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REACH
RESOURCES FOR CHILD HEALTH

Cold Chain Assessment for KPNLF and FUNCINPEC Immunization Program

Office of Khmer Affairs

December 10 - 23, 1991

JSI JOHN SNOW, INCORPORATED, 1616 N. FORT MYER DRIVE, ELEVENTH FLOOR, ARLINGTON, VIRGINIA 22209 USA
TEL: (703) 528-7474 • TELEX: 272896 JSIWUR • FAX: (703) 528-7480

COLD CHAIN ASSESSMENT FOR

KPNLF AND FUNCINPEC

IMMUNIZATION PROGRAM

December 12 - 23, 1991

Stephane Guichard
REACH Cold Chain and Logistics Advisor

Resources for Child Health (REACH) Project
1616 N. Fort Myer Drive, 11th Floor
Arlington, VA 22209

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ACRONYMS

BCG	Bacillus Calmette-Guérin (tuberculosis vaccine)
CNC	Cambodia non-Communist
DPT	Diphtheria-Pertussis-Tetanus
FUNCINPEC	Front Uni National Pour Un Cambodge Independant, Neutre, Pacifique et Cooperatie
K/O	Khmer Office
KPNLF	Khmer People's National Liberation Armed Forces
OPV	Oral Polio Vaccine
TT	Tetanus Toxoid

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The activities described in this report were undertaken in close cooperation with the USAID/Khmer Office in Bangkok and field offices in Aranyaprathet and Surin.

I. EXECUTIVE SUMMARY

Evaluation of Cold Chain needs for the KPNLF Immunization Program

Introduction

The Bantay Meanchey province in northwestern Cambodia is under the administrative control of KPNLF (non-Communist faction). On July 15, 1991 a survey was conducted within the Thnmar Puok sub-district which discovered extremely high morbidity and mortality rates among children. The population has never been immunized, therefore, KPNLF is in the process of planning a vaccination program for the district of Thnmar Puok. The target population is outlined below.

Children between the ages of 0 to 5 years old 16,615
Women of childbearing age 14,278

Children will be immunized for the prevention of the following diseases:

- Measles
- Tuberculosis
- Pertussis
- Polio
- Diphtheria
- Tetanus

Women of childbearing age will be immunized to prevent neonatal tetanus in their infants.

The objective of this mass campaign will be to achieve an immunization coverage of at least 80%.

Mass Campaign Workplan

The vaccination program will be undertaken in three cycles spaced over at least four weeks. Combined, the three cycles make up a "mass campaign". Each cycle should be conducted in four weeks. The mass campaign program will begin in early February. This will allow completion of three cycles before the onset of the rainy season in May and June during which time the roads become impassable.

The main sites and target populations for vaccination are:

Sub-district village	Number of villages	Target child population 0-5	Target women population
Thnmar Puok	9	2,107	1,802
Kouk Romiet	15	2,251	1,921
Beantey Chmar	8	1,693	1,444

Sub-district village	Number of villages	Target child population 0-5	Target women population
Phum Thmey	9	2,092	1,786
Treas	6	1,745	1,489
Phkoam	18	3,032	2,587
Ponley	7	2,735	2,430
Prasat Pheas	6	960	819
	TOTAL:	16,615	14,278

Human Resources

Forty persons, separated into four teams, are planned for this immunization program. However, it is the author's opinion that this number should be increased to at least six teams (see recommendations).

The vaccination teams will be based in the Thnmar Puok and Phkoam sub-districts.

Thmar Puok based teams will work in the following sub-district areas:

- Thmar Puok
- Kouk Romiet
- Beantey
- Phum Thmey
- Treas

Phkoam based teams will work in the following sub-district areas:

- Phkoam
- Ponley
- Prasat Pheas

General Approach

Regarding the target population to be served and the available human resources, the following vaccination material has been planned to conduct the KPNLF mass campaign program and also to guarantee a vaccine delivery system in proper condition.

Material Resources

Vaccine Storage

There are two main sites where the vaccines will be stored.

In Thmar Puok the entire quantity of vaccines will be stored in two electric refrigerators in the district hospital. A generator is available to supply electricity.

In Phkoam the vaccines will be stored in a cold box. The vaccines will be sent weekly from Thmar Puok to Phkoam. A second cold box will be provided to keep the ice pack for the vaccine carrier frozen.

Vaccine Transportation

The vaccines will be ordered from Merieux/Bangkok which is in charge of vaccine transportation from the capital to USAID field offices based in Aranyaprathet, Thailand (near the Thai/Cambodia border). Merieux follows the WHO standards for vaccine packaging. Vaccines will be kept overnight in the air conditioned USAID field office then be transported (in the same factory package) to Thmar Puok, two hours away, the next morning.

Each team will be provided with two vaccine carriers. A total of 12 vaccine carriers have been ordered. Four ice packs will be provided with each vaccine carrier and ten additional ice packs will be used for ice production management and spares.

TOTAL COLD CHAIN MATERIAL REQUEST
FOR KPNLF IMMUNIZATION PROGRAM

- 2 REFRIGERATORS SHARP MODEL 3J-399 FU
- 2 ELECTROLUX COLD BOXES - RCW 25
- 12 VACCINE CARRIERS
- 58 ICE PACKS
- 4 THERMOMETERS
- MONITORMARK

Evaluation of the Cold Chain needs for the FUNCINPEC Immunization Program

Introduction

The health department of FUNCINPEC has conducted several epidemiological investigations within their area. The goal of evaluating the population's state of health is to establish a plan for restructuring the medical program.

The FUNCINPEC Immunization Program will be conducted in the district of Ampil which is situated in Oddar Meanchey province in the northwestern part of Cambodia on the Thailand border.

Target Population for the FUNCINPEC Immunization Program

Target	Number
0 to 5 years old:	5,650
5 to 11 years old:	7,291
Women of childbearing age (18 - 45 years old):	4,713

The objective of this mass campaign is to achieve a minimum of 80% coverage of children under age 5, children age 5 - 11, and women of childbearing age.

Mass Campaign Workplan

The mass campaign is divided in three cycles. Each cycle corresponds to one dose of vaccine. The goal of 80% coverage of the target population is expected to be achieved in four weeks for each cycle. Each cycle will be spaced out at least four weeks.

Two main mass campaign stations will be set up at Ponk Tuk and Seung villages.

Station 1 will be based at Pong Tuk. This station will include the following sub-district villages and population:

Sub-district village	Number of villages	Target child population 0-5	Target child population 5-11	Target women population
Ampil	8	1081	1315	866
Kok Kpos	15	2987	3892	2552

Station 2 will be based at Seung. This station includes the following sub-district villages and population:

Sub-district village	Number of villages	Target child population 0-5	5-11	Target women population
Kok Morn	6	801	658	431
Kok a Lork	3	216	282	135
Beng	9	859	1114	729

Human Resources

This mass campaign will be organized by the Public Health team with the collaboration of the existing medical staff from each local dispensary and local authority. The vaccination program will be conducted by 13 teams, consisting of 12 people each.

The 13 teams will be distributed as below:

- 2 teams for Beng sub-district station 2
- 3 teams for Kok Khpos sub-district station 1
- 2 teams for Kok Mon sub-district station 2
- 2 teams for Ampil sub-district station 1
- 2 teams for Kbal Sar sub-district station 2
- 2 teams for Pong Ror, Choeung Tean, Kro Saing.

General Approach

Regarding the target population to be served and the available human resources, the following vaccination material has been planned to conduct the KPNLF mass campaign program and also to guarantee a vaccine delivery system in proper condition.

Material Resources

Two trucks should be available for vaccine and staff transportation.

1. Vaccine Storage

In terms of the cold chain, three vaccine storage stations have been planned. The entire quantity of vaccine will be stored in the Ban Pluang warehouse. The vaccines will be ordered for each immunization cycle.

Two refrigerators are needed, one at Ponk Tuk and one at Seung. Since electricity is not available at either station, generators will also be needed. Two generators are already available but they cannot run continuously for 24 hours a day. Consequently, two

generators are required per district -- one to run during the day and the other to run at night.

2. Vaccine Transportation

The vaccines will be delivered every two weeks from Ban Pluang warehouse to both stations. Three cold boxes will be needed.

TOTAL COLD CHAIN MATERIAL REQUEST
FOR FUNCINPEC IMMUNIZATION PROGRAM

- 4 REFRIGERATORS SHARP SJ-399 FU
- 3 ELECTROLUX COLD BOXES RCW 25
- 12 VACCINE CARRIERS
- 58 ICE PACKS *
- 4 5 KW GENERATORS
- 7 THERMOMETERS
- MONITORMARK

* Each vaccine carrier requires four ice packs. The 10 additional ice packs are for ice production management and use as spares.

II. PURPOSE OF VISIT

- Brief Dr. Omi and Alan Schnur of WHO/WPRO (1 day in Manila).
- Meet with USAID and Khmer officials, program staff; familiarize with program structure and constraints, staff capacities.
- Advise USAID and Khmer officials on appropriate service structure and equipment procurement to ensure integrity of cold chain.
- Identify related training needs and explore local resources which could be called upon to assist in a training program.
- Identify field-appropriate monitoring systems.

III. BACKGROUND

The Office of Khmer Affairs (O/KA) in Bangkok is responsible for a program of cross-border assistance to two Cambodia Non-Communist (CNC) factions in areas of western Cambodia under their administrative control. This assistance includes a comprehensive health program implemented by each of the two factions: FUNCINPEC in Oddar Meanchey province and the KPNLF in Banteay Meanchey province. These two provinces have been heavily impacted by Cambodia's two-decade-long civil war, and were historically

underserved even before the onset of civil strife. The population of these provinces is unimmunized. The present EPI program in Cambodia, implemented by the Phnom Penh government Ministry of Health does not extend to these areas because they are not under the administrative control of the Phnom Penh government.

Immunization has been identified as the top priority intervention and both the KPNLF and FUNCINPEC plan to conduct intensive mass immunization campaigns over 4-5 months commencing in late January to immunize children under age five and women of childbearing age.

The physical infrastructure in this area of Cambodia is very poor. There is no electricity and roads are bad and become completely impassable during the rainy season which begins in May and June.

IV. TRIP ACTIVITIES

Evaluation of the Cold Chain needs for KPNLF immunization program

Introduction

During a survey conducted by KPNLF within the Thmar Puok sub-district on July 15, 1991, it was discovered that the morbidity and mortality rates among children from birth to five years old were extremely high and that immunization-preventable diseases were a significant cause of morbidity and mortality. This population has never been immunized. Therefore a vaccination program was proposed to immunize the children under age five and woman of childbearing age (with TT) within the area under the administrative control of KPNLF.

Geographical Situation

The Thmar Puok district, which is controlled by KPNLF, is situated in Bantay Meanchey province in the northwestern part of Cambodia, approximately 30 minutes by car from the Thai border. The province is divided into three districts and nine subdistricts. The KPNLF's immunization program is concentrated in Thmar Puok district (Thmar Puok is a district, a sub-district and a town).

The climate is tropical with a rainy season from May to November and a dry season from November to May.

Demographic Situation

Target	Number
0 to 5 year-olds:	16,615
Women of childbearing age (18 - 45 years old):	14,278

Children between birth and five years will be immunized against measles, polio, tuberculosis, diphtheria, pertussis and tetanus. Women of childbearing age will receive tetanus toxoid vaccine.

Mass Campaign Workplan

The program will be undertaken in three cycles spaced out at least four weeks. The three cycles make up a mass campaign. Each cycle should be conducted in four weeks. The mass campaign program is planned to start in early February. The main sites where vaccination points will be set up are:

Sub-district village	Number of villages	Target child population	Target women population
Thmar Pouk	9	2,107	1,802
Kouk Romiet	15	2,251	1,921
Beantey Chmar	8	1,693	1,444
Phum Thmey	9	2,092	1,786
Treas	6	1,745	1,489
Phkoam	18	3,032	2,587
Ponley	7	2,735	2,430
Prasat Pheas	6	960	819
	TOTAL:	16,615	14,278

The objective of the mass campaign is to achieve a minimum of 80% coverage of children under age five and women of childbearing age.

Human Resources

Four teams of 10 people each are planned for this immunization program. However this number should be increased to at least six teams (see recommendations). Each team consists of:

Position	Number of personnel
Supervisor/Administrator	1
Vaccinator	4
Recorder	2
Driver	1
Emergency medical referral staff	2 (1 medic/1 nurse)

The areas chosen as sites will be centrally located to as many village as possible. Each woman and child will be given an immunization card (the same card now used in refugee camps). Each family will be advised of the importance of maintaining the card for future reference. Instructions will be given regarding the need to present the card for any future immunizations.

Vaccine Requirements

Vaccine		First contact	Second contact	Third contact
BCG		19,950	---	---
MEASLES		17,290	---	---
OPV	1	17,290	---	---
	2	---	17,290	---
	3	---	---	17,290
DPT	1	17,290	---	---
	2	---	17,290	---
	3	---	---	17,290
TT	1	14,850	---	---
	2	---	14,850	---

The calculations are detailed in Annex 1.

Material Resources

Four vehicles should be available for vaccine and staff transportation, but at the time this report is written, it is too early to have reliable data about the logistics system. In terms of the cold chain, two vaccine storage sites are planned.

Thmar Puok Vaccine Storage

The entire quantity of vaccine will be stored in Thmar Puok (district capital town). The storage volume needed is 356 liters. The Office of Khmer Affairs in Bangkok has already ordered and received four refrigerators, model Sharp SJ-399 FU. The main storage cabinet volume of each is 200 liters. Two of the refrigerators will be installed in Thmar Puok district hospital which has generator-supplied electricity.

Vaccine Transportation

Vaccines will be ordered from Merieux (Thailand). During this visit the general manager of Merieux gave a demonstration on how the vaccine is packed. The WHO standards for vaccine packaging were adhered to. With good insulation and the use of ice packs and dry ice, it was guaranteed that the vaccine will be safe for 35 hours without additional refrigeration. The delivery of vaccines to Thmar Puok is free of charge.

A cold box is not needed for the transportation from Bangkok to the USAID field office based at Aranyaprathet (near the Thai/Cambodia border). The vaccines will be delivered from Bangkok to Aranyaprathet (5 hours) and will be kept overnight in the air conditioned USAID field office. They will be transported (in the same package) to Thmar Puok (2 hours) the next morning.

The vaccination team will be based on Thmar Puok and Ponley sub-district. Thmar Puok based teams will work in the following sub-district areas:

- Thmar Puok
- Kouk Romiet
- Beantey Chmar
- Phum Thmey
- Treas

Phkoam based teams will work in the following sub-district areas:

- Phkoam
- Ponley
- Prasat Pheas

The vaccine for both bases will be stored at Thmar Puok in two refrigerators. The teams working out of Thmar Puok will take vaccines out in vaccine carriers and return at the end of each day.

Every week the vaccines will be sent to Phkoam in a cold box. The teams working out of Phkoam will establish a second storage point for vaccines using one-day cold boxes. An additional cold box will be necessary to keep ice packs for the vaccine carriers frozen.

Phkoam Vaccine Storage

Every week vaccines will be sent to Phkoam, Prasat Pheas and Ponley. The vaccine will be stored in a cold box based at Phkoam. A second cold box will be provided to store the ice packs for the vaccine carriers. Two vaccine carriers per team will be provided. There are 12 vaccine carriers. The vaccine carriers come from the factory with four ice packs and 10 additional packs will be provided for ice production management and as spares.

TOTAL COLD CHAIN MATERIAL REQUEST
FOR KPNLF IMMUNIZATION PROGRAM

- 2 REFRIGERATORS SHARP MODEL 3J-399 FU
- 2 ELECTROLUX COLD BOXES RCW 25
- 16 VACCINE CARRIERS
- 74 ICE PACKS
- 4 THERMOMETERS
- MONITORMARK

Evaluation of the Cold Chain needs for FUNCINPEC Immunization Program

Introduction

A health and community development program has been instituted in the FUNCINPEC administered areas to respond to community needs.

The Health Department's medical team has conducted several epidemiological investigations in these areas to evaluate the populations' state of health. The information ill be used to determine health priorities in the areas of prevention and curative care and to restructure the overall medical program.

Geographical Situation

The FUNCINPEC immunization program will be conducted in the Ampil District. It is situated in Oddar Meanchey province in the northwestern part of Cambodia near the Thailand border.

The district of Ampil (Ampil is district, sub-district and town) is subdivided into 5 sub-districts and 36 of 40 villages. The climate is tropical with a rainy season from May to November and a dry season from November to May. During the rainy season the roads become impassable.

Demographic Situation

Target	Number
0 to 5 year-olds:	5,650
5 to 11 year-olds:	7,291
Women of childbearing age (18 - 45 years old):	4,713

The objective of this mass campaign is to achieve a minimum of 80% coverage of children under 5 years old, 5 to 11 year-olds and women of childbearing age.

Mass Campaign Work Plan

The mass campaign is divided into three cycles. Each cycle corresponds to one dose. The goal of 80% coverage of the target population is expected to be achieved in four weeks for each cycle. Each cycle will be separated by at least four weeks.

Two main mass campaign stations will be set up in the villages of Ponk Tuk and Seung in order to ease operation and to keep the vaccines in safe condition.

Station 1 will be based at Pong Tuk. This station includes the following sub-district villages and population:

Sub-district village	Number of villages	Target child population 0-5	5-11	Target women population
Ampil	8	1081	1315	866
Kok Kpos	15	2987	3892	2552

Station 2 will be based at Seung. This station includes the following sub-district villages and target population:

Sub-district village	Number of villages	Target child population 0-5	5-11	Target women population
Kok Morn	6	801	658	431
Kok A Lork	3	216	282	135
Beng	9	859	1114	729

The FUNCINPEC warehouse based at Ban Pluang in Thailand (very close to the Thai/Cambodia border) will be used to keep the total amount of vaccine for each cycle and for both stations. Delivery of the vaccines from Bangkok to Ban Pluang and Bangkok to the KPNLF central store will be carried out in the same manner. The vaccines will then transferred from the Ban Pluang warehouse to refrigerators at station 1 and station 2 every two weeks. A cold box will be used for transporting the vaccines, and one vehicle will be allocated for transporting vaccines and staff. The teams will leave from the station early in the morning for the assigned village, with the vaccines packed in the vaccine carriers, and will return by afternoon. The recapitulative list of vaccines will be checked every day by the team. Vaccine monitor cards will be

inserted into the vaccine packages in Bangkok to monitor each vaccine package until it reaches the vaccine delivery point in the field. This will enable the team to determine the amount of time within which the vaccine can be sent to the field while still maintaining the cold chain.

Human Resources

This mass campaign will be organized by the Public Health team with the collaboration of existing medical staff from each local dispensary and local authority. The vaccination program will be conducted by 13 teams with 12 people per team. As of this writing we do not know with certainty the member category who will involve in each team.

The 13 teams will be distributed as below:

- 2 teams for Beng sub-district station 2
- 3 teams for Kok Khpos sub-district station 1
- 2 teams for Kok Mon sub-district station 2
- 2 teams for Ampil sub-district station 1
- 2 teams for Kbal Sar sub-district station 2
- 2 teams for Pong Ror, Choeung Tean, Kro Saing.

Vaccine Requirements

Station 1:

Vaccine	First contact	Second contact	Third contact
BCG	4890	----	----
Measles	4240	----	----
OPV	9680	9680	9680
DPT	4240	4240	4240
DT	5450	5450	5450
TT	3560	3560	

Station 2:

Vaccine	First contact	Second contact	Third contact
BCG	1900	----	----
Measles	1650	----	----
OPV	3790	3790	3790
DPT	1650	1650	1650
DT	2140	2140	2140
TT	1350	1350	

TOTAL VACCINES REQUEST FOR BOTH STATIONS

VACCINE	FIRST CONTACT	SECOND CONTACT	THIRD CONTACT
BCG	6790	-----	-----
MEASLE	5890	-----	-----
OPV	13470	13470	13470
DPT	5890	5890	5890
DT	7560	7560	7560
TT	4910	4910	

The calculations are detailed in Annex 2.

Material Resources Requested

Two trucks should be available for vaccine and staff transportation. Three vaccine storage stations are planned to maintain the cold chain.

Ban Pluang Vaccine Storage

The entire quantity of vaccine will be stored in the Ban Pluang warehouse. Vaccines will be ordered for each immunization cycle.

Storage volume needed is 255 liters. Two Sharp SJ-399 FU refrigerators are needed and are available in the O/KA warehouse.

Vaccine Transportation

Vaccines will be delivered every two weeks from the Ban Pluang warehouse to both stations. Storage volume needed is 55 liters: 39 liters for station 1, 16 liters for station 2.

Three Electrolux RCW 25 cold boxes will be needed (vaccine storage capacity 22 liters each), two cold boxes for delivery to station 1 and one cold box for delivery to station 2.

Station 1 (Ponk Tuk) and Station 2 (Seung) vaccine storage

Station 1

Vaccine storage volume needed is 65 liters. One refrigerator is needed. Electricity is not available at Ponk Tuk. Two generators will be provided. One will run during the day and the other one at night. These generators are in stock but too small to provide electricity constantly for 24 hours.

Station 2

Vaccine storage volume needed is 62 liters. One refrigerator is needed. Two generators will be provided for the same reason as above.

TOTAL COLD CHAIN MATERIAL REQUEST
FOR FUNCINPEC IMMUNIZATION PROGRAM

- 4 REFRIGERATORS - SHARP SJ-399 FU
- 3 ELECTROLUX COLD BOX - RCW 25
- 12 VACCINE CARRIERS
- 58 ICE PACKS *
- 4 GENERATORS - 5 KW
- 7 THERMOMETERS
- MONITORMARK

* Each vaccine carrier is provided with four ice packs. The 10 additional ice packs are for ice production management and spares.

V. RECOMMENDATIONS

R1. The KPNLF vaccination program has been planned based on a four-week schedule. The health workers will work seven days per week, therefore the total number of working days is 28 per cycle. To reach 80% of the target population, 24,715 contacts

(women and children) per cycle are required. If each team carries out 150 contacts per day, the four teams could reach 600 people per day. In 28 days they will have vaccinated, for the first dose, 16,800 of the target population. In order to meet the objective at least six teams will be necessary.

R2. The assessment of necessary volume for vaccine transportation has been calculated using WHO estimates for average storage volume for each vaccine. The required volume per dose is calculated on the following basis: 1) divide the number of doses which are included in the package by the volume of the vaccine package. Unfortunately, the vaccine packages are not standardized. In case this volume should be underestimated, we can remove the vaccine vials from their package and put them in bulk in the cold box. However it is recommended that TT and DPT be kept in packaging because they can be damaged if the vials come in contact with ice packs (TT and DPT are destroyed if the temperature is below -3ºC). The vaccine vial package should be kept. It is much easier to arrange the vaccine vials in a refrigerator if the vials are in their own package.

R3. It would be useful to provide a training course to the healthworkers before the first mass campaign. A majority of them have never been involved in an immunization program. Strengthening their knowledge about vaccine sensitivity and cold chain criteria choice could contribute to a reliable cold chain system.

R4. It would be useful for the health workers to have a follow-up of their daily activities in using the graph of vaccination coverage as represented in Annex 3.

R5. The solvents for BCG and Measles do not need to be kept at a temperature between 0ºC - 8ºC. However they must be cold before being placed in a cold box or vaccine carrier, otherwise the interior temperature of the cold box will increase rapidly and defrost the ice packs.

R6. The use of vaccine Monitormark cards is recommended from the top to the bottom of the cold chain to continuously evaluate whether it is being maintained properly.

VI. FOLLOW-UP

A training course on establishing and maintaining the cold chain has been requested by the Health Department of KPNLF and FUNCINPEC. The following scope of work is suggested.

-- Conduct on-site training of staff in proper use of cold chain equipment.

-- Conduct on-site training of staff in monitoring the cold chain including temperature recording and the use of Monitormark cards.

-- Train the technical staff counterpart in resolving problems with vaccine storage and transport as they arise, in preparation for ongoing vaccination program.

-- Train the technical staff counterpart in collecting data to conduct an evaluation of cost per dose for the mass campaign.
In addition to the CNC cross-border program, USAID supports the EPI program through grants to UNICEF, NGOs and IO's in 12 provinces where the majority of the Cambodia's population resides. This USAID support program began in September 1990 and covers procurement of vaccines and peripheral supplies, cold chain equipment, technical staff and training. There have been numerous conflicting reports regarding the adequacy of the cold chain in this program. USAID would need the assistance of a cold chain expert in assessing technical aspects related to cold chain equipment and procedures.

If requested by USAID, this assignment could be conducted in addition to the KPNLF and FUNCINPEC program. The contractor could travel to Phnom Penh and review the adequacy of the national EPI cold chain. A preliminary scope of work has been suggested:

A. Determine whether the cold chain is adequately maintained:

- during transport of vaccines from the point of manufacture to central store in Phnom Penh;
- at central store in Phnom Penh;
- during transport from the central store to the provincial stores;
- at provincial storage points;
- in transport from the provinces to the districts;
- at district facilities;
- in transport from district to subdistricts and villages;
- in the course of vaccine administration in villages.

The contractor shall comment on the adequacy of equipment used and measures taken at each level of the cold chain system and, where problems are identified, suggest remedial measures.

B. Determine if cold chain equipment being used is the most appropriate for local conditions, taking into account physical conditions (roads, lack of electricity), repair and maintenance capabilities in-country, training levels of workers. Suggest changes as required.

C. Determine if staff at various levels have adequate training and understanding of cold chain principles. Identify deficiencies and recommend additional training needs.

D. Determine if there an effective system in place to monitor the cold chain. Make recommendations as indicated.

E. Determine if UNICEF's project staffing and procedures are adequate for monitoring and technical oversight of the cold chain. Make recommendations as indicated.

In order to complete this scope of work, a work period of 90 days would be required.

TOTAL VACCINE NEED FOR KPNLF "MASS CAMPAIGN"

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
MEASLES	1	1.30	16615	13292	17290
BCG	1	1.50	16615	13292	19950
POLIO	3	1.30	16615	13292	51870
DTP	3	1.30	16615	13292	51870
TT	3	1.30	14278	11422	44550

EVALUATION OF THE VACCINE STORAGE VOLUME IN REFRIGERATOR
THE VACCINE WILL BE ORDERED FOR EACH MASS CAMPAIGN

VACCINE	TOTAL DOSES	CM3/DOSE	VOLUME OF VACCINE	COEFFICIENT FOR REFRIGE	STORAGE VOLUME
MEASLES	17290	3	51.870	2	103.74
BCG	19950	1	19.950	2	39.90
POLIO	17290	1.5	25.935	2	51.87
DTP	17290	2.5	43.225	2	86.45
TT	14850	2.5	37.125	2	74.25
			TOTAL STORAGE VOLUME		356 LIT

EVERY WEEK WE SEND VACCINES TO IMMUNIZE THE CHILD AND THE WOMAN OF PHKOAM. PRASAT PHEAS AND PONLEY. THE VACCINE WILL BE STORED IN A COLD BOX BASED AT PONLEY. A SECOND COLD BOX WILL BE PROVIDED TO KEEP THE NEED ICE PACKS FOR THE VACCINE CARRIERS THE BELOW CALCUL IS TO EVALUATE THE NECESSARY VACCINE VOLUME FOR THE COLD BOX THAN WIL BE BASED AT PONLEY.

VACCINE	TOTAL DOSES	CM3/DOSE	VOLUME OF VACCINE	COEFFICIENT FOR REFRIGE	STORAGE VOLUME
MEASLES	7000	3	5.250	1.20	6.30
BCG	8080	1	2.020	1.20	2.42
OPV	7000	1.5	2.625	1.20	3.15
DTP	7000	2.5	4.375	1.20	5.25
TT	6070	2.5	3.794	1.20	4.55
			TOTAL STORAGE VOLUME		22 LITERS

VACCINE NEED FOR THE FIRST "CONTACT"

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
MEASLES	1	1.30	16615	13292	17290
BCG	1	1.50	16615	13292	19950
POLIO	1	1.30	16615	13292	17290
DTP	1	1.30	16615	13292	17290
TT	1	1.30	14278	11422	14850

VACCINE NEED FOR THE SECOND "CONTACT"

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
POLIO	1	1.30	16615	13292	17290
DTP	1	1.30	16615	13292	17290
TT	1	1.30	14278	11422	14850

VACCINE NEED FOR THE THIRD "CONTACT"

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
POLIO	1	1.30	16615	13292	17290
DTP	1	1.30	16615	13292	17290
TT	1	1.30	14278	11422	14850

TOTAL VACCINE NEED FOR FUNCIPEC "MASS CAMPAIGN"
STATION 1

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
MEASLES	1	1.30	4068	3254	4240
BCG	1	1.50	4068	3254	4890
OPV	3	1.30	9305	7444	29040
DTP	3	1.30	4068	3254	12720
DT	3	1.30	5237	4190	16350
TT	3	1.30	3418	2734	10680

EVALUATION OF THE VACCINE STORAGE VOLUME FOR REFRIGERATOR
THE VACCINE WILL BE ORDERED FOR EACH MASS CAMPAIGN
STATION 1

VACCINE	TOTAL DOSES	CM3/DOSE	VOLUME OF VACCINE	COEFFICIEN FOR REFRIG	STORAGE VOLUME
MEASLES	4240	3.00	12.720	2.00	25.44
BCG	4890	1.00	4.890	2.00	9.78
OPV	9680	1.5	14.520	2.00	29.04
DTP	4240	2.5	10.600	2.00	21.20
DT	5450	2.5	13.63	2.00	27.25
TT	3560	2.5	8.900	2.00	17.80
			TOTAL STORAGE VOLUME	130.51	LITERS

EVALUATION OF THE VACCINE TRANSPORTATION VOLUME FOR COLD BOX
STATION 1

VACCINE	TOTAL DOSES	CM3/DOSE	VOLUME OF VACCINE	COEFFICIEN FOR REFRIG	STORAGE VOLUME
MEASLES	4240	3.00	12.720	1.20	15.26
BCG	4890	1.00	4.890	1.20	5.87
OPV	9680	1.5	14.520	1.20	17.42
DTP	4240	2.5	10.600	1.20	12.72
DT	5450	2.5	13.63	1.20	16.35
TT	3560	2.5	8.900	1.20	10.68
			TOTAL STORAGE VOLUME	78.31	LITERS

VACCINE NEED FOR THE FIRST "CONTACT"
STATION 1

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
MEASLES	1	1.30	4068	3254	4240
BCG	1	1.50	4068	3254	4890
OPV	1	1.30	9305	7444	9680
DTP	1	1.30	4068	3254	4240
DT	1	1.30	5237	4190	5450
TT	1	1.30	3418	2734	3560

VACCINE NEED FOR THE SECOND "CONTACT"
STATION 1

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
OPV	1	1.30	9305	7444	9680
DTP	1	1.30	4068	3254	4240
DT	1	1.30	5237	4190	5450
TT	1	1.30	3418	2734	3560

VACCINE NEED FOR THE THIRD "CONTACT"
STATION 1

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
OPV	1	1.30	9305	7444	9680
DTP	1	1.30	4068	3254	4240
DT	1	1.30	5237	4190	5450
TT	1	1.30	3418	2734	3560

EACH "MASS CAMPAIGN" IS EXPECTED TO BE CONDUCTED
ON FOUR WEEKS
THE VACCINE STOCK WILL BE FOR TWO WEEKS, HENCE
WE DIVISE THE VOLUME BY TWO

Annex 2

TOTAL VACCINE NEED FOR FUNCIPEC "MASS CAMPAIGN"
STATION 2

VACCIN	NUMBER DOSE	%WASTAGE	POPULATIO	POPULATION REACHED	TOTAL DOSES
MEASLES	1	1.30	1582	1266	1650
BCG	1	1.50	1582	1266	1900
OPV	3	1.30	3636	2909	11370
DTP	3	1.30	1582	1266	4950
DT	3	1.30	2054	1643	6420
TT	3	1.30	1295	1036	4050

EVALUATION OF THE VACCINE STORAGE VOLUME FOR REFRIGERATOR
THE VACCINE WILL BE ORDERED FOR EACH MASS CAMPAIGN
STATION 2

VACCINE	TOTAL DOSES	CM3/DOSE	VOLUME OF VACCINE	COEFFICIEN FOR REFRIG	STORAGE VOLUME
MEASLES	1650	3	4.950	2	9.90
BCG	1900	1	1.900	2	3.80
OPV	11370	1.5	17.055	2	34.11
DTP	4950	2.5	12.375	2	24.75
DT	6420	2.5	16.05	2	32.1
TT	4050	2.5	10.125	2	20.25

TOTAL STORGE VOLUME 124.91 LITERS

EVALUATION OF THE VACCINE TRANSPORTATION VOLUME IN COLD BOX
STATION 2

VACCINE	TOTAL DOSES	CM3/DOSE	VOLUME OF VACCINE	COEFFICIEN FOR REFRIG	STORAGE VOLUME
MEASLES	1650	3	4.950	1.2	5.94
BCG	1900	1	1.900	1.2	2.28
OPV	3790	1.5	5.685	1.2	6.82
DTP	1650	2.5	4.125	1.2	4.95
DT	2140	2.5	5.35	1.2	6.42
TT	1350	2.5	3.375	1.2	4.05

TOTAL STORGE VOLUME 30.462 LITERS

VACCINE NEED FOR THE FIRST CONTACT
STATION 2

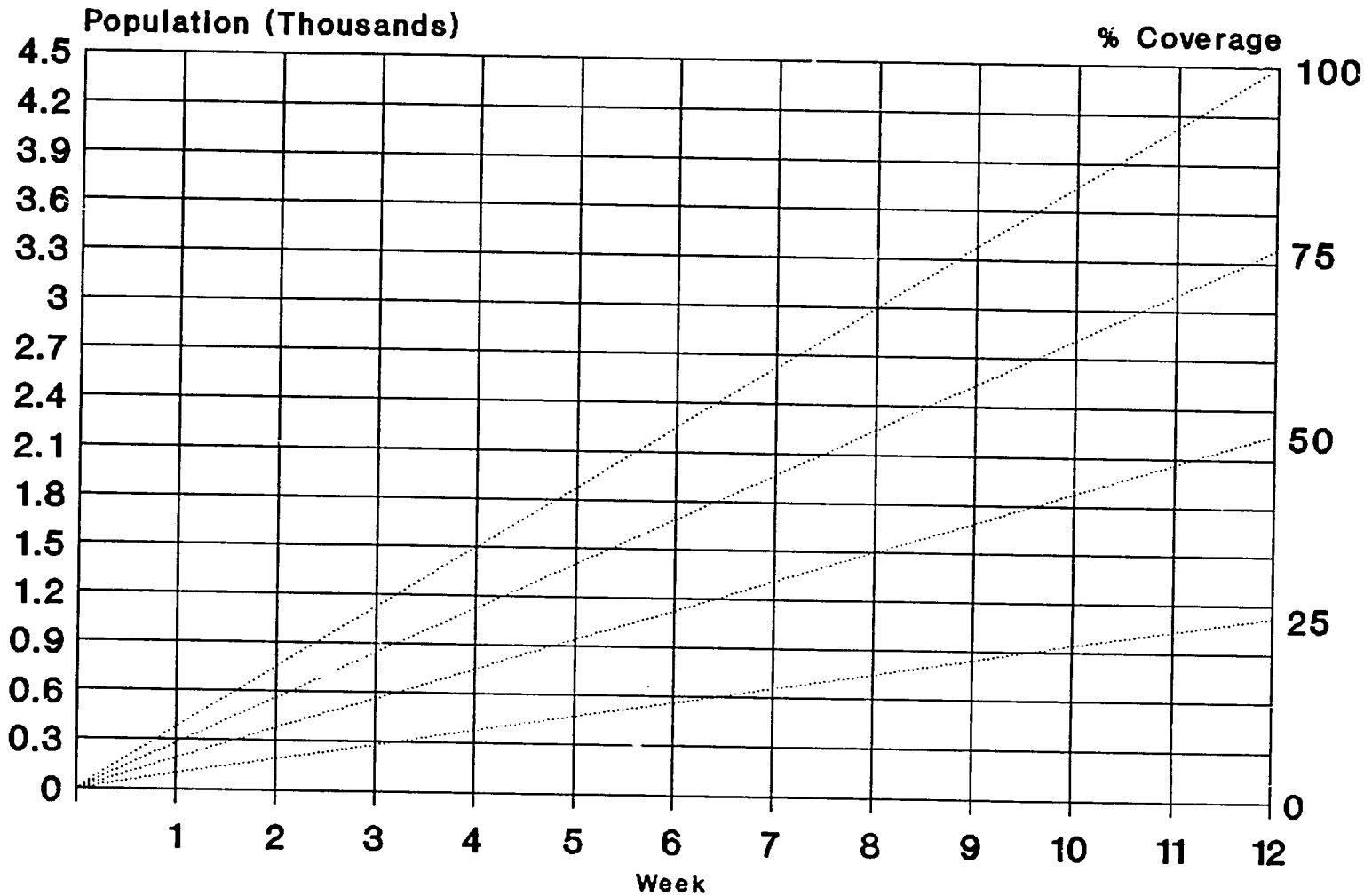
VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
MEASLES	1	1.30	1582	1266	1650
BCG	1	1.50	1582	1266	1900
OPV	1	1.30	3636	2909	3790
DTP	1	1.30	1582	1266	1650
DT	1	1.3	2054	1643	2140
TT	1	1.30	1295	1036	1350

VACCINE NEED FOR THE SECOND CONTACT
STATION 2

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
OPV	1	1.30	3636	2909	3790
DTP	1	1.30	1582	1266	1650
DT	1	1.3	2054	1643	2140
TT	1	1.30	1295	1036	1350

VACCINE NEED FOR THE THIRD CONTACT
STATION 2

VACCIN	NUMBER OF DOSE	%WASTAGE	POPULATION	POPULATION REACHED	TOTAL DOSES
OPV	1	1.30	3636	2909	3790
DTP	1	1.30	1582	1266	1650
DT	1	1.3	2054	1643	2140
TT	1	1.30	1295	1036	1350

EACH CONTACT IS EXPECTED TO BE CONDUCTED
ON FOUR WEEKS
THE VACCINE STOCK WILL BE FOR TWO WEEKS, HENCE
WE DIVISE THE VOLUME BY TWO

Valla Chart
Template