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THE COLD CHAIN IN ZAMBIA

March 30 - April 12, 1996

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ACRONYMS

BASICS	Basic Support for Institutionalizing Child Survival
DPT	diphtheria, pertussis, tetanus
E.C.	European Community
ILR	ice-lined refrigerator
JICA	Japanese International Cooperation Agency
MOH	Ministry of Health
NIDs	national immunization days
ODA	Overseas Development Agency (ODA)
OMS	Old Central Medical Store
OPV	oral polio vaccine
UCI	universal childhood immunization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VVM	vaccine vial monitor
WHO	World Health Organization

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I. EXECUTIVE SUMMARY

A BASICS technical officer visited Zambia between 30 March and 12 April 1996, to work with the Ministry of Health in determining an appropriate approach for assessing the current cold chain system and for identifying urgent cold chain issues affecting the polio national immunization days (NIDs) scheduled for July and August 1996. During these two weeks the technical officer met with staff from the UCI/MOH Secretariat, UNICEF, USAID, ODA, and WHO. He also visited the central cold storage facilities and several health facilities in Lusaka and Kabwe District.

The Zambia immunization program has experienced staff at national and local levels; a long established national cold chain and infrastructure for delivering immunizations; adequate cold storage capacity at central, district, and health facility levels; and experience in conducting immunization campaigns. However, the capacity to manage the immunization program has been weakened over the years due to the reduction in operational staff at the central level. Policies and responsibilities at national, provincial, and district levels have become unclear as a result of decentralization, years of administrative changes, and staff turnover. Discussions with MOH staff and a report by UNICEF in 1995 indicate that the reliability of the cold chain has deteriorated as well.

To ensure that this years NIDs are effective, the following actions are recommended:

- The central UCI Secretariat and UNICEF should closely monitor the incoming vaccine shipments and the distribution rate to ensure that cold storage space at the central level will be adequate when the NID OPV arrives.

- Micro planning must emphasize the availability of frozen ice packs for transporting vaccines and for supporting immunization outreach sites during the week of the NIDs.

- Districts should accelerate efforts to repair broken refrigerators which are needed for the NIDs.

- Regular supervision and monitoring over NID preparatory activities in the districts must be maintained by MOH staff.

To promote sustainability of the cold chain, the MOH needs to revise and document their policies and procedures on cold chain maintenance and repair in accordance with the changes resulting from decentralization, and according to available resources. A long-term plan for maintaining and repairing cold chain equipment, including solar refrigeration systems, needs to be developed. User training on basic refrigerator maintenance should be incorporated in any opportunities for inservice training for health workers.

A nationwide assessment of the cold chain will be costly and time consuming. However, some information is already available through the national inventory of cold chain equipment in 1995 and a report by a UNICEF logistics consultant in 1995. To help formulate new strategies for sustaining the cold chain and to better define user training needs, a provincial-level assessment applying a sampling of health facilities should be carried out. The assessment should be conducted after this year's NIDs. The cold chain assessment should also be used as an opportunity for on-the-job training for MOH staff in identifying and solving problems in the field.

II. PURPOSE OF VISIT

The purpose of this visit was to work with the Ministry of Health, UNICEF, and USAID to determine an appropriate approach for assessing the cold chain in Zambia. The second phase in this assignment will be to conduct the actual assessment during a subsequent visit. The current visit also included defining immediate cold chain issues affecting the mass immunization campaign for polio vaccine (OPV) scheduled for July and August 1996.

III. BACKGROUND

Zambia is divided into 9 provinces and 61 districts and has an estimated population of 9.1 million. According to projections from the 1990 census, the total under-5-year-old population is currently estimated at 1,626,155. In 1992, the under-5 mortality rate was estimated at 191 per 1000. Since 1992, the MOH has been working toward decentralizing management and budget responsibilities. Although considerable attention has been directed at planning decentralization, planning activities have been centrally orchestrated and little has been done to build district systems or technical capacity. As a result, the districts are unprepared to manage or deliver health care services effectively or efficiently.[1]

The USAID/Zambia portfolio includes a $26.5 million, eight year child health project to "increase coverage and quality of promotive, preventive, and curative activities that contribute to child health." This project is designed to assist the Zambian government with their health reform process. USAID also has two family planning projects and an HIV/AIDS prevention project.

Zambia's universal childhood immunization (UCI) program is the oldest and best developed child survival activity in the country.[2] By 1991, the program had achieved 76 percent reported national immunization coverage for OPV3, DPT3, and measles vaccines for children below the

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[1] "Strengthening of Technical Capacity At District Level," draft trip report, C. Hasselblad, November 1994.

[2] "Zambia Child Health Project," draft project paper (no 611-0237) USAID, April 1995.

age of 1 year. Although reported immunization coverage declined in 1993, 1994 levels recovered, ranging from 86 percent to 100 percent for the EPI vaccines.

The central cold store for vaccine storage is located in the Old Medical Stores (OMS) of the MOH. Cold storage capacity includes one walk-in cold room (Huure, 17.2 m^3) installed in 1990; one walk-in cold room (Foster, 2.5m x 1.6m x 1.09m) installed in approximately 1982; and 14 freezers (Vestfrost SB 300 or 400). In addition, there is a cold room (Huure, 17.2 m^3, 1992) located at a commercial cargo warehouse at the international airport which belongs to the MOH. All of the cold rooms have back-up generators. The older cold room at the OMS and the unit at the airport are used only for short-term, back up storage. There are four refrigerated vans for transporting vaccines, three in the provinces and one at the central level.

According to UCI policy, each province should be equipped with at least one ice-lined refrigerator (ILR), one chest freezer, four Electrolux RCW 25 cold boxes, and a back-up generator. Each district is supposed to have three ILRs and two RCW 25 cold boxes. There are reportedly 1,059 refrigerators in health facilities throughout the country, including facilities belonging to missionaries or concessions. Approximately 700 of these refrigerators are absorption models run on kerosene. The most frequent model found in health units is the Electrolux RCW 42 EK. Each health facility with a refrigerator should have two vaccine carriers.

Centrally the core staff at the UCI secretariat consists of the EPI desk officer, the UCI logistics officer, the UCI cold chain technician, and one cold chain assistant. There is also a computer operator who assists the UCI and other MOH programs. The UCI logistics officer is responsible for vaccine/supply management and logistics. The UCI cold chain technician repairs equipment which has been brought to the OMS, and is also responsible for training provincial and district cold chain technicians. One senior-level MOH staff member and two public health nurses from Lusaka Municipality have been seconded to the UCI to assist with NID preparations at the national level.

Each province has a cold chain technician who is responsible for repairs and supervision over the cold chain in each district. Each district should have two cold chain technicians who are responsible for maintenance and minor repairs of cold chain equipment in the district. Not all the district cold chain technician posts are filled. Transportation for immunization support staff at all levels is a major problem, both in terms of availability and bureaucratic procedures to obtain a vehicle and per diem.

As a major step toward the eradication of polio, the MOH will conduct its first NIDs between 19 - 20 July and 23 - 24 August 1996. During each round all children below age 5 years are targeted to receive a single dose of oral polio vaccine (OPV). Thus, during 1996, each child should receive two supplemental doses of OPV in addition to their routine required immunizations. The estimated target population for this effort is 1,626,155. The primary object of the NIDs is to interrupt the transmission of wild polio virus in Zambia. The NIDs are also intended to raise

community awareness about immunization in general, increase knowledge among health workers about polio eradication, strengthen interagency coordination among the partners for immunization, and improve social mobilization.

According to the NID plan, OPV will be given through vaccination posts and, in sparsely populated areas without health services, through house to house immunization. The MOH estimates that 23 percent of the total NID OPV immunizations will be given by house to house delivery. Vaccination teams will include trained health workers who will be assisted by volunteers. Three committees have been formed at the nation level to plan and implement the NIDs: social mobilization, vaccine delivery, and monitoring/evaluation. BASICS/Zambia is a member of the vaccine delivery committee. The MOH NID coordinator leads the effort to prepare for the NIDs.

IV. TRIP ACTIVITIES

During these two weeks, the BASICS technical officer met staff from the UCI/MOH Secretariat, UNICEF, USAID, ODA, and WHO. The names of the persons met are in Appendix A. The technical officer attended a one day NIDs national planning session for the MOH UCI Secretariat and staff from the University Teaching Hospital. This planning session was led by the WHO/CDC polio eradication regional epidemiologist who is based in Nairobi.

The technical officer also spent time at the UCI Secretariat with the UCI cold chain technician and the UCI logistics officer reviewing the central cold storage facilities and records, and getting background information on the Zambian health care system and the cold chain. He visited several health facilities in Lusaka, the cold store for Central Province in Kabwe, the Kabwe District cold store, and several health facilities in Kabwe District. He also entered and analyzed cold chain inventory data on 26 of the 61 districts (43 percent). These data were copied into the UCI computer for future use in their Epi Info program (C:\epi6\zamfrige.rec, zamfrige.qes).

During the second week of this visit, the NID coordinator and the EPI desk officer were in Nairobi for a WHO NID planning meeting. As a result, the technical officer was not able to debrief key MOH operational staff on the outcome of this visit. Briefing notes were left for the BASICS office, the MOH/UCI, and USAID (see Appendix B). The documents reviewed are listed in Appendix C.

V. RESULTS AND CONCLUSIONS

Many of the problems with the cold chain and logistics systems in Zambia are the same problems confronting the MOH as a whole. The number of MOH operational staff at the central level is inadequate. Policies and responsibilities at national, provincial, and district levels have become unclear as a result of decentralization, years of administrative changes, and staff turnover; travel

by government staff for supervising and monitoring field activities is infrequent due to long bureaucratic delays in getting authorizations and funds.

The range of donor assistance to Zambia complicates the management, distribution, and standardization of UCI supplies and equipment. Some donors bypass the central MOH and allocate equipment directly to the districts, and in some cases, directly to health facilities. As a result, existing equipment inventories are unreliable in terms of distribution and allocation is unbalanced. Immediate cold chain issues for the NIDs and long-term issues concerning the sustainability of the cold chain follow.

A. National Immunization Days

1. For conducting NIDs, the Zambia UCI has the advantages of: experienced staff at national and local levels; a long established national cold chain and infrastructure for delivering immunizations; adequate cold storage capacity at central, district, and health facility levels; and experience in conducting immunization campaigns.

2. Potential cold storage space is adequate at the central level for incoming NID OPV, but at the time of this visit nearly all storage space was occupied with the routine vaccine supply. If such a large central stock exists when the NID OPV arrives (approximately 2,000,000 doses in July and another 2,000,000 doses in August), UCI central cold storage space will not be adequate. According to UNICEF in Lusaka, the following routine shipments are anticipated this June: 500,000 doses of OPV and 600,000 doses of DPT.

   The current overstock of vaccine at the central level results from unscheduled deliveries through donors. JICA, UNICEF, and the EC provide vaccines to the MOH. One donor sent the entire 1996 measles vaccine supply in one shipment rather than quarterly as planned. In addition, the central supply of tetanus toxoid (TT) is not moving because health workers tend to immunize only pregnant women with TT, while the national policy calls for immunizing all women.

3. An auto log temperature recording device revealed that the older standby cold room (Foster) at the OMS is operating from 2° to 3.5° above recommended temperature for vaccines. Although the unit's thermometer was showing +3° to +5° C, the auto log device and subsequent readings from alcohol thermometers showed that the actual temperatures were between +10.5° to +11.5° C. Fortunately, DPT, the more stable EPI vaccines (toxoid), has been stored in this unit and only for a short period. The UCI initiated measures to relocate the vaccine (toxoid) to proper storage conditions and to distribute it ahead of the DPT stored under proper conditions.

4. Inspection of MOH's standby cold room at the airport revealed that the unit is not suitable in its present condition for storing vaccines. The seams of the unit are separating and the unit is not clean. There is neither supervision nor temperature

monitoring of this unit. However, the airport unit can still serve as a back up if maintenance, supervision, and temperature monitoring are initiated.

5. Neither of the generators for the OMS or airport cold rooms are functioning. Observation indicates that routine maintenance is not being performed. Most of the new generators provided by UNICEF to the provincial stores are not yet operational.

6. According to discussions and refrigerator distribution policy, cold storage space at the provincial level may not be adequate for the NIDs if vaccines are distributed strictly by administrative levels (i.e., national to provincial to district levels). The MOH has requested UNICEF to purchase 22 additional freezers (4 for central, and 2 for the each province, total 18). UNICEF/Lusaka has recently begun to process this request, but these refrigerators may not be received in time for this year's NIDs.

7. According to discussions and refrigerator distribution policy, cold storage space at the district level should be adequate for the NIDs.

8. While without proper planning storage capacity at the higher levels may present problems, vaccine storage space at health facilities should be more than adequate. However, ice pack freezing capacity is a significant problem at lower levels, particularly for rural health centers. The majority of rural health facilities use the Electrolux RCW 42EK, which only makes four ice packs in approximately 24 hours. The RCW 42EK refrigerator is not adequate for making ice for conducting outreach during the NIDs.

9. Visits to a few facilities revealed two refrigerators which had been out of operation for several weeks. The repair needs for these refrigerators were quickly resolved during our visits. No doubt there are similar situations throughout the country where refrigerators needing only basic repair are out of operation.

10. To help districts and health facilities plan for the NIDs, a two page worksheet for determining storage, ice, and personnel requirements was developed during this visit (Appendix D). This worksheet was sent to the provinces and districts prior to their training/planning sessions scheduled for May.

11. Future OPV shipments reportedly will include the vaccine vial monitors (VVMs).[3] VVMs will add considerable flexibility to NID delivery strategies by allowing health workers to immediately determine the condition of the OPV. This allows opportunities for extending storage time and for more reliable outreach immunization. Unfortunately however, health workers have not been trained on using the VVMs.

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[3] Vaccine vial monitor (VVM) is a label made of heat sensitive material which is placed on a vaccine vial to register cumulative heat exposure over time.

B. Long-Term Issues

1. Cold chain and logistics management have become more difficult as a result of decentralization. Responsibilities over repairing equipment, vaccine distribution procedures, and the distribution of equipment have become less clear.

2. According to UCI staff and a report by a UNICEF consultant in 1995 (Appendix E), refrigerators are poorly maintained and temperatures are not monitored. Visits to a few facilities and the measles outbreak with reported high coverage in Lusaka last year further support opinions that the cold chain in Zambia is not reliable.

3. Unfortunately, the information collected by the national cold chain inventory is difficult to interpret. The type of information required was not clearly specified and some districts returned incomplete questionnaires. For example, one cannot determine which refrigerators are used for vaccine storage. Some of the refrigerators listed as 'broken' may merely be very old equipment that was decommissioned long ago. Nevertheless, the inventory further documents some useful information. For example, in the 25 districts from which data were entered (25/61, 41 percent of the districts), 57 percent (255/559) of the refrigerators are the Electrolux RCW 42 model, which has 24 litre vaccine storage capacity. As this model can freeze only four ice in a minimum of 24 hours, the RCW 42 is not suitable for supporting an immunization delivery strategy involving outreach. This factor must be considered when planning immunization delivery strategies and future equipment requirements.

   Another and troublesome fact revealed by this partial analysis of the cold chain inventory data is that 15 out of the 51 solar refrigerators (29 percent) were reported as 'not working.' Although these data need to be reverified, this preliminary finding further underscores the need for implementing better procedures for preventive maintenance and for more timely repair.

4. The EC has donated 200 solar refrigerator units to the UCI ($1.2 million). This donation includes a one year maintenance contract through the manufacturer, BP Solar, but there is no maintenance plan nor provision for spare parts after the first year of operation. In addition, the Dutch are planning to donate 60 additional solar units. However, discussions and field visits indicate that the users are not being trained on how to maintain the solar equipment. Also, as experienced in other countries, theft of solar panels is adding to the long-term cost of maintaining solar refrigeration systems. Some solar units installed in previous years have been out of operation for extended periods.

5. A nationwide assessment of the cold chain will be costly and time consuming. In addition some information is already available through the nationwide cold chain inventory which was conducted by questionnaire during 1995. All of this information has not yet been compiled or analyzed. A less costly and less time consuming geographically

limited assessment, however, will provide sufficient insight into the cold chain and logistics management issues. A field assessment will also help to better define equipment and user training needs.

Information from the field will also support formulating policies and long-term plans for sustaining the cold chain, as well as for addressing more immediate needs, like improving vaccine supply management. Of greater benefit, an easily executed field assessment will provide an opportunity for on-the-job training for the provincial and district cold chain technicians on identifying and solving problems.

VI. RECOMMENDATIONS

A. National Immunization Days

1. Vaccine stock outflow and incoming vaccine shipments must be closely monitored to ensure that cold storage space will be adequate when the NID OPV arrives from the manufacturer. In addition, the UCI secretariat should develop contingency plans for additional cold storage space, such as commercial establishments, should any unforeseen shipments or breakdowns occur.

2. The Foster walk-in refrigeration unit at the OMS needs immediate servicing; it's external thermometer should not be used. This unit should be made reliable so that it can serve as a back up for any unexpected overstock at the central level.

3. The MOH should take immediate action to repair and maintain the back-up generator for the OMS central cold store. The generator for the airport unit requires service as well.

4. The UCI Secretariat should develop their NID vaccine distribution plan based on the existing cold chain and not on equipment being ordered. The NID vaccine distribution plan should be based on the most efficient distribution routes and mechanisms, not necessarily on administrative structures. For example, where practical, the provincial stores could be bypassed and vaccines could be delivered or picked up by the districts.

5. Districts and health facilities need to develop plans for providing a sufficient supply of FROZEN ice packs during NIDs, both for delivering vaccine and for conducting outreach session.

6. The UCI should routinely emphasize to the district and provincial authorities and cold chain technicians the urgency of repairing refrigerators before the NIDs.

7. The provincial/district NID planning meetings and the next set of meetings for the health facilities are very important. These meetings should critically assess equipment status

and ice making capacity. During these meetings the districts and facilities should discuss approaches for more accurately estimating catchment area populations. Utilization of facilities may not correspond with census tracts.

8. All NID planning and training activities should include sessions on using the VVMs. WHO training materials were left with the UCI Secretariat.

9. The UCI Secretariat and NID planning committee should take every opportunity to visit districts and health facilities before the NIDs to monitor the progress on NID preparation. Although the MOH "NID Proposal" specifies that "ten health staff at the national level will coordinate and supervise the activities at district level," it is unlikely that the MOH can allocate this much staff consistently. BASICS/Zambia may need to provide local support by hiring a short-term local consultant with experience in immunization delivery to assist the MOH NID Secretariat on supervising and monitoring the preparations. The decision to provide a local consultant can best be made by the BASICS/Zambia office through their participation on the NID planning committee.

The following summarizes the more critical recommendations concerning the cold chain for the NIDs.

- The central UCI Secretariat and UNICEF should closely monitor the incoming vaccine shipments and also the distribution rate to ensure that cold storage space will be adequate when the NID OPV arrives.

- Micro planning must emphasize the availability of frozen ice packs for transporting vaccines and for supporting immunization outreach sites during the week of the NIDs.

- Districts should accelerate efforts to repair broken refrigerators that are needed for the NIDs.

- Regular supervision and monitoring over NID preparatory activities in the districts must be maintained by MOH staff.

- The standby generators for the central cold storage facilities must be repaired as soon as possible; routine maintenance must be initiated.

B. Long Term

1. The remaining cold chain inventory data collected in 1995 should be entered into Epi Info; analysis of these data should be completed. This can be accomplished during a subsequent visit by a BASICS technical officer or consultant. (See recommendation B.4 below.)

2. Improving user practices on basic nontechnical refrigerator maintenance will reduce dependence on the district cold chain technicians for routine maintenance. Improved user maintenance will also reduce the frequency of repairs and thereby contribute to a more affordable cold chain.

3. The MOH should revise and document their policies and procedures on cold chain maintenance and repair according to the changes resulting from decentralization and to the available resources. A strategy for maintaining and repairing solar refrigeration systems needs to be developed. More detailed information on the problems in the field is necessary to formulate practical policies and strategies. (See recommendation B.4 below.)

4. A provincial-level field assessment of the cold chain should be performed after this year's NIDs. In this context cold chain equipment also includes vaccination equipment. Through a selection of a districts and a sampling of facilities, the assessment will provide the following information:
   - distribution and status of cold chain and injection equipment for comparison with district and national records
   - user maintenance knowledge and practices
   - reasons and down time for malfunctioning cold chain equipment
   - the reliability of refrigerator temperature monitoring

   The cold chain assessment will collect any additional defined by the MOH.

   Participation by MOH staff from national, provincial, and district levels in the design, implementation, and data analysis is essential. Their active participation will not only promote the collection of more useful information, but also will expand the capabilities of the cold chain technicians from only making repairs to being able to better supervise the cold chain and define the problems in their district The number of districts involved in the assessment will depend on the availability of MOH staff, funds, and logistics.

VII. FOLLOW-UP ACTIONS

1 Through its participation on the NID planning committee, BASICS/Zambia should determine the need for a local consultant to assist the NID Secretariat with supervising and monitoring NID preparations at national and district levels. If necessary, the Zambia office will hire and provide logistical support for the local consultant.

2. BASICS/Washington will prepare a cold chain assessment methodology, including the cost requirements.

3. If all parties (USAID, MOH, BASICS) desire a cold chain assessment, the assessment will require a three to four week visit by a BASICS technical officer or consultant. One to two weeks will be required for planning and training surveyors, one week for conducting the survey, and one week for analysis and preparing a preliminary draft report. In addition, limited assistance will be needed from the BASICS/Zambia office to obtain cost and other background information and to help organize a MOH working group for the assessment.

APPENDIXES

APPENDIX A

PERSONS CONTACTED

APPENDIX A

PERSONS CONTACTED

USAID/Zambia

Steve Weirsma, M.D. M.P.H.	Child Survival and HIV-AIDS Advisor
Paul Hartenburger	Health & Population Officer

UNICEF

Kirk Hoffman	Operations Officer
Mariye Tefari	Supply Officer
Dr. Halima Dao	Medical Officer

Ministry of Health

Dr. Mary Kaomo	NIDs Coordinator
Ms. Chivundu	EPI Desk Officer
Mr. Mitumbishe	UCI Logistics Officer
Mr. Chazya N. Siame	UCI Cold Chain Technician
Dr. E.M. Mpabalwani	Dept. Of Paediatrics, University Training Hospital
Mr. Khondowe John	Cold Chain Technician, Lusaka Municipality
Mrs. Bwalya	Public Health Nurse, Lusaka Municipality

WHO

Dr. Wilfred S. Boayue, M.D., M.P.H.	Country Representative
Dr. Douglas N. Klauke, M.D., M.P.H.	Intercountry Medical Officer, WHO/EPI Nairobi, Kenya

APPENDIX B

DEPARTURE NOTES

Cold Chain and Logistics Management in Zambia

Mark Weeks, BASICS Technical Officer

30 March - 12 April 1996

APPENDIX B

DEPARTURE NOTES

Cold Chain and Logistics Management in Zambia

Mark Weeks, BASICS Technical Officer

30 March - 12 April 1996

This visit involved determining an appropriate approach for assessing the cold chain in Zambia. This visit also involved looking at the more immediate cold chain and logistics issues for the OPV National Immunization Days (NIDs), which are scheduled for July and August. During these two weeks I met with staff from: the UCI/MOH Secretariats, UNICEF, USAID, and WHO. I attended a one day NID national planning session which was led by the WHO/CDC Regional Epidemiologist. I also spent time with the national UCI Cold Chain Technician and the UCI Logistics Officer reviewing the central cold storage facilities and records, and getting background information on the Zambian health care system and the cold chain. I visited several health facilities in Lusaka, the cold store for Central Province in Kabwe, the Kabwe District cold store, and several health facilities in Kabwe District. I entered data from UCI records on refrigerators in 26 districts the Epi Info program. A record file of the data was copied into the UCI computer (C:\epi6\zamfrige.rec, zamfrige.qes).

Unfortunately, Ms. Mary Kaoma, the NID Coordinator, and Ms. Chivundu, the EPI Desk Officer, were in Nairobi for a WHO NID meeting during the second week of my visit. As a result I was not able to discuss much of the content of this briefing paper with them. The following impressions are based on this brief visit and previous experience with EPI in Africa. They are not intended to be as representative as a perspective gained from a thorough assessment and more time in the field.

Many of the problems with the cold chain and logistics systems in Zambia are the same problems confronting the MOH as a whole. The number of MOH operational staff at the central level is inadequate; policies and responsibilities at national, provincial, and district levels have become unclear as a result of decentralization and years of administrative changes and staff turnover. Travel by government staff for supervising and monitoring field activities is infrequent due to bureaucratic delays in getting authorizations and funds. The range of donor assistance complicates the management, distribution, and standardization of supplies and equipment. Some donor projects bypass the central MOH and allocate equipment directly to the districts, and in some cases directly to health facilities. Comments and issues more specific to cold chain and logistics management follow.

NIDs

1. For conducting NIDs, the UCI has the advantages of: experienced staff at national and local levels, a long established national cold chain and infrastructure for delivering immunizations, adequate vaccine storage capacity at central, district, and health facility levels, and experience in conducting immunization campaigns.

2. Potential cold storage space is adequate at the central level for incoming NID OPV, but at the time of this visit nearly all storage space was occupied with routine vaccine supply. If such a large central stock exists when the NID OPV arrives (approximately 2,000,000 doses in July and another 2,000,000 in August), UCI central cold storage space will not be adequate. Vaccine stock outflow and incoming vaccine shipments must be closely monitored to ensure that adequate cold storage space will be available when NID OPV arrives. In addition, the UCI secretariats should develop a contingency plan for additional cold storage space, such as commercial establishments. BASICS will advocate at the international level for timely notification on NID OPV and routine vaccine shipments through UNICEF. According to UNICEF/Lusaka the following routine shipments are anticipated in June: 500,000 doses of OPV and 600,000 doses of DPT.

Note: The current overstock vaccine supply at central level results primarily from unscheduled deliveries through donors (3 donors provide vaccines to the MOH). For example, one donor decided to send the entire 1996 measles vaccine supply in one shipment rather than quarterly as previously stipulated.

3. An auto log temperature recording device revealed that the older walk in cold room (Foster) at the OMS is operating from 2 to 3.5 degrees (10.5 to 11.5 degrees C) above recommended temperature for vaccines, although the unit's thermometer was showing +3 to +5 degrees C. The DPT vaccine stored in the Foster cold room needs to be relocated to proper storage conditions. Samples of the DPT vaccine should be sent for potency testing through WHO. The Foster unit needs immediate servicing and it's external thermometer should not be used. This unit should be made reliable so that it can serve as a back up for any unexpected over stock at the central level. Unfortunately, the auto temperature logging device placed in the cold room at the airport did not function properly. However, visible inspection of the airport unit (Foster) indicates that it is presently not suitable for storing vaccines. The seams of the unit are separating and the unit is not clean. There is no supervision or temperature monitoring of the airport cold room. However, this unit still has potential as a back up if the holding temperature is tested, and if supervision and temperature monitoring are initiated.

4. According to discussions and refrigerator distribution policy, cold storage space at the provincial level may not be adequate for the NIDs if vaccines are distributed strictly by administrative levels. The MOH has written to UNICEF for 22 additional freezers (4 for central, and 2 for each province, 18). UNICEF Lusaka has recently begun to process this request, but it is unlikely that these refrigerators will be received in time for the NIDs. The UCI Secretariats needs to develop their NID vaccine distribution plan based on their existing cold chain. The NID vaccine distribution plan should be based on the most efficient distribution routes and

mechanisms (a "fast chain") and not necessarily on administrative structures. For example, where practical, the provincial stores could be bypassed by direct delivery to, or pick up by, the districts.

5. According to discussions and refrigerator distribution policy, cold storage space at the district level should be adequate for the NIDs.

6. While storage capacity may present problems at higher levels (without proper planning), storage space in facilities should be more than adequate. However, ice pack freezing capacity is a significant problem at lower levels, particularly rural health centres. The majority of rural health facilities use the Electrolux RCW 42EK which only makes 4 ice packs in approximately 24 hours. The RCW 42EK refrigerator is not adequate for two days of outreach during the NIDs. Districts and health facilities need to develop plans for providing a sufficient supply of FROZEN ice packs during NIDs, both for delivering vaccine and for conducting outreach session.

7. Visits to a few facilities revealed two refrigerators out of operation from three weeks to three months. The repair needs for these refrigerators were quickly resolved during our visits. No doubt there are nonworking refrigerators throughout the country needing only minor repairs. The UCI needs to continuously emphasize to the district and provincial cold chain technicians the urgency of repairing refrigerators before the NIDs.

8. To help districts and health facilities plan for NIDs, a two page worksheet for determining storage, ice, and personnel requirements was developed during this visit. This worksheet will be sent to the provinces and districts prior to their training/planning sessions scheduled for May. The provincial/district NID planning meetings and the following set of meetings for health facilities are very important and should critically assess equipment status and ice making capacity. More accurate estimates of facility catchment area populations are also needed (vs. census based).

9. Future OPV shipments reportedly will include the Vaccine Vial Monitors (VVM). Using the VVMs can add flexibility to NID delivery strategies and improve the reliability of vaccines. However, health workers have not been trained on using the VVMs. All NID planning and training activities should include sessions on using the Vaccine Vial Monitors. WHO training materials were left with the UCI Secretariats. Central staff are also unfamiliar with the VVMs.

10. The UCI secretariat and NID planning committees should take every opportunity to visit districts and health facilities before the NIDs to monitor the progress on NID preparation.

Long Term

1. Improving cold chain and logistics management has become more complex through decentralization. Responsibilities for repairing equipment, the vaccine distribution system, and the placement of equipment has become less clear.

2. Visits to facilities and discussions with UCI staff reveal that refrigerators are poorly maintained and that temperatures are not adequately monitored. The measles outbreak with reported high coverage which occurred in Lusaka last year, further supports that the cold chain is not reliable.

3. A large number of solar refrigerators are being installed without adequate user training or a long term maintenance plan or provision for spare parts after one year.

4. Improving user practices on basic refrigerator maintenance (nontechnical) will reduce dependence on district and provincial cold chain technicians for routine maintenance, and thereby will increase the frequency of routine maintenance and reduce the frequency of repairs.

5. A nationwide assessment of the cold chain will be costly and time consuming. However, a geographically limited assessment will provide a better insight into cold chain and logistics management issues, and equipment and user training needs. More information from the field will also support formulating and/or revising policies and long term plans for maintaining the cold chain and for improving vaccine/supply management and forecasting. Such an activity would also provide an opportunity for on the job refresher training and field experience for the cold chain technicians. Consistent participation by MOH staff would be essential if such an activity is carried out. A protocol for an assessment can be designed quickly; the budget and timing still need to be worked out.

APPENDIX C

DOCUMENTS REVIEWED

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1. "Zambia Child Health Project." Project No. 611-0237, Draft Project Paper, USAID Zambia, April 5, 1995.

2. "National Immunization Days (NIDS) Proposal." Ministry of Health, Expanded Programme on Immunization, Republic of Zambia, January 1996.

3. "End of Contract Report, January - July 1995." A. Dahlin, UNICEF Logistics Consultant.

4. "Strengthening of Technical Capacity at District Level." Draft report, C. Hasselblad, 14 November 1994.

5. "Field Guide for National Immunization Days in Zambia." Draft, MOH Zambia, 3 April 1996.