American University of Armenia
Center for Health Services Research and Development

Rapid Assessment of the Immunization System in Nagorno Karabagh

Prepared for the Ani & Narod Memorial Fund

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Table of contents

Acronyms

ANMF	Ani and Narod Memorial Fund
AUA	American University of Armenia
BCG	Vaccine against TB
CDCP	Center for Diseases Control and Prevention (RA)
CHSR	Center for Health Services Research and Development (of AUA)
CRH	Central Regional Hospital
DT	Vaccine against Diphtheria and Tetanus
DTP	Vaccine against Diphtheria, Tetanus, and Whooping Cough
FAP	Health Post (Фелдшерско-акушерский пост)
FTE	Full Time Equivalent
IDI	In-depth interview
MMR	Vaccine against Measles, Mumps, and Rubella
MOH	Ministry of Health
NK	Nagorno Karabakh
OPV	Oral Polio Vaccine
RA	Republic of Armenia
SES	Sanitary Epidemiological Station
SUB	Village District Hospital (Сельская Участковая Больница)
SVA	Village Ambulatory (Сельская Врачебная Амбулатория)
UNICEF	United Nations Children's Fund

Executive Summary

The Center for Health Services Research and Development (CHSR) of the American University of Armenia (AUA) conducted a rapid assessment of the immunization situation in NK with support of the Ani and Narod Memorial Fund (ANMF). The project investigated the effectiveness of the immunization system in Nagorno Karabagh (NK), emphasizing epidemiologic data, the structure and function of the vaccine procurement and delivery system, and existing sources of health information and vaccine coverage.

Mixed qualitative and quantitative methodologies were utilized to provide a richer understanding of the key determinants affecting system performance and to allow triangulation or cross checking of the information. Qualitative methods included 6 key informant interviews of officials involved at various levels of the immunization system. Quantitative methods included 75 parental interviews and 94 complete record reviews employed to assess the immunization coverage among a sample of children born in 2002 and to roughly assess the validity of the several existing information sources on vaccination coverage (medical records, immunization cards, and parental recall).

The analysis suggested that:
- Vaccine preventable illnesses currently occur infrequently, as long as adequate supplies are available.
- The immunization system in NK is reasonably well developed and is functioning satisfactorily. Shortcomings include:
    o Poor national coordination of the vaccination schedule and process. Irregular supplies with vaccines, lack of consumable supplies and other resources (vehicles, cold chain equipment, etc.) result in a fragmented regional approach to immunization, which is disruptive to the medical system and confusing to the general public.
    o Lack of a modern information/surveillance system. The information system tracking epidemiologic data, such as immunization coverage and disease outbreaks has not changed since the Soviet period. Computerization is needed to improve its efficiency/effectiveness.
    o Poor training of personnel on new vaccines (new MMR vaccine)
    o Poor parental knowledge of the immunization schedule and vaccines.
- Due to the lack of international recognition and the conflict with Azerbaijan, vaccines in NK are primarily purchased from the Center for Diseases Control and Prevention (CDCP) of the Republic of Armenia, which is itself supplied from UNICEF/Armenia. Armenia often lacks sufficient supplies to meet its own needs and only provides excess vaccines to NK
- Recently, the supply of some vaccines (DPT, DT, Polio) in NK has sharply decreased mainly because of a delay of the second semi-annual supply of vaccines to Republic of Armenia, resulting in substantial declines in coverage, which might lead to outbreaks of controlled diseases among infants in NK.
    o Acceptable vaccination coverage should be no less than 90%
    o Coverage for the first six months of 2004 was half of what was expected

- o The DPT/DT and Polio vaccines are in short supply and MMR is not introduced yet {MMR was added to the immunization schedule in 2004, but is not available in NK yet}
- o Challenges to maintaining the cold chain may result in ineffective vaccines and a false sense of coverage

To address these challenges the following recommendations are made:
- Find a stable source of vaccines and resources to procure them – other than excess supplies from Armenia. {Given the international political situation, this may require the involvement of private donors.}
- Ensure adequate resources are found to implement the MMR vaccine throughout NK in addition to the "traditional" vaccines.
- Provide refresher training on MMR vaccination to those involved in different levels of the immunization system.
- Improve the cold chain and vaccine logistics system (equipment for national and regional facilities, vehicles for transportation to/within NK, etc.).
- Strengthen the immunization and vaccine preventable disease information system at national and regional levels, including implementation and utilization of immunization cards.
- Educate parents on the timing and importance of immunizations for their children.
- Implement Immunization Cards for parents, which they can keep at home. Consider giving mothers these parent-retained vaccination cards for the newborn before their discharge from maternity.
- As most vaccines are available through UNICEF in 10-dose vials, order DPT and Polio vaccines for NK in 10-dose vials to avoid unnecessary vaccine losses.
- To restore the herd immunity against mumps, consider conducting a follow-up campaign against mumps, targeting children up to five years of age throughout NK.
- As a long-term goal, consider adding other "routine" immunizations as resources permit (e.g., Hepatitis A, Varicella).

1. Background Information

1.1 Introduction

Nagorno Karabagh (NK) is a region located in the northeastern part of the Armenian highlands. According to the NK Republican Statistical Service (2003), the total population of the region is estimated up to 145,000 and approximately 57,000 are concentrated around Stepanakert, the capital of the region. Roughly 20% of the population is under 15 years of age.

A movement for independence began in NK in 1988 and the armed conflict with Azerbaijan resulted in many thousand deaths and destroyed Nagorno Karabakh's economy. A cease-fire was enacted in 1994. However, despite Nagorno-Karabakh's parliament declared the region independent in 1991, NK has not been politically recognized to date as an independent state, which limits flow of humanitarian aid and credits from international financial institutions.

Map 1. Nagorno Karabagh
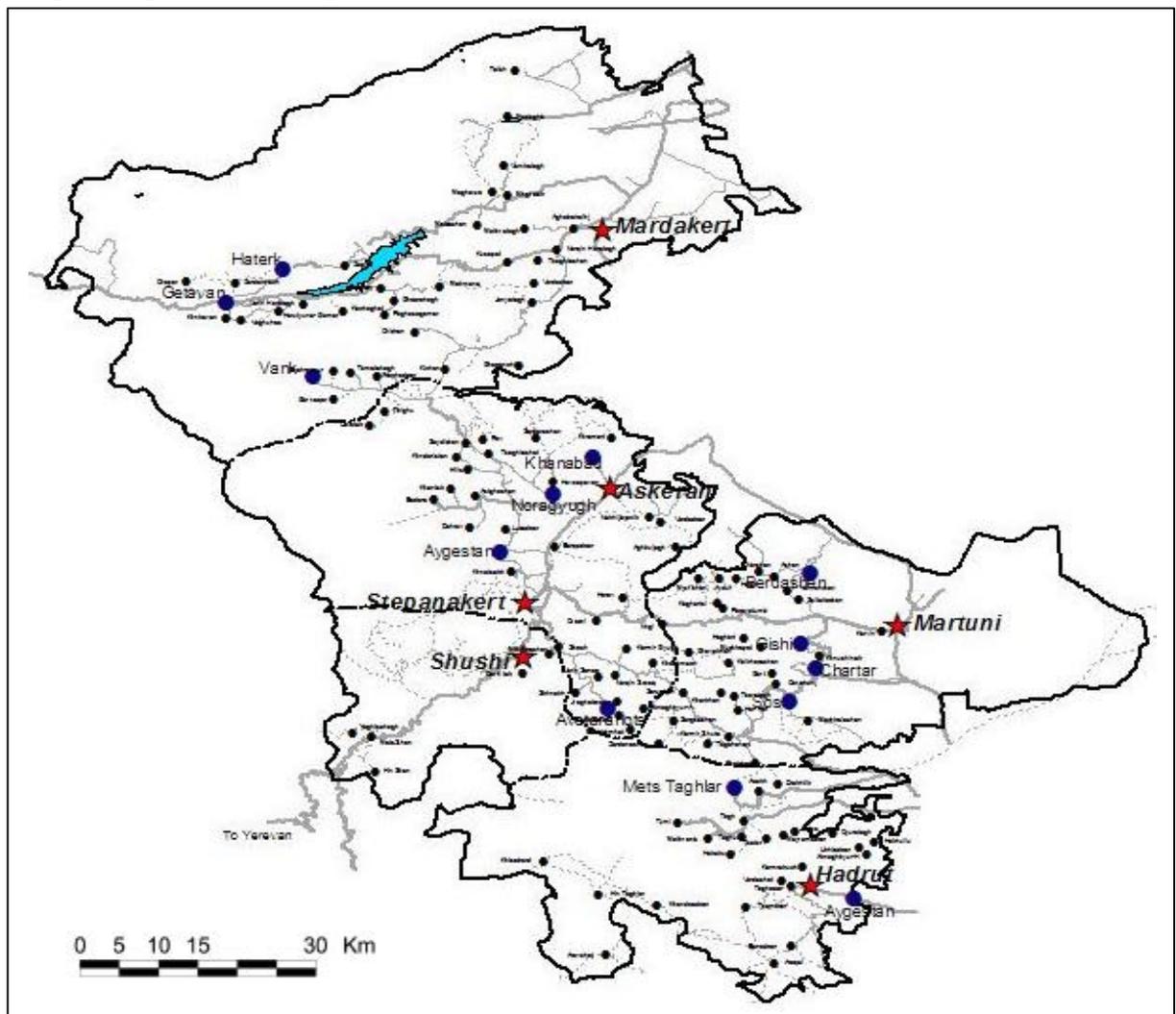
The burden of the disease in NK includes transition health problems, such as infectious and parasitic diseases, as well as the conditions more typical for a post-transition phase that is heart diseases, cancers, and diabetes. According to the morbidity data obtained from the MOH of NK for the year 2003, the largest burden in adults is imposed by respiratory diseases (20.4%), followed by diseases of nervous system and CVD (13.8% and 12.9% respectively). In children, acute respiratory diseases (55.3%) and infectious diseases (10.9%) are highly prevalent.

Among infectious diseases in children, intestinal infections including Hepatitis A are the most common infections, and constitute up to 52.9 percent of all infections. During the outbreak of Hepatitis A in 2002, 820 cases were registered, followed by 439 cases in 2003. Regarding controlled infectious diseases, rubella, chicken pox, and mumps are the most frequent. Since 1998 no cases of diphtheria, polio, or whooping cough were registered.

Overall, the epidemiological situation in NK can be regarded as secure thanks to well developed immunization system. Considerable contribution in developing the system was done by British NGO "MERLIN", which provided equipment for cold chain maintenance in 1995-1996 that is being utilized till now.

Immunization system of NK is under the control of the Republican San-Epi Service (SES). The service is responsible for procurement and distribution of vaccines. The vaccines in NK are primarily delivered from the Center for Diseases Control and Prevention (CDCP) of the Republic of Armenia. They are kept at the Republican SES and periodically distributed to primary health care facilities, where immunization is carried out.

Effective immunization systems depend on several factors: 1) vaccine supply, 2) vaccination schedule, 3) cold chain maintenance, 4) control and monitoring of immunization and epidemiological situation, 5) trained personnel, and 6) overall management of immunization system. In NK, the Republican San-Epi Service is responsible for the immunization system. It is separate from, but works with, the primary health care system. The main goal of the SES is to guarantee epidemiological security of the population. The SES consists of Republican San-Epi Station (SES), which supervises and coordinates functioning of City and Regional SESs and one central, one city, and seven regional SESs, including an anti-plague station in Hadrut (Appendix 1).

1.2 Purpose of the research

The Center for Health Services Research and Development (CHSR) of the American University of Armenia (AUA) conducted a rapid assessment of the immunization situation in NK with support of the Ani and Narod Memorial Fund (ANMF). The project investigated the effectiveness of the immunization system in NK, emphasizing epidemiologic data, the structure and function of the vaccine procurement and delivery system, and existing sources of health information and vaccine coverage.

The intent of the project was to critically assess the immunization system and to recommend options for strengthening the procurement, delivery, administration of vaccines, and surveillance

of the vaccination system to guide potential donors in making contributions that would have the most impact on reducing vaccine preventable illnesses in NK.

2. Methods

Mixed qualitative and quantitative methodologies were utilized to provide a richer understanding of the key determinants affecting system performance and to allow triangulation or cross checking of the information. Qualitative methods included 6 key informant interviews of officials involved at various levels of the immunization system:

1) Head, Epidemiological Department, Republican San-Epi Service
2) Leading Epidemiologist, Stepanakert San-Epi Station
3) Head Pediatrician, MOH
4) Head, Stepanakert Children's Polyclinic
5) District Pediatrician
6) Executive Director, Infectious Hospital

Quantitative methods were employed to assess the immunization coverage among a sample of children born in 2002 and to roughly assess the validity of the several existing information sources on vaccination coverage (medical records, immunization cards, and parental recall).

Two-stage stratified random sampling technique was utilized to select participants of the quantitative survey. The ambulatory lists of served children population born in 2002 served as a sampling frame. The record review and the survey among parents were conducted in one regional policlinic (Askeran Central Regional Polyclinic), three village health facilities (Aygestan FAP, Askeran region; Berdashen SVA, Martuni region; and Vank SUB, Martakert region), and the Stepanakert Children's Policlinic. Immunization cards and ambulatory medical records of the selected sample of children were reviewed and simultaneously interviews (mainly telephone) with their parents were conducted. Thus, three instruments were developed for the quantitative research. Two of these were very similar: Immunization Card Review Form (Appendix 2) and Medical Record Review Form (Appendix 3). These instruments were developed based on the content of record forms utilized at the primary health care level. The third instrument was a questionnaire for the parent survey (Appendix 4). Telephone survey was mainly conducted in Stepanakert, Askeran, and Berdashen, due to well-developed telephone connection in the mentioned settlements. In Aygestan and Vank villages, parents were called to health posts for interviews, since there was almost no telephone connection in households. Overall, 96 immunization cards and 94 medical records were reviewed and 75 interviews with parents were conducted.

2.1. In-Depth Interviews

CHSR staff developed IDI guides for epidemiologists (Appendix 5), pediatricians (Appendix 6), and infectious disease experts (Appendix 7). While similar, the guides were slightly different in their content for each specialist. The guides were developed in English, translated into Armenian, pre-tested in NK settings, and revised accordingly.

The interviews were facilitated by a professional CHSR moderator and supported by a trained note-taker/recorder. The IDI guides were semi-structured, contained 5-15 questions, and took approximately 55 minutes to administer. The interviews were conducted in Armenian (shifting to Russian in cases where the interviewee was more fluent in Russian). Detailed notes on the content of the IDIs and non-verbal cues were captured by the note-taker. The interviews were also recorded on audiocassettes after verbal agreement was solicited from the participants.

2.2. Instrument content

The contents of the IDI instruments were similar for epidemiologists and pediatricians with minor variations (the guide for epidemiologists was slightly more detailed). The guides were focused on the following topics:

1. **Epidemiological situation in NK** (general characteristic of the epidemiological situation in NK, outbreaks of infections in NK during the last year, the most common infectious diseases encountered in different population groups, referral for an assistance outside of NK to cope with outbreaks of infectious diseases).

2. **Immunization Situation in NK** (main sources of purchasing/getting vaccines; who is responsible for procurement, distribution and coverage of vaccines (percentage) and how is it done, standard vaccination schedule in NK, effectiveness of immunization, information on vaccination coverage, Cold Chain System, needed equipment for Cold Chain maintenance, quantity/type of vaccines lacking, training of personnel needed to assure adequate immunization/preventive measures, crucial needs of the immunization system in a whole).

The IDI instrument for infectious disease experts contained only the first part: epidemiological situation in NK.

3. Qualitative Data Analysis

Detailed IDI reports were transcribed and translated into English (word-processing format). The audiotapes were used where appropriate to verify, clarify, and expand the written notes taken during the interviews to produce detailed transcripts. The preliminary analysis sought to identify major themes and delineate the structure of the findings. Based upon the preliminary analysis, a more detailed coding system was developed for comprehensive analysis presented in this report.

3.1. Findings

The findings are presented separately for each type of specialists (epidemiologist, pediatrician, infectious disease). Direct quotes from respondents are presented in this section to serve as clear examples and confirmation of the summarized information.

3.1.1. Epidemiologists

IDIs were conducted at the Republican San-Epi Station with the head of epidemiological department of the Republican San-Epi Service and the leading epidemiologist of the Stepanakert San-Epi Station.

Epidemiological Situation in NK

Compared with the previous two years, the situation is relatively quiet: all controllable infectious diseases have decreased. Decreases in Hepatitis were particularly noted.

> *"...during the first quarter of 2004 reduction of all the infections is observed, particularly the number of Hepatitis A cases decreased from 219 to 49 (by 77.7%)[1]".*
>
> *Head, Epidemiological Department, Republican San-Epi Service*

No cases of tetanus, polio, whooping cough, measles, or typhoid fever were registered. However, both epidemiologists were concerned about the increase in rubella. During the first half of the year 83 cases of rubella were registered.

> *"Moreover, during the last 3 years of my practice in NK I have noticed tendency of rubella increase".*
>
> *Head, Epidemiological Department, Republican San-Epi Service*

Another concern of epidemiologists was mumps. Although no outbreak had occurred in the past year and infections appear to be decreasing (7 cases were registered during the first six months of this year as compared with the 16 registered cases during the first six months of the last year), the risk of an outbreak was seen as increasing given that the population is not being vaccinated.

Tuberculosis was also seen as a national problem.

> *"...8 cases of tuberculosis were observed this year till now... Increase in tuberculosis was observed in 2003 - 19 cases during the fist six months of 2003. Although the incidents decreased now by 11 cases, tuberculosis can still be regarded as a national problem".*
>
> *Head, Epidemiological Department, Republican San-Epi Service*

Regarding other infections, both epidemiologists mentioned a decrease in intestinal infections. However, a relative increase in Proteus caused cases was observed.

The respondents mentioned that the most common infections seen in children under 5 are respiratory and intestinal infections. Chickenpox was mentioned as the next most common infection in this age group. Adolescents were characterized by increasing rates of rubella. Several cases of rubella were registered in pregnant women, which was a significant concern.

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[1] Accurate number of registered cases of different infections as well as vaccination coverage for the half year was provided by the head of epidemiological department of the Republican San-Epi Service two days after the actual IDI. The reason for this was that at the time of the interview she was preparing biannual report for the MOH and the final numbers were not available yet.

Although the combined vaccine against Measles, Mumps and Rubella was included in the vaccination schedule in 2004, but is not introduced yet because of being in short supply. Tuberculosis was observed in different age groups, but mostly in adults. The only significant recent outbreak was Hepatitis A.

Immunization Situation in NK

The Republican SES carries responsibility for procurement and distribution of vaccines in NK. According to the head of epidemiological department of the Republican SES, there is no direct supply line to NK. The Center for Diseases Control and Prevention (CDCP) of the Republic of Armenia usually provides them with vaccines, which were provided to them by UNICEF.

The next component of the immunization system is the primary health care service, consisting of the City Children's Polyclinic, pediatric departments of regional polyclinics, and village health facilities (FAPs, SVAs, SUBs), which are responsible for administering the vaccines. Monitoring and surveillance of vaccination coverage is carried out by the Republican SES.

According to both epidemiologists, acceptable vaccination coverage should be no less than 90 percent. For 2004, the coverage was estimated at less than half its expected level, and was not considered acceptable.

> *"...and it (vaccination coverage) couldn't be more because of vaccines' shortage. For instance, I made a request for 8,000 doses of DPT (12,000 with losses), but received only 1,620 DPT and 1,250 DT-M".*
>
> *Head, Epidemiological Department, Republican San-Epi Service*

The respondents explained that the UNICEF supplies of vaccines to Armenia had been adequate for both Armenia and NK. Now, the supplies are not even adequate to meet Armenia's need.[2]

A national vaccination schedule was approved by the Ministry of Health (MOH) in 2003 (Appendix 8) and revised in 2004 (Appendix 9). The latest version of the immunization

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[2] We tried to find out the reason for the current inadequate supply of some vaccines (DPT/DT, Polio) to RA/NK through telephone conversations with some officials from UNICEF and CDCP of RA. An official from the health department of UNICEF informed us that they work directly with the government of RA and deliver amount/type of vaccines in accordance with the annual demand in vaccines received from the MOH of RA. This year is not an exception and UNICEF will provide the needed type/amount of vaccines fully in accordance with the demand presented by the MOH of RA. From CDCP of RA, we were informed that the reason of the current shortage of DPT and Polio vaccines experienced both in RA and NK is the delay of the second semi-annual supply of these vaccines to Armenia due to some concerns expressed about the quality (reactogenity) of the vaccines supplied at the first semi-annual shipment. Thus, the observed shortage is only transitory, and the planned delivery of vaccines in September will allow restoring the coverage of infants with these vaccinations both in RA and NK. The CDCP official (Dr. Almast Aharonyan, Department Head) also mentioned that the current vaccine shortage in NK is relative, because the available vaccines would be enough to cover the needs if utilized efficiently, but a lot of vaccine doses are discarded because of the mismatch between few infants scheduled for vaccination in villages and multiple doses of vaccines in a pack, that should be discarded in a short while after the pack is opened. In respect to the observed shortage of vaccines against Mumps and MMR, we were informed that MMR vaccine is not officially (by the decree of the minister of health of NK) implemented in NK yet. They continue vaccination with mono-vaccines against Measles and Mumps, which cannot be provided to them by Armenia, because the latter made a shift to MMR already.

schedule included MMR vaccination, which is not available. Effectively, the 2003 schedule is the one being followed, when feasible.

> *"...we have included three-vaccine, so called MMR (measles, mumps and rubella) into the national schedule from the experience of RA, but as we are not provided with the mentioned vaccine yet, it still remains only on paper".*
>
> *Head, Epidemiological Department, Republican San-Epi Service*

The vaccination schedule differs in Stepanakert from that in regions. This is due to the lack of equipment in the regions to maintain the cold chain. While in Stepanakert vaccines are available two days per week (Hepatitis B every work day), villages in regions have a 2-3 day window each 45 days (8 times per year). The reason for this approach is to minimize waste as most vaccine ampoules (including DPT and Polio) contain 20 doses and will only last 2-3 days (how long the igloo coolers last) in the regions. Hepatitis B comes in single dose ampoules.

BCG vaccination (Tuberculosis) is predominantly administered in Maternity Houses or in groups of 10 outside of maternities.

In general, the schedule is well developed and the outcome of it is the current epidemiological situation, which can be regarded as satisfactory. The only obstacle to follow the schedule is the unstable supply/lack of vaccines and inadequate infrastructure (vehicles, equipment) to implement it.

> *"...due to poor vaccine supply, we are obliged to cover those children who are not vaccinated and delay revaccination for the rest.".*
> *Head, Epidemiological Department, Republican San-Epi Service*

In general, both epidemiologists evaluated immunization system in NK as very effective.

> *"During the post-war period we had only one case of diphtheria in 1997 and one case of tetanus in 2000 diagnosed in a 70 year old woman".*
>
> *Head, Epidemiological Department, Republican San-Epi Service*

The vaccine coverage information system in NK has not been changed since the Soviet period. The system is well developed and works satisfactorily. Reporting forms are completed at the primary health care level and submitted to regional san-epi stations. Regional san-epi stations summarize this information and submit it to the Republican San-Epi Service. In its turn, the Republican San-Epi Service prepares a report for the MOH of NK and the Republican Statistical Service. There are monthly, quarterly, and yearly reports. The forms include information on age distribution of population served by each health facility, infectious disease registration, type and number of needed vaccines, and number of vaccines administered.

While the SES is separate from the primary health care delivery system, it does have a coordination and supervisory role over the primary care system's vaccine distribution and delivery process. An epidemiologist, sometimes together with the regional pediatrician,

regularly visits villages and checks pediatric service papers and documentation. Unfortunately, this activity is often hindered by the lack of transportation.

At the national level, equipment to maintain the cold chain was considered adequate until recently, when the main refrigerator designed for long-term vaccine storage broke down. Regionally, supplies are delivered in igloo coolers and only sustained for 2-3 days, as equipment is lacking at the central regional facilities.

The cold chain can only be maintained when the Republican SES and the 8 regional/city San-Epi Stations are each provided with a refrigerator and a freezer. Both are important because there are some vaccines that need to be frozen and some that can be kept at temperature of +2° to + 8°C. Freezers are also necessary to freeze the cool packs for the igloo coolers used to deliver vaccines to outlying villages. The Republican San-Epi Station receives vaccines once each 3 months and distributes them to the regional San-Epi Stations according to an approved schedule.

> *"The existing "Electrolux 11-51" has been recently broken and actually we are left without refrigerator. The working life of it was 7 years, but it has served for 10 years already".*
>
> *Head, Epidemiological Department, Republican San-Epi Service*

Only Measles (mono-vaccine), Hepatitis B, and BCG vaccines are available in adequate quantities. The other typical childhood immunizations (DPT/DT, OPV, MMR) are in limited supply or not available. With the adoption of MMR vaccine in Armenia, the access to the measles mono-vaccine is also ending. Armenia has indicated that the training of NK staff on MMR vaccine utilisation will be a pre-requisite for providing MMR, if and when Armenia has excess supplies.

In addition, the Mantoux test (for BCG coverage among children 6-7 years old entering school) is in short supply. This limits the ability to adequately ensure effective coverage against TB (and, when available, may increase the demand for BCG vaccine)[3].

> *"...my main concern is the trainings on MMR. We have 100 health providers in total (to be trained) and most of them would be glad to participate at any workshops or courses".*
>
> *Head, Epidemiological Department, Republican San-Epi Service*

Among the priorities for improving vaccination coverage, the respondents agreed that the following is important:
- Improve access to vaccines/find alternate sources (find sources and donors other than Armenia).

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[3] According to WHO guidelines, a Mantoux test prior to BCG administration is not required. BCG can be given regardless of weather a Mantoux test is available. Despite there are WHO references on this, many TB specialists in former SU countries have not been convinced and continue the routine of Mantoux test administration prior to second BCG.

- Ensure cold chain maintenance (provide equipment to Republican and regional facilities).
- Ensure adequate transportation from Republican to regional facilities and from regional facilities to villages.
- Improve/modernize the information/surveillance capacity.
- Assess the cost effectiveness of procuring single-dose ampoules to provide on-going vaccinations concurrent with sick or well child visits.
- Train personnel to administer the MMR vaccine.

3.1.2. Pediatricians

IDIs were conducted at the MOH of NK with the Head Pediatrician and at the Stepanakert Children's Polyclinic with the Head of the Polyclinic and one of the district pediatricians.

Epidemiological Situation in NK

The pediatricians' echoed the epidemiologists in their assessments.

> *"Basically, the epidemiological situation is not bad. It is the impact of good vaccination of children during the last years. Its coverage was 95% to 96% respective of what we have done".*
>
> Head, Stepanakert Children's Polyclinic

The pediatricians were concerned about recent increases in rubella and the persistence of chicken pox. Like the epidemiologists, the pediatricians attributed the increase to a lack of MMR vaccine and lack of interest/support for introducing the varicella vaccine until stable supplies of the core vaccines were available. They noted the effectiveness of these vaccines in Russia.

Immunization Situation in NK

At the end of each year (last two weeks of the year) the Children's polyclinic conducts a census of its children's population (under the age of 15) to ensure all children are registered and their documentation complete. This includes the immunization registration (Form [1] 63). Every child has its own form containing information on vaccinations he/she received. Based on the data on this form, each district nurse plans vaccinations among her population for the coming year. This data is then collated and summarized to plan for the total immunization need for the coming year at the polyclinic. This procedure is replicated throughout NK and the information funnelled to the Republican SES where national estimates of vaccine needs are prepared.

The Children's Polyclinic has adequate, though dated, refrigeration equipment to maintain the cold chain, but often lacks needed vaccines, including MMR, DPT/DT, DT-M, and OPV. The Head of the Children's Polyclinic suggested purchasing vaccines containing 1-2 doses in a pack to decrease losses and to expand vaccination calendar to at least 4 days per week[4].

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[4] Most vaccines are not supplied in 1-2 doses because they are extremely expensive per dose in that presentation. They are also not available through UNICEF.

> *"Because of absence of MMR vaccine we still follow 2003 schedule instead of 2004 where MMR vaccine is incorporated. Hopefully, we will be soon provided with the mentioned vaccine…Based on my experience, I can say that the list of diseases [contraindications] has been shortened during the past 10 years. The list of contra-indications was much larger in the past. Usually, these are chronic conditions of nervous, endocrine systems".*
>
> *Head Pediatrician, MOH of NK*

Both pediatricians believed in the effectiveness of vaccines and of the immunization system. Despite the lack of anti-Mumps vaccine, no outbreak of mumps occurred during the past 3-4 years. This was attributed to the successful immunization of all children under the age of 14 during 1999-2000. They feared that this herd immunity is waning and an epidemic is imminent.

> *"Taking for instance smallpox, which is eliminated totally, diphtheria, tetanus, whooping cough and para-whooping cough, a case of each of the mentioned infections was hardly registered during the pats 3-4 years. Presently there is a vaccine even against chicken pox, which is implemented abroad".*
>
> *Head Pediatrician, MOH of NK*

Primary health care providers are well trained to administer the currently available vaccines. UNICEF provided slots for several NK staff to attend training courses in Goris and Yerevan. This information was shared with others in NK. The pediatricians did note that there was a UNICEF-sponsored training on the MMR vaccine, which would be needed when the MMR became available, preferably using invited specialists from Yerevan.

> *"It was designed that the head epidemiologist of the Republican San-Epi Service together with the head pediatrician, that is me, study the modules and deliver trainings to the local specialists. However, the San-Epi Service prefers specialists from Yerevan to conduct the course assuming that they have already had an experience of its utilization (it is applied all over RA), are better informed of its effectiveness and better prepared to address the range of possible questions".*
>
> *Head Pediatrician, MOH of NK*

> *"The main need is to improve vaccines procurement. I am very anxious, because the republic is in great hazard. I don't even want to imagine how the events will develop if any infection is brought in from outside of NK. The first risk group are the children who were vaccinated poorly".*
>
> *Head Pediatrician, MOH of NK*

To improve the effectiveness of immunization system, the pediatricians
- noted the need to provide a stable supply of vaccines,
- suggested purchasing vaccines in 1-2 dose packing;
- considered necessary improving the design of the vaccination journal form, and
- providing health education to mothers on the importance and schedule of immunization for their children.

3.1.3. Infectious Disease Control Physician

The IDI was conducted at the Ministry of Health with the Executive Director of the Republican Infectious Disease Hospital. She was interviewed about the epidemiological situation in NK.

Epidemiological Situation in NK

The Executive Director of the Infectious Disease Hospital noted seasonal increases in intestinal infections and Hepatitis A were a current concern. The most common infection diseases she encountered in children under 5 were intestinal infections, Hepatitis A (including a major outbreak in 2002), and rubella. She strongly encouraged adding Hepatitis A to the vaccination schedule, which she knew had been successfully implemented in Russia.

3.2. Conclusions

The Republican San-Epi Service is responsible for overall management of the immunization system in NK, including vaccines procurement and distribution. However, primary health care providers are responsible for annual vaccination planning, vaccine administration and, thus, immunization coverage. Yet they are accountable to the Republican San-Epi Service for their activities. During the first half of 2004, reduction of almost all controllable infections was observed, including Hepatitis A. No cases of tetanus, polio, whooping cough, or measles were registered. Only rubella was increasing, and that was due to the lack of the new MMR vaccine. The most common infections seen in children under 5 in NK were respiratory and intestinal infections, as well as Hepatitis A, chickenpox and rubella, while tuberculosis was observed mainly in adults.

The main sources of information on immunization situation are primary health care facilities. They send information on epidemiological situation and vaccine coverage to the regional and city san-epi stations monthly through specially developed reporting forms containing information on age distribution of the served population; registered cases of infectious diseases; number and type of planed and administered vaccines; number of denials from vaccination and reasons for denials. The Republican San-Epi Service generates this information from regional/city san-epi stations, analyzes and prepares reports for the MOH. The information system on epidemiological situation and vaccine coverage that is operating in NK is the same as in Soviet period. The system is well developed and works satisfactory. However, computerization is needed to further improve it.

Immunization is conducted in accordance with the national vaccination schedule approved by the MOH of NK in 2003. The latest approved revision (2004) of the immunization schedule, which includes MMR, is not implemented due to the lack of the vaccine/specific training of personnel. The current low level of vaccine preventable diseases in NK serves as the best evidence of the effectiveness of the immunization system and its implementation. However, the last several months has seen the full implementation of the vaccination schedule endangered due to the shortage of many vaccines: DTP/DT, DT-M, Polio, Mumps, and Tuberculin. Consequently, coverage for the first half of 2004 is over 50% behind projections.

New equipment is needed in the republican and regional SESs to ensure the continuation of the cold chain and allow for more consistent access to vaccines.

The personnel involved in immunization system of NK are well trained mainly due to participation in UNICEF courses on immunization conducted in Armenia. The current main training need of the personnel (vaccination nurses, district pediatricians, pediatric nurses, epidemiologists, and assistants of epidemiologists) is MMR training for when this combined vaccine becomes available.

4. Quantitative Study

To assess immunization coverage among a sample of children born in 2002 and to roughly assess the validity of the several existing information sources on vaccination coverage (medical records, immunization cards, and parental recall), a small-scale record review and a survey (mainly telephone) among a statistical sample of parents were conducted in one regional policlinic, three village health posts and the children's policlinic in Stepanakert.

4.1. Study Concept

The study utilized a two-stage stratified random sampling technique to select the sampling units. The desired sample of 75 children was divided into five sites of 15 each, representing a mix of urban and rural populations. Within these target sites, a random sample of children was drawn from the desired birth. The sample size was increased to 20 per site to compensate for expected missing data. All children born in 2002 living in a selected village/regional center/district were considered eligible for the study. For efficiency considerations (due to limited study funds) only villages with at least 15 children born in 2002 were considered eligible for selection.

From the available list of 130[5] village outpatient health facilities (FAPs and SVAs) and 4 inpatient health facilities (SUBs) only 14 met the criteria of serving at least 15 children born in 2002 (Appendix 10). Of these 14 villages, three were selected by simple random sampling:

1. Aygestan (Balluja) – FAP – Askeran region – 20 children born in 2002
2. Berdashen (Karaqend) – SVA – Martuni region – 20 children born in 2002
3. Vanq – SUB – Martakert region – 34 children born in 2002

Of the 5 regional polyclinics, Askeran Central Regional Polyclinic (28 children born in 2002) was randomly selected. Stepanakert Children's Polyclinic serves 12 districts, from which district # 5 (64 children born in 2002) was randomly selected to be studied.

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[5] During the assessment phase of HANK project, 130 outpatient health facilities (FAPs, SVAs), 4 inpatient health facilities (SUBs) and 4 regional hospitals were assessed. The needed information was obtained from the mentioned study.

4.1.1. Assessment Instruments

Three instruments were utilized to gather data on vaccination coverage among the sample of children born in 2002:

1. Medical record review form
2. Immunization card review form
3. Parents' survey instrument

The medical record review form (Appendix 3) and the immunization card review form (Appendix 2) were very similar. These forms were developed based on the content of standard immunization cards and medical records (the latter contains a page specially designed for registration of vaccines administered to the child). The forms consisted of the following information:

1. Name
2. Date of birth
3. Address
4. Phone number
5. BCG vaccination – age of child, date of administration, dose of vaccine, medical denial (reason)
6. Hepatitis B vaccination – V_1, V_2, V_3 – age of child, date of administration, dose of vaccine, medical denial (reason)
7. DTP/DT vaccination – V_1, V_2, V_3, V_4/RV_1[6] – age of child, date of administration, dose of vaccine, medical denial (reason)
8. Polio (OPV) vaccination – V_1, V_2, V_3, V_4/RV_1, V_5/RV_2 – age of child, date of administration, dose of vaccine, medical denial (reason)
9. Measles vaccination – age of child, date of administration, dose of vaccine, medical denial (reason)
10. Mumps vaccination– age of child, date of administration, dose of vaccine, medical denial (reason)

The parents' survey instrument was a questionnaire (Appendix 4) consisting of items similar to the review forms to facilitate comparing information gathered from different sources.

4.1.2. Data collection

Quantitative data collection started on July 1 and lasted through July 7. Medical records' and immunization cards' reviews were conducted in selected health facilities. Simultaneously, telephone interviews were carried out. Of 64 registered children born in 2002 and living in district #5 served by Stepanakert Children's Polyclinic, 23 were included in the study. However, only for 18 of them it was possible to gather data from all three sources. In Askeran, out of 28

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[6] Some pediatricians stated that there is no revaccination for Polio; instead, there are vaccinations 1, 2, 3, 4, 5, and 6. That is why vaccinations are denoted as V_1, V_2, and V_3 in the text. For vaccinations 4th and 5th, which are accepted as revaccination by others, RV_1 and RV_2 are marked together with V_4 and V_5. The same was stated for the 4th vaccination or the first revaccination for DTP/DT.

registered children, data on 19 were obtained. And only for 17 data were available from all the three sources. The numbers of studied children along with the available sources of information for each are presented in the table below (Table 1). Overall, 96 immunization cards and 94 medical records were reviewed and 75 interviews with mothers of the selected children were conducted.

Table 1. Number of registered and selected children per each health facility with the available sources of information for each, NK, June-July, 2004

Health Facility (HF)	# of children registered	# of children studied/ selected	Available sources of information			
			IC[*] + MR[**] + Srv[***]	IC + MR	IC or/and IC + Srv	Srv
Stepanakert CP[1]	64	23	18	3	0	2
Askeran CRP[2]	28	19	17	1	1	0
Vanq SUB	35	23	5	14	1	3
Berdashen SVA	20	20	14	5	0	1
Balluja FAP	20	18	13	4	0	1
Total	**167**	**103**	**67**	**27**	**2**	**7**

[1] CP – Children's Polyclinic, [2] CRP- Central Regional Polyclinic

[*] IC - Immunization Card, [**] MR - Medical Record, [***] Srv - Survey

Phone numbers were obtained from medical records of the selected children. Poor telephone connection in regions limited the ability to conduct many telephone surveys. Consequently, telephone surveys were carried out mainly in Stepanakert, Askeran, and Berdashen, while in Aygestan and Vanq, parents were called to health posts for interviews, since there was almost no telephone connection in the houses. Overall, 75 complete parent interviews were conducted.

4.1.3. Data Review, Entry, and Cleaning

Data were reviewed and entered into an SPSS data file by CHSR staff. Upon completion of the data entry phase, which lasted two days, the data were cleaned. Range checks and logical checks were used to clean the data. The analysis was carried out using SPSS 11.0 statistical software package.

4.2. Results

4.2.1. Administrative Information

A total of 103 children from 5 settlements (Stepanakert, Askeran, Vanq, Berdashen, and Aygestan) throughout the NK were involved into the study (Table 1).

In the Stepanakert Children's Polyclinic, as well as in Askeran Central Regional Polyclinic, a designated vaccination nurse administered vaccinations. This nurse also completed the immunization cards. Making notes in the medical records, however, was the responsibility of the district pediatrician or nurse. In villages, pediatric nurses completed both medical records

and immunization cards. In Berdashen SVA and Vanq SUB, medical records did not contain the standard immunization record form required throughout NK. Their cost and limited availability were cited as a reason. In these cases, the nurses typically inserted special pages for vaccination in common notebooks, thus keeping the standard information, but in an unconventional format. These variations in practice and standards added to the complexity of the data collection process. In rural arras, the regional epidemiologist who delivered vaccines was present when the latter were administered, increasing the recording compliance. Given that the pediatric nurse is accountable for every dose of vaccine administered and/or expended, the record system does capture most of the required information, just not in a consistent place and format.

Another obstacle in gathering data was the absence of some medical records. Sometimes, parents take their child's medical records for some reason and bring back after some period of time. This was observed almost in all the selected sites and impacted the completeness of data.

4.2.2. Immunization Card/Medical Record Review

The immunization cards proved to be the most complete and accurate data source. The medical records never provided information not captured in the Immunization Cards. Consequently, the medical records were not analyzed separately.

BCG vaccination

BCG vaccination was usually conducted at the maternity house/department. Almost all children had documented BCG vaccination. In 2-3 exceptions the scars of BCG vaccination were found but no information about the time of vaccination was available.

The mean age of receiving BCG vaccination (N=93) was 5.4 days from date of birth, with a range of 0-99 (SD 11.4 days). Most newborns were vaccinated in accordance with the standard vaccination schedule on the 2nd-3rd days from the birth. Excluding the mentioned three uncertain cases as vaccinated, BCG vaccination coverage was 96.9 percent.

Hepatitis B vaccination

Hepatitis B vaccination was implemented in NK starting in July 2002 and limited to those born after July 18. There was an explicit instruction not to vaccinate children born before this date. The rationale for this decision is not clear, but likely relates to ensuring an adequate supply of vaccines for the target population. Thus, when analyzing Hepatitis B vaccination coverage, only children born after July 18 were included in the study to get accurate results on how well the vaccination schedule for Hepatitis B was followed. Consequently, a sample of 39 children was considered for the analysis.

The first dose of vaccine against Hepatitis B (V_1) is scheduled together with BCG vaccination at the maternity house/department. On 45th day from birth, infants should get the second vaccination (V_2). The third vaccination against Hepatitis B (V_3) is scheduled 6 months after V_1.

The mean age of those receiving the first Hepatitis B dose (N=39) was 3.3 days (SD 4.2, range 1-26). It can be seen that the timing for the first Hepatitis B dose was more consistent with the

schedule than the BCG vaccination timing. The mean age for the second dose (N=38) was 96.6 days or 3.2 months (instead of the recommended 1.5 months) with an age range of 44-245 days (1.5 - 8.2 months) (SD 49.0 days). For the final dose (N=36), the mean age was 224.9 days or 7.5 months (SD 62.9, range 103-367 days or 3.4 -12.2 months). Since the third vaccination against Hepatitis B (V_3) was scheduled in 6 months after V_1, the interval between V_1 and V_3 was also analyzed. The mean interval between V_1 and V_3 (N=36) was 222.3 days or 7.4 months, which exceeded the scheduled time by 1.4 months. Excluding three incomplete vaccinations, Hepatitis B coverage was 92.3 percent.

Given that rural areas have vaccines available only on a 45 day cycle, it is reasonable to expect substantially more variation in the timing of vaccinations that those in urban areas, where vaccines are available weekly. The difference between timing of vaccination against Hepatitis B in Stepanakert versus the regions is presented in Table 2. Although there are no statistically significant differences (probably due to the small sample size), the timing of vaccinations in Stepanakert was generally closer to the schedule.

Table 2. Difference between the mean vaccination ages (in days) and timing of vaccination against Hepatitis B in Stepanakert vs. regions, June-July 2004, NK

Area	Vaccination against Hepatitis B							
	V_1		V_2		V_3		Interval $V_3 - V_1$	
	Mean	**Range**	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**
Stepanakert (N=7)	3.6	1-11	80.7	48-145	222.0	184-291	218.4	183-287
Regions (N=29)	2.3	1-5	107.0	44-245	252.0	189-367	249.7	186-364
Difference (days)	1.3	-	-26.3	-	-30.0	-	-31.3	-
P- value	0.13	-	0.25	-	0.14	-	0.13	-

DTP/DT and Polio Vaccination

The combined vaccine against Diphtheria, Tetanus and Whooping Cough (DTP/DT) and the vaccine against Polio (OPV) are usually administered together. The first vaccination against DTP/DT and Polio – DTP_1/OPV_1 is scheduled at the age of three months. The second dose is due 45 days after the first, and the third dose 45 days later. At 18 months of age, a booster DTP and Polio (DTP_4/OPV_4) is given and at 20 months OPV_5.

The mean age of DTP V_1 (N=95) was 136.7 days or 4.6 months (SD 62.5, range 88-487). The mean age of OPV V_1 was slightly different; mean 137.2 days or 4.6 months (SD 62.5 days, range 88-487). The mean ages of vaccinations against DTP and Polio are presented in the table below (Table 3).

Table 3. Mean ages of vaccination against DTP/DT and Polio, NK, June-July, 2004

Type of Vaccines	Vaccinations							
	V_1 (N^1=95)		V_2 (N=95)		V_3 (N=95)		RV_1/V_4 (N_{DTP}=6, N_{OPV} =4)	
	M^2	R^3	M	R	M	R	M	R
DTP/DT	136.7	88-487	193.4	135-533	253.6	179-607	798.7	753-861
OPV	137,2	88-487	194,8	135-533	254,2	179-607	832,0	753-898

[1] N - number of observations
[2] M - mean age of vaccination
[3] R - range of ages

There was no significant difference between the city and regions in the coverage with DTP/DT and OPV vaccinations as well as in the timing of administration of these vaccines.

Out of 96 studied immunization cards, only one child was not vaccinated against DTP/OPV – and that was due to a permanent medical denial (cardiac failure). Thus, vaccination coverage in DTP/DT was 99.0 percent for $V_1+ V_2 + V_3$. For the 4th dose, due in 2004 for these subjects, the coverage was only 20%, confirming the impact of limited supplies mentioned in the qualitative assessment. A similar situation (14%) was observed for OPV.

Measles vaccination

The recent measles vaccine shortage did not impact this cohort who reached age one last year when supplies were adequate. Thus, the mean age of vaccination against measles (N=95) was 408.2 days or 13.6 months (SD 52.4, range 361-719 days or 12-24 months). Vaccination coverage for this vaccine was 99.0 percent. When comparing the mean age of measles vaccination in Stepanakert and regions, there was statistically significant difference as a result of utilization of different vaccination calendar. The mean age of measles vaccination in Stepanakert (N=21) was 386.9 days (12.9 months) with a range of 361-488 (SD 36.3), while in regions (N=74) the mean age was 414.3 days (13.9 months) with a range of 365-719 (SD 54.9), p = 0.03.

Mumps vaccination

Mumps is scheduled at 15 months of age according to the 2003 standard vaccination schedule. Out of 96 children only 2 were vaccinated against mumps. Both of them were vaccinated at 15 months. Thus, vaccination coverage constituted 2.1 percent. During the past few years, there was almost no supply of mumps vaccine in NK.

4.2.3. Telephone Survey

Overall, 75 complete interviews were conducted of which 52 were telephone interviews and 23 were face-to-face interviews. Understandably, most mothers could not recall either the date and/or the age of their child at the time of certain vaccination, or even the times he/she was vaccinated and the type of vaccine he/she received. Thus, the survey gave only a general picture of immunization system from parents' perspective as well as a sense of parents' attitude and willingness to vaccinate their children.

BCG and Hepatitis B (V_1)

Out of 75 participants, 73 (97.3%) were aware that their children were vaccinated at the maternity house/department. Of them, 69 (92.0 %) mentioned that BCG vaccination was administered, while 32 (42.7%) stated that their children were vaccinated against Tuberculosis (BCG) and Hepatitis B. Considering that Hepatitis B vaccination was implemented after July 2002, it becomes clear why less than half of the respondents were aware about it. Besides, this information provided a strong confirmation that BCG and Hepatitis B vaccinations were carried out at the maternity house/departments according to the adopted schedule. Based on parents' recall, BCG vaccination coverage could be considered as 97-98 percent.

Hepatitis B (V_2 and V_3)

Almost the same mothers (32 or 42.7%) stated that their children received the continuation of Hepatitis B vaccination (V_2, V_3) at their polyclinic/ambulatory. Meanwhile, 11 (14.7%) mothers stated that their children were not vaccinated against Hepatitis B at the policlinic/ambulatory, and 32 (42.7%) mothers did not know. None were sure about the child's age at the time of vaccination.

DTP/DT and OPV vaccination

Out of 75 respondents, 73 (97.3%) stated that their children got DTP/DT vaccination and 68 (90.7%) mentioned getting OPV. Very few mothers could recall the ages at which their children were vaccinated. Nevertheless, the mean ages of vaccinations recalled by these few mothers were surprisingly consistent with the figures obtained from the analysis of immunization cards: the mean age of DTP V_1 (N=20) was 4.5 months (SD 2.6, range 1-12 months). The mean age of OPV V_1 (N=9) was 4.4 months (SD – 2.1, range 1-8 months). For DTP V_2 (N=12) the mean age was 7 months and for DTP V_3 (N=9) 8 months. Similarly, for OPV V_2 (N=4) the mean age was 5.1 months, and for OPV V_3 (N=2) 8.5 months. According to parents' recall, vaccination coverage for DTP/DT and OPV vaccinations could be regarded as 97-98 percent for $V_1 + V_2 + V_3$.

Measles vaccination

Of all participants, 53 (70.7%) mentioned that their children were vaccinated against measles, while 10 (13.3%) stated the opposite and 16.0 percent did not know, thus creating an image of vaccination coverage with measles up to 75-78 percent. According to mothers' (N= 33) recall, the mean age of vaccination against measles was 11.7 months with a range of 3-18 months (SD 3.0).

Mumps vaccination

Nineteen mothers mentioned that their children were vaccinated against mumps (25.7%), another 37.8 percent stated that their children were not and 36.5 percent did not know. The mean age of vaccination against mumps, according to them, was 20.1 months. Considering the lack of Mumps vaccine in NK during the last years, these numbers cannot be considered as reliable.

Mothers' attitude towards vaccination

Almost all interviewees trusted vaccinations and the NK vaccination program. Most stated that they were not exactly aware about the types of vaccines administered to their children but always took the children to the health facility whenever they were called for vaccinations and were satisfied with vaccination process.

4.3. Main Findings

The main findings of the study are presented in the following topics separately for each type of vaccine.

BCG vaccination

BCG coverage is high, almost perfect (96.9%, Figure 1), and administered on time. Its ready availability and its administration in the maternity house (where most births occur) lead to this high rate.

Hepatitis B vaccination

Hepatitis B vaccination was implemented relatively recently. All children born after July 2002 were to be vaccinated. Hepatitis B vaccination, like BCG vaccination, had very high coverage: 95.3 percent of neonates/infants got vaccinated against Hepatitis B (Figure 1). The vaccination schedule with this vaccine was followed significantly better in Stepanakert than in the regions.

DTP/DT and OPV vaccination

During previous years, the supply of these vaccines was satisfactory. However, recently, namely during the past 5-6 months, the amount decreased sharply throughout NK. Considering this fact, it could be predicted that among the sample of children born in 2002, the coverage with the first three vaccinations of DTP/DT and Polio (V_1, V_2, V_3) would be relatively good as compared to the V_4 (first booster) with both vaccines and V_5 (second booster) with Polio (the latter two were to be administered to the children of this age during the time of vaccines shortage). Coverage dropped from 99.0% for doses one-three to 20% for dose 4. A similar trend was observed with OPV (97.9% declining to 13.3 %).

Measles vaccination

Measles vaccination was conducted satisfactorily both in Stepanakert and regions. There has been no shortage of this vaccine to date, but the adoption of MMR in Armenia is expected to change this fact shortly. Coverage is currently 99.0% percent.

Mumps vaccination

Considering very low supply of the mumps vaccine, 2.1 percent vaccination coverage was anticipated and observed in the data.

**Figure 1. Vaccination coverage in children born in 2002.
NK, July, 2004**
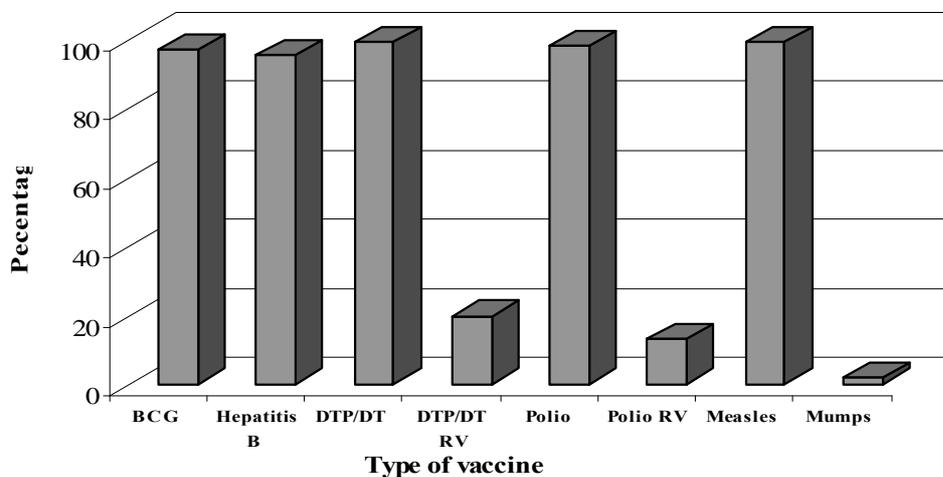
4.4. Conclusions and Recommendations

On the basis of the combined qualitative and quantitative findings, the following observations and recommendations are made:

- Vaccine preventable illnesses currently occur infrequently, as long as adequate supplies are available.
- The immunization system in NK is reasonably well developed and is functioning satisfactorily. Shortcomings include:
  - Poor national coordination of the vaccination schedule and process. Lack of vaccines, consumable supplies and/or other resources (vehicles, cold chain equipment, trained personnel, etc.) result in a fragmented regional approach to immunization, which is disruptive to the medical system and confusing to the general public.
  - Lack of a modern information/surveillance system. The information system tracking epidemiologic data, such as immunization coverage and disease outbreaks has not changed since the Soviet period. Computerization is needed to improve its efficiency/effectiveness.
  - Poor training of personnel of new vaccines (new MMR vaccine including).
  - Poor parental knowledge of the new immunization schedule and vaccines.
- Due to the lack of international recognition and the conflict with Azerbaijan, vaccines in NK are primarily delivered from the Center for Diseases Control and Prevention (CDCP) of the Republic of Armenia, which is itself supplied from UNICEF/Armenia. Armenia sometimes lacks timely/sufficient supplies to meet its own needs and only provides excess vaccines to NK

- Recently, the vaccine supply has sharply decreased (mainly due to technical delays of vaccine delivery from Armenia), resulting in substantial declines in coverage and, if not changed, may lead to serious outbreaks of controlled diseases among infants in NK:
    - Acceptable vaccination coverage should be no less than 90%
    - Coverage for the first six months of 2004 was half of what was expected
    - The DPT and MMR vaccines are in chronic short supply {MMR was added to the immunization schedule in 2004, but is not available in NK yet}
    - Challenges to maintaining the cold chain may result in ineffective vaccines and a false sense of coverage
- Mothers of children were satisfied with the vaccination process and followed health workers instructions. However, they were not aware about the time and type of vaccines administered to their children. Probably, it would be reasonable to implement immunization cards for parents, which they could keep at home. Such an approach could be considered as a form of parent education.

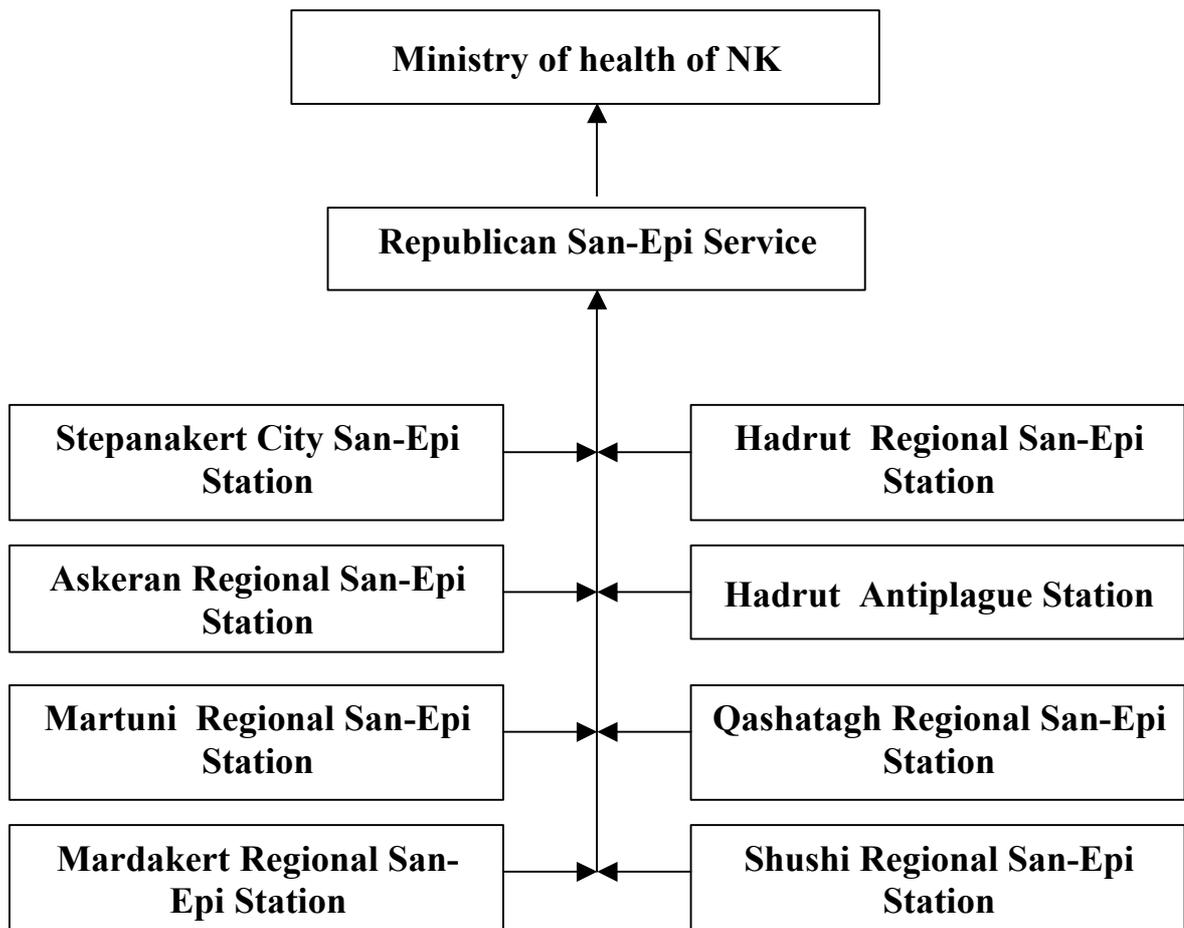To address these challenges the following recommendations are made:
- Find a stable source of vaccines and resources to procure them – other than excess supplies from Armenia. {Given the international political situation, this will require concerted effort by UNICEF, the WHO or other international governmental organizations or the involvement of private donors.}
- Ensure adequate resources are found to implement the MMR vaccine throughout NK in addition to the "traditional" vaccines.
- Provide refresher training to those involved in all levels of the immunization system.
- Improve the cold chain and vaccines logistics system (equipment for national and regional facilities, vehicles for transportation to/within NK, etc).
- Strengthen the immunization and vaccine preventable disease information system at national and regional levels, including implementation and utilization of immunization cards.
- Educate parents on the timing and importance of immunizations for their children. Before discharge from the maternity, consider giving mothers a parent-retained vaccination card for the newborn and some health counseling about the importance of timely coverage with vaccines.
- As most vaccines are available through UNICEF in 10-dose vials, order DPT and Polio vaccines for NK in 10-dose vials to avoid unnecessary vaccine losses.
- To restore the herd immunity against mumps, consider conducting a follow-up campaign against mumps, targeting children up to five years of age throughout NK.
- As a long-term goal, consider adding other "routine" immunizations as resources permit (e.g., Hepatitis A, Varicella).
- Provide equipment/supplies for a serological laboratory in Stepankert as resources permit.

In sum, the system is functioning exceedingly well within the constraints it faces. The recent declines in vaccine supplies will inevitably result in epidemics of otherwise preventable illness if this situation is not quickly reversed. Efforts need to be implemented to ensure the adequate supply of vaccines and to expand the scope of coverage to align with international standards (e.g., Hepatitis A, Varicella).

Appendices

Structure of the San-Epi service in NK

Ministry of health of NK

Republican San-Epi Service

Stepanakert City San-Epi Station	Hadrut Regional San-Epi Station
Askeran Regional San-Epi Station	**Hadrut Antiplague Station**
Martuni Regional San-Epi Station	**Qashatagh Regional San-Epi Station**
Mardakert Regional San-Epi Station	**Shushi Regional San-Epi Station**

Appendix 2

CHSR/ANMF PROJECT
Rapid assessment of the immunization situation in
Nagorno Karabagh

Immunization Card Review Form
(For children born in 2002)

A. Personal Data

1. Name _____   2. Date of birth_____

3. Address _____   4. Phone #   _____

B. Vaccination

Vaccine name	Vaccination	Age	Date	Dose	Medical Denial (date, reason)
5.BCG	Vaccination				
6.Hepatitis B	1. Vaccination I				
	2. Vaccination II				
	3. Vaccination III				
7.DPT/DT	1. Vaccination I				
	2. Vaccination II				
	3. Vaccination III				
	4. Revaccination I				
8.Polio	1. Vaccination I				
	2. Vaccination II				
	3. Vaccination III				
	4. Revaccination I				
	5. Revaccination II				
9.Measles	Vaccination				
10.Mumps	Vaccination				
11.Other					
12.Other					
13.Other					

CHSR/ANMF PROJECT
Rapid assessment of the immunization situation in
Nagorno Karabagh

Medical Record Review Form
(For children born in 2002)

A. Personal Data

2. Name _____   2. Date of birth_____

4. Address _____   4. Phone #   _____

B. Vaccination

Vaccine name	Vaccination	Age	Date	Dose	Medical Denial (date, reason)
5.BCG	Vaccination				
6.Hepatitis B	1. Vaccination I				
	2. Vaccination II				
	3. Vaccination III				
7.DPT/DT	1. Vaccination I				
	2. Vaccination II				
	3. Vaccination III				
	4. Revaccination I				
8.Polio	1. Vaccination I				
	2. Vaccination II				
	3. Vaccination III				
	4. Revaccination I				
	5. Revaccination II				
9.Measles	Vaccination				
10.Mumps	Vaccination				
11.Other					
12.Other					
13.Other					

CHSR/ANMF PROJECT
Rapid assessment of the immunization situation in NK

Parent Telephone Interview
(For children born in 2002)

INTRODUCTION (Please read the following introduction verbatim)

Hello, I am.........., from the Center for Health Services Research and Development of AUA. We are conducting research about immunization situation in NK.

Are you the parent of _____ born in 2002?

The immunization card of your child was selected by chance at your policlinic/ ambulatory. We have studied it and would like to clarify some issues. Can you spare me a few minutes?

Everything you tell me will be kept confidential and your name will not be attached to any written information/report. In addition, you do not have to respond to any question you do not wish to. May I continue?

1. Do you remember whether your child received any vaccination in Maternity House/Department where he was born?

    a. Yes ⟶ b. No   *Go to Q.3*

2. Were those:
    1. BCG?   a. Yes   b. No
    2. Hepatitis B? a. Yes   b. No

3. Did your child get vaccination against Hepatitis B at the policlinic/ambulatory?

    a. Yes ⟶ b. No   *Go to Q.5*

4. If yes, when? a._____, b. _____, c._____ (month, year)

(Please, mention the exact age of your child when he got the shot(s): _____, _____, _____)

5. Did your child get vaccination against tuberculosis (BCG) at the policlinic/ambulatory?

    a. Yes ⟶ b. No   *Go to Q.7*

6. If yes, when? _____(month, year)

(Please, mention the exact age of your child when he got the shot: _____)

7. Would you recall if he/she ever got vaccination against DPT/DT?

        a. Yes   ⟶ b. No   *Go to Q.9*

8. If yes, when? a._____, b._____, c._____ (month, year)

(Please, mention the exact age of your child when he got the shot(s): _____, _____, _____)

9. Do you remember if your child ever got vaccination against polio?

        a. Yes   ⟶ b. No   *Go to Q.11*

10. If yes, when? a._____, b._____, c._____, d._____ (month, year)

(Please, mention the exact age of your child when he got polio vaccine(s): _____, _____, _____, _____)

11. What about measles? Did he get vaccination against it?

        a. Yes   b. No   *Go to Q.13*

12. If yes, when? _____ (month, year)

(Please, mention the exact age of your child when he got the shot: _____)

13. Did your child get vaccination against mumps?

        a. Yes   b. No   *Go to Q.15*

14. If yes, when? _____ (month, year)

(Please, mention the exact age of your child when he got the shot: _____)

15. Do you have any concerns/suggestions to improve vaccination process at your policlinic/ambulatory?

_____

_____

THANK YOU VERY MUCH!

Appendix 5

CHSR/ANMF PROJECT
Rapid assessment of the immunization situation in
Nagorno Karabagh

GUIDE FOR IN-DEPTH INTERVIEWS WITH EPIDEMIOLOGIST

INTRODUCTION *(Please read the following introduction verbatim)*

Hello, I am............, from the Center for Health Services Research and Development (CHSR) of AUA. We are conducting interviews about immunisation situation in NK. This research is conducted with support of ANMF. The project seeks to investigate epidemiological situation in NK, emphasizing immunisation system, particularly vaccine procurement and distribution system, vaccine coverage and overall effectiveness of the system. Now we would like to better understand current situation and the needs of the system. May I ask you a few questions about these issues? Everything you tell me will be kept confidential and your name will not be attached to any written information/report. In addition, you do not have to respond to any question you do not wish to answer. Do you mind if we use tape recorder? May I continue?

A. Profile data

NAME: _____

AGE: _____

EDUCATION: _____

POSITION   _____

FOR HOW MANY YEARS HAVE YOU WORKED IN THIS POSITION: _____

OCCUPATION: _____

HOW MANY YEARS ALTOGETHER HAVE YOU WORKED IN HEALTH SYSTEM? _____

B. Epidemiological Situation in NK

I would like to ask you about epidemiological situation in NK.

3. How would you generally characterise epidemiological situation in NK? Have there been any outbreaks of infections in NK during the last year? If yes, what are the most common epidemics observed in NK?

4. What are the most common infectious diseases encountered in the following population groups in NK:
   - children under 5

    −   adolescents

    −   adults (men and women)

5. For which infectious diseases there is need to request for assistance outside of NK? And where do you usually refer? Could you please specify this for the most common infectious diseases?

C. Immunisation Situation in NK

6. What are the main sources of purchasing/getting vaccines?

7. Who is responsible for procurement, distribution and coverage of vaccines (percentage) and how is it done? (*Probe:* what percent of vaccine coverage would you assess as acceptable?).

8. Could you describe the standard vaccination schedule in NK? What are the positive and negative sides of this schedule? Is it implemented fully or partially? Why? What are the most common obstacles to its implementation (if any). What changes would you introduce in this schedule to improve it (if any)?

9. Are there any cases of delaying scheduled vaccination? If yes, what are the main reasons of delaying vaccination?

10. Does MOH coordinates San-Epi system activities in this area?

11. In general, how would you evaluate the effectiveness of immunization? How do you get information on vaccination coverage? Are there any on-going immunization monitoring mechanisms in the country? What are the main sources of information on this issue?

12. How Cold Chain System works? How would you evaluate it? Do you think the equipment for Cold Chain maintenance is sufficient/appropriate? (*Probe:* specify, what kind of equipment is lacking (freezers, refrigerators, Cold Chain Igloos)?).

13. To best assure immunization effectiveness does San-Epi system have enough quantity/type of vaccines? What vaccines are lacking (if any).

14. Do you think training of personnel is needed to assure adequate immunization/ preventive measures? If yes, what personnel, what topics should be included in the training?

15. As to you, what are the crucial needs to address to ensure the effective functioning of the immunization system in a whole?

16. **What suggestions/recommendations do you have for effective organization of immunization?**

THANK YOU FOR YOUR PARTICIPATION

CHSR/ANMF PROJECT
Rapid assessment of the immunization situation in
Nagorno Karabagh

GUIDE FOR IN-DEPTH INTERVIEWS WITH PEDIATRICIAN

INTRODUCTION *(Please read the following introduction verbatim)*

Hello, I am............, from the Center for Health Services Research and Development (CHSR) of AUA. We are conducting interviews about immunisation situation in NK. This research is conducted with support of ANMF. The project seeks to investigate epidemiological situation in NK, emphasizing immunisation system, particularly vaccine procurement and distribution system, vaccine coverage and overall effectiveness of the system. Now we would like to better understand current situation and the needs of the system. May I ask you a few questions about these issues? Everything you tell me will be kept confidential and your name will not be attached to any written information/report. In addition, you do not have to respond to any question you do not wish to answer. Do you mind if we use tape recorder? May I continue?

B. Profile data

NAME: _____

AGE: _____

EDUCATION: _____

POSITION   _____

FOR HOW MANY YEARS HAVE YOU WORKED IN THIS POSITION:

_____

OCCUPATION: _____

HOW MANY YEARS ALTOGETHER HAVE YOU WORKED IN HEALTH SYSTEM?

_____

B. Epidemiological Situation in Children.

I would like to ask you about epidemiological situation in children.

17. How would you generally characterise epidemiological situation in children? Have there been any outbreaks of infections in children during the last year? If yes, what are the most common epidemics observed in children?

18. For which infectious diseases does health care system in NK provide adequate and complete medical care?

19. For which infectious diseases there is need to request for assistance outside of NK? And where do you usually refer? Could you specify this for the most common infectious diseases?

C. Immunisation Situation in NK

20. What are the main sources of purchasing/getting vaccines?

21. Who is responsible for procurement, distribution and coverage of vaccines (percentage) and how is it done? (*Probe:* what percent of vaccine coverage would you assess as acceptable?).

22. Could you describe the standard vaccination schedule in NK? What are the positive and negative sides of this schedule? Is it implemented fully or partially? Why? What are the most common obstacles to its implementation (if any). What changes would you introduce in this schedule to improve it (if any)?

23. Are there any cases of delaying scheduled vaccination? If yes, what are the main reasons of delaying vaccination?

24. Does MOH coordinates San-Epi system activities in this area?

25. In general, how would you evaluate the effectiveness of immunization? How do you get information on vaccination coverage? Are there any on-going immunization monitoring mechanisms in the country? What are the main sources of information on this issue?

26. How Cold Chain System works? How would you evaluate it? Do you think the equipment for Cold Chain maintenance is sufficient/appropriate? (*Probe:* specify, what kind of equipment is lacking (freezers, refrigerators, Cold Chain Igloos)?).

27. To best assure immunization effectiveness does healthcare system have enough quantity/type of vaccines? What vaccines are lacking (if any).

28. Do you think training of personnel is needed to assure adequate immunization/ preventive measures? If yes, what personnel, what topics should be included in the training?

29. As to you, what are the crucial needs to address to ensure the effective functioning of the immunization system in a whole?

30. **What suggestions/recommendations do you have for effective organization of immunization?**

THANK YOU FOR YOUR PARTICIPATION

Appendix 7

CHSR/ANMF PROJECT
Rapid assessment of the immunization situation in
Nagorno Karabagh

GUIDE FOR IN-DEPTH INTERVIEWS WITH INFECTIONIST

INTRODUCTION *(Please read the following introduction verbatim)*

Hello, I am.............,from the Center for Health Services Research and Development (CHSR) of AUA. We are conducting interviews about immunisation situation in NK. This research is conducted with support of ANMF. The project seeks to investigate epidemiological situation in NK, emphasizing immunisation system, particularly vaccine procurement and distribution system, vaccine coverage and overall effectiveness of the system. Now we would like to better understand current situation and the needs of the system. May I ask you a few questions about these issues? Everything you tell me will be kept confidential and your name will not be attached to any written information/report. In addition, you do not have to respond to any question you do not wish to answer. Do you mind if we use tape recorder? May I continue?

C. Profile data

NAME: _____

AGE: _____

EDUCATION: _____

POSITION _____

FOR HOW MANY YEARS HAVE YOU WORKED IN THIS POSITION:

_____

OCCUPATION: _____

HOW MANY YEARS ALTOGETHER HAVE YOU WORKED IN HEALTH SYSTEM?

_____

B. Epidemiological Situation in NK

I would like to ask you about epidemiological situation in NK.

31. How would you generally characterise epidemiological situation in NK? Have there been any outbreaks of infections in NK during the last year? If yes, what are the most common epidemics observed in NK?

32. What are the most common infectious diseases encountered in the following population groups in NK:
    − children under 5
    − adolescents
    − adults (men and women)

33. For which infectious diseases does health care system in NK provide adequate and complete preventive and medical care?

34. For which infectious diseases there is need to request for assistance outside of NK? And where do you usually refer? Could you specify this for the most common infectious diseases? (*Probe*: Did you observe any complications as a result of infectious diseases, specify?)

35. What suggestions/recommendations do you have to effectively tackle infectious diseases?

THANK YOU FOR YOUR PARTICIPATION

Appendix 8

Medical Monitoring Ranges of Healthy Child Approved in 2003 by the MOH of NK

Pediatrician	Specialist	Vaccination	Laboratory test
At the Maternity House ***Home Visits*** 1-3 days after discharging from the Maternity House		BCG^7 and hepatitis B_1 24-48 hours after birth	
15 day old,1 month old			
Visits to the Polyclinic 1.5-2 month old		Hepatitis B_2	
3 month old	Neurologist, surgeon – orthopedist	DPT^8_1+OPV^9_1	
4.5 month old		DPT_2+OPV_2	
6 month old		DPT_3+OPV_3, Hepatitis B_3	
7 month old			
9 month old 10 month old			Blood test (Hb revealing)
12 month old	Neurologist, oculist, ENT specialist	Rubella	General blood and urine test
15 month old		Mumps	
18 month old		DPT_4+OPV_4	
20 month old		OPV_5	
2 year (24 month) old			General blood and urine test
3 year old	Oculist, ENT specialist		General blood and urine test for helminthiasis before the child is admitted to kindergarten
4 year old		Rubella (RV)	
5 year old			
6-7 year old	Dentist, neuropathologist, oculist, ENT specialist	BCG (TB)- RV DT_5+OPV_6	General blood and urine test for helminthiasis
Conduction of medical examination of a child over 7 years old once a year (by pediatrician)			
12 year old	Dentist		
14-15 year old	Neurologist, surgeon, oculist, ENT specialist, dentist	$DT-M_2$	General blood and urine test, other tests as needed

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[7] BCG – vaccination against TB
[8] DTP – vaccination against whooping cough, diphtheria, and tetanus
[9] OPV – Oral Polio Vaccine – vaccination against polio

Appendix 9

Medical Monitoring Ranges of Healthy Child

Pediatrician	Specialist	Vaccination	Laboratory test
At the Maternity House		BCG^{10} and hepatitis B_1 24-48 hours after birth	
Home Visits 1-3 days after discharging from the Maternity House at the age of 15 days, 1 month			
Visits to the Polyclinic			
1.5-2 month old		Hepatitis B_2	
3 month old	Neurologist, surgeon – orthopedist	DPT^{11}_1-OPV^{12}_1	
4-5 month old		DPT_2-OPV_2	
6 month old		DPT_3-OPV_3, Hepatitis B_3	
7-8 month old			
9-10 month old			Blood test (Hb revealing)
12 month old	Neurologist, oculist, ENT specialist	MMR^{13}_1	General blood and urine test
15 month old			
18 month old		DPT_4-OPV_4	
20 month old		OPV_5	
2 year (24 month) old			General blood and urine test
3 year old	Oculist, ENT specialist		General blood and urine test for helminthiasis before the child is admitted to kindergarten
6 year old		MMR_2 (RV)	
6-7 year old	Dentist, neuropathologist, oculist, ENT specialist	BCG (RV) $DT-M_1$+OPV_6	General blood and urine test for helminthiasis
Conduction of medical examination of a child over 7 years old once a year (by pediatrician)			
14-15 year old	Neurologist, surgeon, oculist, ENT specialist, dentist	$DT-M_2$	General blood and urine test, other tests as needed

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[10] BCG – vaccination against TB

[11] DTP – vaccination against whooping cough, diphtheria, and tetanus

[12] OPV – oral polio vaccine, vaccination against polio

[13] MMR – vaccination against measles, mumps, and rubella

Appendix 10

¹	Name and type of village health post	Number of children born in 2002
1.	Ashan (FAP) – Martuni region	16
2.	Avetaranots (SVA) – Askeran region	18
3.	Aygestan (FAP) – Askeran region	20
4.	Azokh (SVA) – Hadrut region	15
5.	Berdashen (Karaqend) (SVA) – Martuni region	20
6.	Chartar (SUB) – Martuni region	64
7.	Getavan (SUB) – Martakert region	64
8.	Haterq (SUB) – Martakert region	31
9.	Karmir Shuka (SVA) – Martuni region	24
10.	Mets Taghlar (FAP) – Hadrut region	43
11.	Sos (SVA) – Martuni region	23
12.	Togh (SVA) – Hadrut region	16
13.	Vaghuhas (FAP) – Martakert region	16
14.	Vanq (SUB) – Martakert region	34