congenital Rubella Syndrome in Kyrgyzstan)

- Effective surveillance is performed by means of coordinated interaction of medical institutions at all levels (Fig. 2).

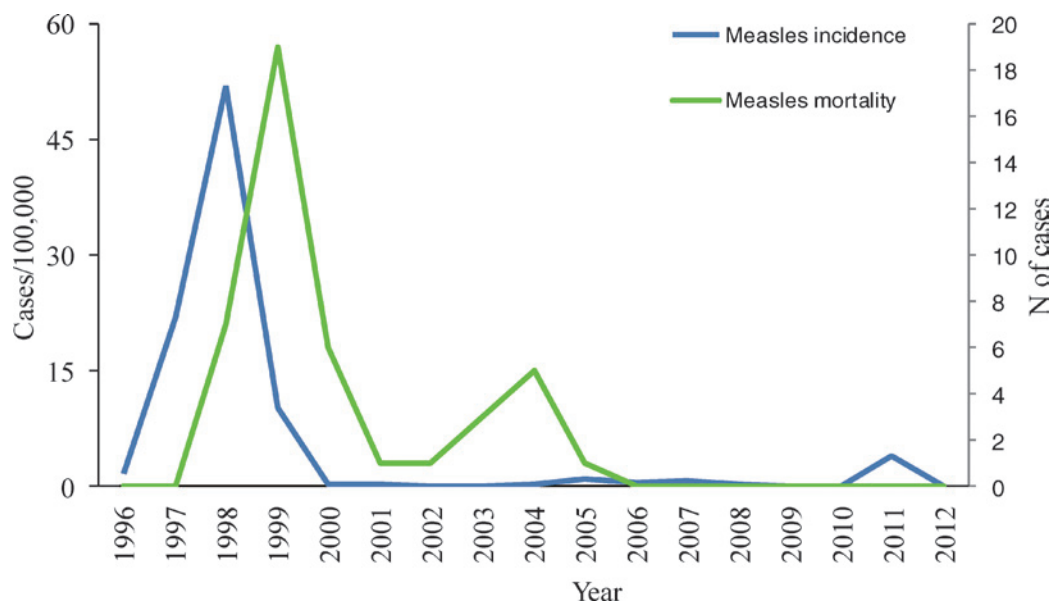
Statutory measles surveillance is based on a mandatory reporting system of clinically diagnosed measles cases. Kyrgyzstan consists of the nine administrative units: seven oblasts and two major cities (the capital of Bishkek and city of Osh). Oblasts are then subdivided into 40 rayons in total. Each rayon has a local State Sanitary Epidemiological Surveillance Center (SSESC) that is responsible for collecting measles case reports from healthcare providers. Information collected includes the patient's name, age, date of birth, gender, home address, occupation, education level, assigned polyclinic, primary diagnosis, dates of symptom onset, physician visit, diagnosis, and a report to the SSESC. Surveillance data are aggregated and reported weekly or monthly to the oblast SSESC and then further up to the national level. Hospital-based cases of clinically and laboratory confirmed measles are handled according to the abovementioned case definition suggested by the WHO.

In 2002, with the technical support of the WHO, Kyrgyzstan developed and introduced an integrated surveillance system for measles, rubella and congenital rubella syndrome. At present, all national laboratories and 17 rayon ones have been accredited by the WHO. The system is relatively new, with supervision, coordination and control going downward from the national to the subnational level, whereas reporting goes from the subnational to the national level.

Outbreak case

Despite the relatively high level of the routine vaccination coverage, outbreaks take place from time to time and evidence of this is obvious, with 222 cases across the country reported in 2011 (Fig. 3). Among the abovementioned reported cases only 69 patients sought treatment at RIDH in the capital city of Bishkek (Table 2). Of them, 40 were city dwellers and 19 came

from the regions. Most of the patients were children representing the following age groups: 42 patients aged 0–12 months, 9 patients aged 1–4 years, 13 patients aged 5–14 years, and 5 patients aged 15 years and over. As far as the vaccination history is concerned, 14 patients received the MCV1 and MCV2 according to the calendar, while 55 were non-vaccinated. Among



(Source: Republican Medical Information Center)

Fig. 3 Reported measles incidence rate and mortality, Kyrgyzstan, 1996–2012

Despite the relatively high level of the routine vaccination coverage, periodic outbreaks took place from time to time which is usual during the virus elimination process. No measles-related deaths have been registered since 2000.

Table 2 Characteristics of 69 measles patients treated at the Republican Infectious Diseases Hospital, Bishkek during a 2011 measles outbreak.

Area	N	Age in years				Vaccination		IgM elevation		Severity*		
		<1	1–4	5–14	≥15	Yes	No	Yes	No	Mi	Mo	Se
Osh	1	–	–	–	1	–	1	1	–	–	–	1
Jalalabat	2	–	1	1	–	–	2	2	–	–	–	2
Naryn	3	3	–	–	–	–	3	3	–	–	1	2
Issykul	1	1	–	–	–	–	1	1	–	–	–	1
Chui	22	11	2	9	–	3	19	3	19	2	11	9
Bishkek	40	27	6	3	4	11	29	34	6	–	23	17
Total	69	42	9	13	5	14	55	44	25	2	35	32

* Severity at diagnosis by the treating physicians based on their subjective definition; Mi: mild, Mo: moderate and Se: severe.

(Source: Republican Infectious Diseases Hospital)

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the non-vaccinated, 42 patients were aged under 1 year. The IgM antibody was positive in 44 patients and negative in 25 patients. It could be negative for the patients who were tested within 3 days after the appearance of rash. According to the measles case definition, 59 patients had a laboratory confirmation of the measles diagnosis, whereas in 10 cases measles remained laboratory unconfirmed. The course of the diseases revealed was as follows: 32 patients developed severe measles, 35 were moderate in severity, and 2 patients had a mild course of measles, according to the records. All of the patients were soon released. No measles-related deaths had been registered neither during the 2011 outbreak nor since 2000 (Fig. 3).

Budget and funds

The procurement of the traditional vaccines included in the national vaccination schedule is exclusively funded from the National Budget, and a sum of USD 758,000 to 848,000 will be annually allocated throughout the National Program “Immunoprophylaxis 2013–2017”. The implementation of other components of the program, such as improving infrastructure and logistics, increasing people’s access to immunization services, capacity building, etc., will be available through the National Budget and Mandatory Health Insurance Fund, as well as international donors such as WHO, United Nations Children’s Fund, Japan International Cooperation Agency, and United States Agency for International Development.

In 2000 a sum of USD 18,356 was allocated from the National Budget for vaccines procurement, but most of the vaccines arrived in the country in the form of humanitarian aid. However, in 2010 National Budget allocated USD 642,000 for vaccines procurement, which covered 85% of the annual demand for the vaccine fund formation (Fig. 4).

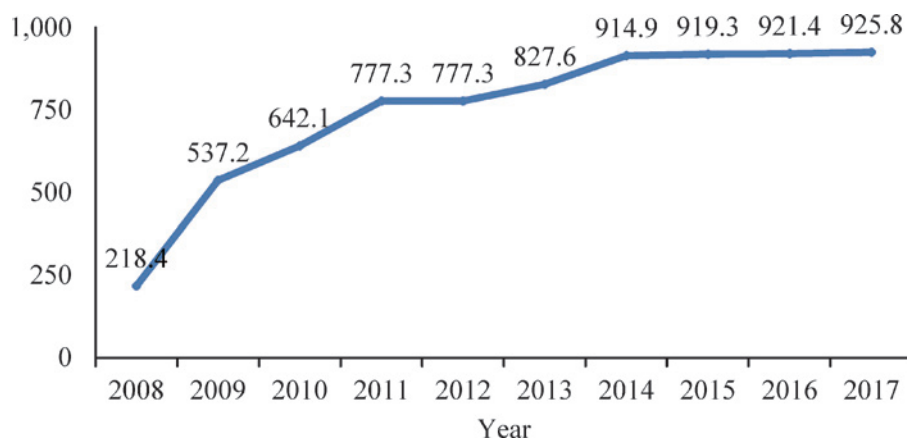


Fig. 4 Actual (2008–2013) and planned (2014–2017) immunization services expenditures in Kyrgyzstan, 2008–2017, in thousands of USD over the course of the National Program Immunoprophylaxis”

(Source: Republican Center for Immunoprophylaxis)

The procurement of the traditional vaccines included in the national vaccination schedule is exclusively funded from the National Budget. Despite the increasing volume of funds allocated for immunization program, there is a challenge to get necessary funds in a timely manner in order to avoid undesirable interruptions in routine immunization.

DISCUSSION

To achieve measles elimination, member states should aim to fully implement measles control and elimination strategies described in GVAP. The 2012–2020 Global Measles and Rubella Strategic Plan includes achieving vaccination coverage of 95% or greater with 2 doses of MCV administered through routine immunization or supplementary immunization activities, and maintaining this coverage across all districts. This article has shown that the increase in vaccination coverage (88% in 1994 to 97% and greater in 1997) led to the decline in measles incidence, making Kyrgyzstan no longer endemic for it.

Another cornerstone for eliminating measles at a national level is the high-quality case-based surveillance which was made available due to WHO assistance.^{8, 17)} Nationwide surveillance system has ensured the detection of sporadic cases of measles and allowed classification of cases as endemic or imported based on the disease epidemiology and virus genotype. It has also enabled the collection and analysis of information, and effective communication so that health workers and decision-makers may respond promptly and take appropriate actions.

Although it is usual that small outbreaks occur periodically in the elimination process, this article has shown that high routine vaccination coverage had a substantial contribution to the success in eliminating indigenous measles virus. The 2011 outbreak was said to be due to the virus importation from neighboring Uzbekistan, however, no evidence for this was available for the author. Among 69 hospitalized patients, 42 represented 0–12 month age group and were discovered to have not been previously vaccinated, which again underlines the necessity of ensuring of MCV1 before the age of 1 year.

For many member states, reaching 95% or greater coverage will require additional substantial and sustained investments of financial resources to strengthen health systems and achieve equitable access to immunization services. Currently, there are insufficiencies in the volume of funds allocated from the National Budget for vaccine procurement. Since 2009 the donor society has been instrumental in the purchase of one of the nine EPI vaccines - pentavalent vaccine – DTP + HBV + Hib; the other eight (BCG, IPV, HBV, DPT, MMR, MR, DT, DT-m) are purchased at the expense of the National Budget. Untimely, insufficient allocation of the necessary funds leads to undesirable interruptions in routine immunization. In addition, the lack of funding does not allow the formation of a 25% of mandatory vaccine buffer stock.^{18, 19)}

Thus, the implementation of immunization programs has allowed the achievement of a high level of vaccination coverage of the population, and thereby significantly reduced the incidence of measles and prevented measles-related deaths.^{20, 21)} As a result of a continuous high routine measles vaccination coverage Kyrgyzstan has been steadily approaching WHO target to eliminate measles by 2015, reducing annual measles incidence to less than five cases per million and maintaining that level.

The findings in this study are subject to at least three limitations. The first is the inability to make comparisons of measles elimination progress in Kyrgyzstan with other similar reviews due to the absence of articles on the countries in similar circumstances. Second, the surveillance data might underestimate the actual number of cases because not all patients with measles seek care, although the reported cases were almost perfectly accounted for. Finally, there has been some contradiction in reports and documents issued by the Kyrgyz MOH concerning measles elimination policy, which could cause misunderstandings regarding the measles situation in the country.

In conclusion, based on the information that was brought together, this article has provided a whole view on measles situation in Kyrgyzstan, including commitments to eliminate measles by 2015 at a national level through maintaining high level of routine vaccination coverage, timely identification of suspected measles cases in order to prevent outbreaks, provision with effective

treatment for measles diagnosed patients, adequate and suitable allocation of committed funds, which would all be useful to control measles worldwide.

ACKNOWLEDGEMENTS

The authors wish to thank colleagues from Kyrgyzstan Jyldyz Asanova, Chief of the Republican Medical Scientific Library, Ainura Uzakbaeva, Deputy Chief Doctor of the Republican Infectious Diseases Hospital, Tilek Buteshov, Republican Center for Immunoprophylaxis, Olga Kindyakova, Republican Medical Information Center and Chinara Abdrahmanova, National Statistics Committee for their help in obtaining reports, documents, orders of the MOH, archive materials. The authors declare that there is no conflict of interest.

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