

Immunization Focus

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GAVI

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Immunization Focus

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Yellow fever vaccine stocks still low as fears of new outbreaks grow

NEWS

THE World Health Organization has appealed to the international community for funds to stockpile scarce yellow fever vaccine after a mass immunization campaign in Côte d'Ivoire. The campaign, successfully completed in Abidjan earlier this month, immunized an estimated 2.6 million people in under 2 weeks, in an effort to control the first urban outbreak of yellow fever in Africa in a decade. Worldwide, there are now at most 1 million remaining doses of vaccine available for the coming month.

"The vaccine supply situation is very bad," said Michel Zaffran, of the World Health Organization's Department of Vaccines and Biologicals. "If there were another urban outbreak we would need to do a similar campaign and there would not be enough vaccine right now." As *Immunization Focus* went to press, there were unconfirmed reports of a second outbreak of yellow fever in Conakry, Guinea. Officials are concerned at the possibility of outbreaks in larger population centres in West Africa.

Until now, only two manufacturers—Aventis Pasteur and the Institut Pasteur in Dakar, Senegal—have supplied the international market. A third in Brazil, Biomanguinhos, has this month received WHO official quality approval—or "prequalification"—for its vaccine. Julie Milstien in the WHO Department of Vaccines and Biologicals said this would ease the situation somewhat, but warned that the new supplies would not be available for another month.

Yellow fever is responsible for an estimated 200,000 cases of illness and 30,000 deaths each year. It is caused by a virus which is spread by several species of mosquito. Most outbreaks are

relatively small and confined to forested areas or villages. The more dangerous urban outbreaks occur when infected people introduce the virus into a densely populated area, where it is rapidly spread by *Aedes aegypti* mosquitoes. As of 10 October, Côte d'Ivoire's ministry of health had reported 203 suspected cases of the disease and 21 deaths in the current outbreak, although actual numbers are likely to be much higher.



Come and get it: a Red Cross volunteer appeals to the public in Côte d'Ivoire to attend vaccination centres

Martha Kodjic/International Red Cross

Ideally, says WHO, countries should offer routine immunization against yellow fever, with catch-up campaigns where necessary. So far, however, only a minority of countries at risk have invested in routine immunization against the disease.

For the outbreak in Côte d'Ivoire, WHO, UNICEF, the Red Cross and other donors have spent US \$1.1 million on vaccine and supplies. "Additional funds are urgently needed to complete financing of the operation," said WHO. ■

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Do your data measure up?

Kenya, working with a team of auditors, has just put its immunization data through an accuracy check. Lisa Jacobs went along and listened to the audited and the auditors

PATRICK Mbugua, district public health nurse for Murang'a district in central Kenya, explains to Kangema Health Unit's Medical Officer Julia Njagi, and Stanley Kagwi, the nurse, why he and the other visitors have come this morning. They are here to audit the unit's information system as part of a pilot test of a new tool to assess the accuracy of national immunization data. "The mission is to see, from top to bottom, the quality of the information," says Mr Mbugua. "Because if there is a problem at the bottom, it will go to the national level."

With Mr Mbugua are Vicki Doyle, from Liverpool Associates in Tropical Health (LATH), a UK-based company, owned by the Liverpool School of Tropical Medicine, which heads the independent consortium appointed by GAVI to do the audit, and Kenya's national information officer for the Expanded Programme on Immunization (EPI), David Kiongo.

"Didn't you know we were coming?" asks Dr Akpala Kalu, immunization advisor from the national office of the World Health Organization in Nairobi, who has joined the audit today as an observer. "You didn't get the message that we were coming?" Dr Kalu smiles. "I'm just joking." Surprise is an element of the audit.

Accurate numbers make for better management

Why put people on the line like this? For health workers struggling to provide a basic level of service, keeping good records may seem less important than most other aspects of their job. As one Kenyan nurse put it: "You have mothers waiting for you, children waiting for you, curative waiting for you, antenatal waiting for you, family planning waiting for you. It is very difficult to rush back and tally."

Yet all countries need accurate immunization data, so that their health managers can promptly detect downward or upward trends, measure their own performance and direct their resources efficiently to ensure the maximum number of children are safely protected against killer diseases. The idiom, "If you can't measure it, you can't manage it", is as true for immunization as it is for any programme. And, since the emergence of GAVI and the Vaccine Fund, the incentives to improve immunization data have sharpened.

Kenya is among the first countries to receive funding from GAVI and the Vaccine Fund under the "share" system, which provides incentives and rewards to countries for increasing their immunization coverage. Under the system, in one year's time, the GAVI Board will need to decide how much to award each country, based on its reported figures for the percentage of infants receiving three doses of diphtheria, tetanus and pertussis (DTP3 coverage). Shares are awarded for each additional child reported as immunized, relative to the previous year.

1. The DQ-What?

The immunization Data Quality Audit assesses the accuracy of the immunization reporting system that flows from the health units to the districts to the national level. To do this, four districts are randomly selected to ensure representativeness; within each district, six health units are selected (24 health units in all). Two teams, each comprised of one national immunization official and one external auditor, split the districts; each team then links up with a district official in their visits to the health units.

Health unit records are compared to district level records, district records are compared with the nationally reported figures. In addition to the accuracy checks, all aspects of the reporting system are assessed, and the auditors also observe staff to ensure that their practice is correct. The auditors give immediate feedback to national, district and health unit staff on practical ways to strengthen their performance and their recording system.

The audit was put out to tender and GAVI eventually awarded the contract to a consortium that is headed by LATH, in association with the Euro Health Group from Denmark and the Deloitte and Touche Emerging Markets Group in the US. The audit was initially implemented on a pilot basis from May to September 2001 in eight countries that were awarded the greatest support for strengthening their immunization services in 2000 and early 2001: Côte d'Ivoire, Kenya, Liberia, Mali, Pakistan, Rwanda, Tanzania, and Uganda.

Early indications from the pilot sites reveal a problem in most countries with stock management issues—many staff do not have adequate training to keep accurate vaccine ledgers, nor is this closely monitored. Data consistency on the different levels varied in the countries tested, with incidents of disagreement of data outnumbering those in which data agreed. The DQA also highlighted that countries with an integrated approach to data collection, such as Uganda and Tanzania, have a problem with parallel reporting systems: EPI data are reported twice, and inconsistently.

The experiences from this year's pilot audits will guide subsequent audits and will help GAVI to decide whether it is an appropriate tool for adjusting funding amounts provided to countries from the Vaccine Fund, and if so, how this will be done. GAVI partners will review the DQA pilot experience at the end of October; recommendations will follow.

• For more general information on the DQA, see Lloyd, J. *Immunization Focus* June 2001, p 9.

Only reported immunizations can be taken into account. If vaccinations are happening in health units, but not getting reported, a country could be awarded less money than it technically "deserves".

But the GAVI Board will also need assurance that the immunization coverage data are correct. The immunization data quality audit, or DQA, developed by health information experts at WHO and the Bill and Melinda Gates Children's Vaccine Program, has been designed to do just that (see Box 1).

While its major emphasis is to assess the quality, accuracy and completeness of immunization reporting

systems, the DQA has also been designed to provide practical feedback to health staff on how to improve data quality. However, questions have arisen regarding the emphasis on data reporting in such resource-poor settings.

“Do you invest in quality of data or reducing disease?” says Dr Kalu, the immunization adviser from the national WHO office in Nairobi. Others working in immunization in African settings argue, however, that there is no conflict between good data management and combating disease.



Lisa Jacobus

The hand re-count:
Vicki Doyle and
Patrick Mbugua
check tally sheets

“When I first came in I was quite cynical,” says Dr Doyle. But after conducting DQAs in Uganda and Kenya, her attitude has changed. “As a starting point it’s really good—it’s like a ‘wake-up’ call.” If vaccinations are not being reported properly, it could be an indication of more fundamental problems in the programme—whether it is lack of knowledge of policy and procedures, inadequate supervision, or staff shortages. The auditors report on this information as well as the numbers.

And, says Dr Doyle, inaccurate information can lead to waste of scarce resources. “If they’re under-reporting their immunization they may be spending money on areas they shouldn’t.” For example, a district might invest in unnecessary outreach or social mobilization efforts in a community if the reports say coverage is low, when actually, children are being reached but not counted.

The health unit re-count

The DQA starts at the most basic level of reporting: the immunization tally sheet. Nurses use tally sheets to tick off each vaccine they administer over the course of an immunization session—whether it’s a whole day, just a morning, or an outreach activity.

As part of the DQA, Dr Doyle and Mr Mbugua will need to re-count by hand the health unit’s tally sheets from the previous year, verifying the number of DTP3,

measles, and maternal tetanus vaccinations that were given over the year. The recount is then compared with the data that the unit had reported to the district; district data are compared with reports found at the national ministry. Consistency is what the auditors look for.

Where are Kangema’s tally sheets for the year 2000? No one has ever asked to see them before.

Two searches through a file cabinet finally produce a pile of crumpled tally sheets from the year 2000—all except January. In many of the health units visited in Kenya, none of the tally sheets from 2000 could be found. In others, they were found to have new uses: as liners for the scales used for weighing babies, folded into envelopes to hold drugs from the pharmacy, or used to write out lab requests. Not surprising, perhaps, considering that Kenya does not currently have any official policy on what units should do with tally sheets after the data are transferred to the monthly reports. “Now I think we will develop a policy,” says Mr Kiongo, the EPI information officer.

While the particular problem of missing tally sheets was more serious in Kenya than in other countries that participated in the DQA pilot this year, it is widespread. So why does the DQA look at them, especially since they seem to be in such shortage? Simple: “Tally sheets are difficult to fake,” says Dr Doyle. In other words, if all the tally sheets look crisp and new, and are filled out with the same pen (which was observed in one health unit in another pilot country), the auditors are going to catch it.

While Dr Doyle and Mr Mbugua re-count the tally sheets, David Kiongo observes immunizations, assessing whether the vaccinators are giving infants the right vaccines and correctly marking the tally sheets and the child health cards. In health units that do not conduct immunizations every day, a simulation exercise has been developed to assess performance.

The DQA also looks for other signs that the health information system is working. For example, is there a chart or table showing child vaccination rates on display? Has there been a supervisory visit in the last two months and is there a record of the topics covered? And, does the unit maintain an accurate ledger book to track stock of the different vaccines?

Other system issues are also assessed. For example, does the district’s senior medical officer—not the EPI person—sign the reports? If so, this indicates that immunization is integrated into the wider health system. Are the best demographic estimates used in the calculation of the denominator? And so on.

The feedback session

Kangema fares better than others, but can still only account for 57% of DTP3 reported at the district level. However, the auditors have found coverage and drop-out charts prominently displayed, a vaccine stock ledger book—unfortunately, one month out of date, but there nonetheless—and a reasonably good system for keeping records filed. “We know that you’re doing a good job here,” Dr Doyle tells the staff.

But there are some areas for improvement. “You need

to know your catchment area,” says Dr Doyle. “Otherwise, how do you know you are achieving the level that you should be doing?” Careful stock recording is also essential. “When the new vaccine comes, it will be very expensive,” says Dr Doyle. “Reducing wastage and stock management will be very important.” And a practical suggestion: “When you receive stock, write it in red. When you take it out, write it in blue.”

David Kiongo reports that the vaccination sessions he observed were all correct. But there is another problem: “You are doing immunizations in the same room where you have sick babies coming in,” he says. Obstetrics, antenatal and family planning patients also use the room.

“There seems to be an empty room available, not all of the rooms are being used,” Mr Kiongo says. Perhaps they could convert a room down the hall into another room for outpatient mother-and-child-health care?

Mr Kiongo continued. “And another thing, slightly outside the audit—I saw your health officer re-capping needles.” Re-capping needles before discarding them raises the risk that a health worker might prick a finger; if the blood is infected, the worker might infect themselves. He advises the team on good safety rules.

“Most of these things are within our reach. We want to be able to do them,” says Nurse Kagwi, who has been taking fervent notes throughout the feedback session. “Thank you for coming. Maybe if you are in the province again you could come back to see how we are doing.”

Meanwhile, in Bondo

Staff in the health units in Bondo face greater challenges than those in Murang’a. Bondo is in the western part of Kenya, on the shores of Lake Victoria. The region is one of the poorest in the country, and immunization rates are low: whereas DTP3 coverage rates in Murang’a district hover around 85%, Bondo reports well below 50%.

Five out of the six health units selected in Bondo do not have tally sheets available to the auditors for re-count. The sixth is the district hospital, and staff there search for three hours to locate the sheets.

In their feedback to the district officials in Bondo, LATH auditor Max Moyo and his national counterpart, vaccine control officer Dr Amos Chweya, lay down some hard truths. “We came here to investigate: ‘Is it true that the data we are getting from you is the same as the data from the units?’” Dr Chweya begins. “As you will see the picture looks a bit funny—numbers from you are different than numbers we found at the units and than we get in our recounts.”

Furthermore, none of the health units has been found to keep records of vaccine stock. “This is a weakness that we have in the country—it is not just a problem in Bondo,” says Dr Chweya. “At the moment we do not know our wastage rate.” This is a big problem, considering the higher cost of the new vaccines being supplied by GAVI and the Vaccine Fund. “The days when we had people bringing in vaccines when we asked for them are long gone,” warns Dr Chweya.

Mr Moyo points out that none of the health units have immunization coverage targets. “If you are travelling to Nairobi, you need to know where Nairobi is. Otherwise, how do you know if you have made it there?”

Even accessing the data has proved difficult. The district data manager has been out of the office because of a broken-down car, and no one else knows how to find the correct records. “The way an information office should work is that the information is available when you are away,” says Mr Moyo, an information systems expert. “So if parliament calls and asks what your immunization rate is, anyone could go to a file and get the data.” In other words, “Don’t take the keys with you when you go,” he says. “Sorry to say that but that’s the way I think.”

“We did not come to condemn,” says Dr Chweya, Kenya’s national vaccine control officer

Dr Francis Odira, the district medical officer of health, listens quietly to the feedback. “I agree with most of the findings. They are not exaggerated,” he says finally. “The quality of our health information system has been declining. It is something we have known but we were looking for ways to improve.”

“We are impressed with people’s commitment to improve the data collection system”

But, he says, the problems can’t be solved without addressing staffing issues. “Most health units have only one qualified nurse—one to see patients, take records, summarize records and take them to the district. She also has to collect revenue

from patients,” he says. Most districts in Kenya require patients to pay small user fees for health services—including immunization. “Most of the way we work is a matter of improvising,” adds Herbert Onyando, the district records and information officer.

“We know the constraints,” says Dr Chweya. “We didn’t come to condemn. We are telling you what we found out there from the people—what they said.” He promises to bring the staffing issue to the national level.

“We still have time to improve our records”

The final step for the auditors is to present their findings to a meeting of the Interagency Coordinating Committee. Dr Doyle and Dr Chweya split the presentation between them. Dr Doyle presents the main findings: poor data storage leading to reporting inaccuracies at all levels; weak systems to monitor and analyse immunization performance; and a lack of integration in the health information system.

All of these issues contribute to inaccuracies in Kenya’s reporting system—while Kenya’s “best estimate” of its coverage for 2000 was 63%, the DQA finds that the reported coverage from administrative data was 51%.

But Dr Doyle is optimistic. “Though we’ve pointed out a lot of the weaknesses here, we were very impressed with the commitment of people to improve the system of data collection.”

And, as Dr Chweya says to the district management team in Bondo: “When GAVI comes back to audit us they will look at 2001. We still have time to improve our records.”

Training vaccinators in a time of change

Scott Wittet describes one nongovernmental organization's experience of training with partners in countries

EVERYONE agrees that effective staff training is crucial for quality immunization services. It seems obvious, especially now when many countries are introducing new vaccines, new injection technologies, and new policies. Why is it then that training activities have been neglected, sometimes for many years? Why is training so often given short shrift—insufficient staff allocation, insufficient budget, and insufficient time?

At a recent meeting in Manila of the Alliance's Western Pacific Regional Working Group for Immunization, delegations from three countries approved for support from the Vaccine Fund were asked to say how the RWG could assist them. One of the first requests from all three delegations was: "Give us help with training programmes." As one observer put it: "There is a flood of autodisable syringes and vaccine vials bearing down on these countries—they have to tell their people how to deal with it. The countries are grateful for these needed supplies, and ready to strengthen services, but there is a lot of anxiety as well."

The Gates Children's Vaccine Program at PATH is collaborating on training initiatives with Ministries of Health, NGOs, and other GAVI partners in India, Cambodia, and several other Asian and African countries. This "note from the field" shares recent experiences with the development and implementation of training programmes during this time of change. We hope that lessons we have learned will be useful to colleagues in other parts of the world.

First, find out what staff know and what they need

Every country situation is different and requires careful strategic planning to meet local needs and to be successful within the local environment. Good planning begins with good information, especially information from those who will be trained. We have found that qualitative rapid assessments of staff needs are a cost-effective way to get a sense of gaps in knowledge and skill. Such methods provide a different type of data than closed-ended questionnaires (the latter can be administered and analysed on a larger scale, for quantitative information, but offer only a choice between existing, set responses, rather than an opportunity to express any original viewpoint). Typically, qualitative data are useful for the design of training and other initiatives aimed at changing behaviour. What is more, such methods are cheaper and generate information much more quickly than a large-scale survey. The rapid assessment reports referenced⁽¹⁾ include sample discussion guides for focus groups and individual



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interviews, along with details about audience research methods that proved effective in those countries.

Qualitative data also are helpful for designing questionnaires for quantitative surveys, if desired. Such surveys are particularly useful for programme evaluation.

Safety, service quality, and coverage suffer without well-trained staff

When we take the time to listen to service providers, they often complain that they have not received immunization refresher training in many years. (The main exception is the good work done training people to assist with polio campaigns.) Recent rapid assessments of service providers' knowledge and attitudes in India and Nepal reveal a number of common weaknesses that appear to be related to inadequate training and education. For example, several providers report hearing individual accounts of children dying within hours of receiving reconstituted measles vaccine that had been allowed to sit overnight. Whatever the reasons for the reported deaths, the staff assumed that the vaccine had become toxic. As a result, respondents reported, many field workers in the area refused to continue providing measles vaccine without a doctor being present, and measles coverage declined rapidly over the following two years.

The findings revealed two problems: first, that some vaccinators appear to have received no training in the safe use of measles vaccine and the prompt disposal of reconstituted unused vaccine; second, that staff were not supported in the thorough recording and analysis of reported adverse events linked to vaccination. Thus, even though the deaths could have been isolated events that had no causal relationship with the improper delivery of the vaccine, staff became wary of using a safe vaccine and children were left unprotected.

We were further alarmed by the fact that many of the health workers and managers did not regard measles as a killer disease and did not give measles vaccination high priority. This is a failure of training and advocacy within the system, and helps to explain high drop-out rates.

The assessment of health workers' beliefs and knowledge revealed other common concerns too. Asked what they knew about hepatitis B and whether they supported introduction of the vaccine, most health workers were cautiously positive, but emphasized that training should be given high priority.

They also complained that they lack the training, and often the time, to mobilize community groups in support of routine immunization efforts—a strategy which would help boost coverage and save many young lives. ▀

Take the opportunity to meet broader training needs

When we first began discussing training strategies with our Ministry partners in one Asian country, we assumed that the curriculum would focus primarily on new services and procedures. However, our colleagues in that country felt strongly that a more comprehensive approach should be taken, so the team decided that each vaccinator would receive a full two-day refresher training. The course would communicate information on hepatitis B vaccine and auto-disable (AD) syringes. It would also ensure that vaccinators' injection skills were excellent, and that they would be able to conduct more efficient and effective outreach. In addition, the course would ensure that staff were equipped with improved interpersonal communication and social mobilization abilities.

High-quality, effective training takes time to design, implement, and evaluate

Countries have applied for, and received, vaccines from the GAVI partners and the Vaccine Fund at unprecedented speed. This has created immense challenges—and very tight timeframes. Maximizing the effectiveness of training programmes requires a multi-step process, something like that shown in Box 1.

Training often exposes policy gaps and forces decisions

One of the reasons that the design of training programmes takes so long is the fact that the documentation of procedures (i.e. writing the training manual) requires that all relevant policies be in place. Unfortunately, policies are often being developed at the same time as training materials. We have seen many examples of this in the past months: lack of clear procedures for handling and disposal of AD syringes in immunization programmes where staff have always used sterilizable equipment; lack of clarity about whether ADs would be used for all immunizations; confusion about new policies for the use of multi-dose vials; and the need to design record forms which can be reproduced in the training manual. Sometimes, early on, there is confusion about which AD syringe and which disposal box will be provided. This can also delay the creation of instructions for use. Ideally, all procedures, policies, equipment, and forms will be on hand when the training materials are

designed, but in our experience that is seldom the case—there are always loose ends. A good trainer will adapt the curriculum as conditions change.

Train staff first, then increase demand for immunization

Most countries are rightly keen to increase demand for their immunization services as a key step towards strengthening the programme. But we feel strongly that staff should first be trained, and new procedures should be running smoothly, before demand on those services is significantly increased through public education and advocacy. There are several reasons:

- First, consumers will ask about changes in the programme and staff must have been trained to effectively deal with those questions and concerns;
- Second, if consumers at the clinic get the feeling that staff are not adequately prepared to use AD syringes or to deliver new vaccines, confidence in the quality of care erodes and will be difficult to rebuild;
- Third, once trained in interpersonal communication and social mobilization, staff can become key agents for creating demand.

Who pays for training?

Staff training is often funded by governments or NGOs themselves, but sometimes supplementary funding is necessary. Countries approved for assistance from the Vaccine Fund for infrastructure strengthening might choose to allocate some of their resources to training. In other situations, Alliance partners in a given country may be willing to pay for some, or all, training costs. What matters is that the immunization partnership in the country recognize the need for the development of human resources as a high priority. Given the political will, countries will find a way to mobilize funds.

NGOs can be highly effective partners

Even though the bulk of immunizations worldwide are provided by governmental agencies, NGOs vaccinate many children each year and contribute other support to immunization too, such as the work described here. Sometimes NGOs are members of national Interagency Coordination Committees. And, since many NGOs have

1: Successful training: some suggested ingredients and timelines

- Understand your various training audiences and their needs—trainees might include vaccinators (including private providers, paediatricians, and hospital staff), their managers, cold chain personnel, and stock managers, among others;
- Develop a comprehensive training strategy for each cadre of trainee, taking into account constraints such as staff availability and training budget;
- Identify and recruit the team needed to carry out the strategy;
- Design and pre-test handouts, job aids, exercises, and visual aids to be used during training courses;
- Organize the courses and make certain that the right staff are invited and attend (this requires the support of all programme and clinic managers—an advocacy initiative in its own right(2));
- Implement strategy and evaluate training impact; and
- Revise future courses based on your experience and evaluation results.

A reasonable timeline for steps one to five is six to nine months, then add the time actually needed for training, depending on the total number of trainees and other factors. Plan to evaluate training impact a month or so after the sessions. In reality, due to a dearth of time, budget, staff, or political will, sometimes the process outlined above is abbreviated, or adapted for the local situation

2: Examples of training initiatives developed by the Gates Children's Vaccine Program at PATH, in close collaboration with Ministries of Health, NGOs, and other GAVI partners:

Andhra Pradesh, India (2000 and 2001)

- Rapid assessment of attitudes towards immunization in service providers and consumers
- Development of curricula for managers and vaccinators
- Training of trainers programme
- Assistance with training 4000+ staff

Cambodia (2001)

- Provision of resource documents for training
- Recruitment of training expert to work with health ministry

Nepal (2000 and 2001)

- Audience research into attitudes towards injections and injection practices in both the private sector and the EPI programme

Regional initiatives:

- Workshops on immunization strengthening, adapted for regional needs, Africa (2001) and Eastern Europe (2001)

already developed strong training programmes for their own health workers, they may offer good models for the government training programme.

Some immunization topics require extra attention

Our audience research findings, and experience since then, have stimulated us to pay special attention to certain topics when designing immunization training programmes:

Hepatitis B issues

- Make sure that audiences get all the information they need on the new vaccine⁽³⁾.
- Be sure vaccinators understand that hepatitis B vaccine must not freeze, and how they can avoid freezing it.
- Communicate instructions specific to the vaccine used in your country. Hepatitis B vaccine is available as a stand-alone vaccine, in combination with DTP (quadrivalent vaccine), and in combination with DTP and Hib (pentavalent vaccine). Each combination has different advantages: the quadrivalent vaccine does not require reconstitution and therefore requires less time and fewer steps to administer; on the other hand, the pentavalent vaccine delivers an additional antigen.

Measles issues

Train health workers to deal with certain issues specific to measles immunization:

- Proper reconstitution of the vaccine and handling and disposal of reconstituted vaccine.
- Challenges associated with the child's age. Measles vaccine is given later than most childhood vaccines. Older children squirm more during immunization. By this stage, the mother has resumed her normal duties and may not

have as much time to bring the child to the clinic. And because older children eat supplementary food, they are at increased risk of diarrhoeal disease. Mothers are less likely to bring a sick child for immunization.

- Make sure policies are clear about how health workers should deal with multi-dose vials. A number of health workers told us that they are not willing to open a twenty-dose vial for just a few children.
- Help staff to promote the value of measles immunization, and to understand the dangers associated with the disease and its complications.

Injection safety issues

- Anticipate confusion related to "unusual" packaging. When provided in bulk, AD syringes are sometimes packaged without an individual plastic wrapper and without a packaging expiry date printed on each unit (the manufacturing date is printed on the box holding the bulk syringes). This is confusing to health workers accustomed to individually packaged disposable syringes—they have been taught that unopened wrappers suggest that the syringe inside is sterile. While the new AD syringes are sterile (they are adequately protected by plastic sheaths over the needle and the plunger), people in the field need to be reassured that this is true.

- Don't underestimate the difficulty of some "mundane" tasks. Experience over the last few months has demonstrated that some of the disposal boxes delivered with AD syringes are a bit tricky to assemble. Anyone can learn to do it, but it requires a little coaching and practice.

- Clearly communicate realistic procedures for handling and disposal of filled safety boxes.

BCG issues

- Finally, BCG immunizations are particularly difficult to administer. Extra time should be allocated to practising intra-dermal injection technique.

The prospect of training thousands of health workers, their managers, and others can be daunting, but improving staff skills and knowledge is one of the best investments we can make. It is especially important to meet this need when we have such a tantalizing goal: making sure that all children have access to the vaccines they need. Training becomes more crucial than ever in the era of GAVI. ■

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References and notes:

1. Bhattarai and Wittet, "Perceptions about Injections and Private Sector Injection Practices in Nepal" (2000) and "Rapid Assessment of Perceptions, Knowledge, and Practices Related to Immunization Injection Safety in Nepal" (2001) are both available on the web at www.childredivaccine.org/html/safe_injection.htm.
2. A further note about the need for support from managers: you may wish to organize trainings for these staff prior to those for vaccinators. In that way you can deal with questions and concerns ahead of time and get a better response when calling for vaccinator trainees later on.
3. See *Immunization Focus* March 2002, pp 6-7, for more on this topic.

How the fridge loses its cool

Failing refrigerators are preventing effective immunization in a large number of health centres. Phyllida Brown finds out why, and hears about new approaches to keeping the cold chain cold

THERE may be nothing glamorous about a refrigerator. But as anyone involved in immunization knows, it is one crucial tool in enabling all children to receive the vaccines they need. Disturbingly, however, the performance of the refrigerator in thousands of health centres in low-income countries is so poor that regular effective immunization becomes impossible, some children are left unprotected, and expensive vaccines may be wasted.

“We have a widespread problem with the management and the maintenance of the equipment,” says Modibo Dicko, of WHO’s African regional office in Harare.

Hard data are scanty, but individual reports from countries in Africa indicate that up to one in four health centres cannot offer immunization regularly because of refrigerator failure. These figures are probably representative of the region, says John Lloyd, formerly head of the cold-chain section in the Expanded Programme on Immunization at WHO, and now at the Program for Appropriate Technology in Health (PATH).

Souleymane Kone, a logistics specialist for WHO in Côte d’Ivoire, presented an assessment of overall vaccine management in 13 African countries to the Technical Network for Logistics in Health (TechNet) meeting in Delhi last August. The assessment found consistent problems with the maintenance and supply of spare parts for fridges(1).

African countries are not the only ones with a problem. Refrigerator failures are also common in South Asia, where surveys and repair programmes have been undertaken by IT Power India, a private consultancy specialising in environmental and renewable energy solutions, based in Pondicherry. In one of the most severe examples, in Bihar, about half of the cold chain equipment was not working when it was surveyed in 1998 prior to

a repair programme. A survey this year in Nepal suggests there are widespread problems there too(2).

Many refrigerator breakdowns are due to interruptions in the supply of spare parts. Many of the parts are actually consumables such as wicks, fuel and glasses for kerosene-run units which account for many of the refrigerators used to store vaccines. A key reason for supply problems is weakness in the management of the system, so that spare parts are not ordered efficiently, stock is controlled poorly and then not delivered where it is needed. “Things tend to fall apart,” says Mr Lloyd, “and often there will be no automatic system for reordering.” Where spares are ordered

With a limited budget and a limited supply of government technicians, most health districts cannot get repairs done when they need to. As a result, says Dr Dicko, in the African countries where the problem has been studied, up to 70% of health districts’ maintenance is done by private-sector technicians, some of whom may not have the specific parts or skills needed. “It is easier to call the local handyman and give him the job,” says Dr Dicko. “But if they don’t have the right spare part, then the equipment remains out of action.” More recently, private-sector electricians have been invited to join courses, and have accounted for about half the trainees.

Don't spoil it now: vaccines are kept cool through the toughest journeys, like this one, only to risk damage in a clinic fridge



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in a haphazard fashion, they may end up in the wrong place or being misused for other purposes. “You need a guaranteed flow of spare parts,” says Mr Lloyd. In principle this should be easy to achieve, since the lifetime of the consumables is predictable.

Another fundamental problem, says Dr Dicko, is the training and employment of technicians. For most countries, the Ministry of Health is officially responsible for cold chain maintenance, yet government salaries are too low to retain technicians. Until the late 1990s, WHO helped to train technicians in refrigerator maintenance for a number of African countries’ health ministries. But that training programme was stopped after it became clear that as many as half of the trainees left within two years of qualification to work for the private sector. Some of them took their newly-supplied toolkits, worth about \$1000, away with them.

Some governments and non-governmental organizations are exploring the use of the private sector, not just for technicians, but for the maintenance of the whole cold chain. Their reasoning is that a for-profit company may have greater incentives than a public-sector body to ensure its equipment is maintained and its staff retained. “When you walk into a shop to buy cola, the fridge is working,” says Mr Lloyd. In a privatised system, the company buys the cold-chain equipment from the government and then takes rent in return for a properly maintained system, paying its technicians and taking responsibility for ordering parts, stock control and distribution.

Côte d’Ivoire, for example, has just entered a five-year contract in which the entire cold chain is outsourced from the Ministry of Health to a private company. If the experiment

works well, other countries may follow, says Dr Dicko, although he warns that some governments are resistant to the idea.

Another approach, now being advocated in Nepal by IT Power's Terry Hart, is to encourage decentralization of cold-chain maintenance. When other aspects of the health system are decentralized, maintenance may be best done by small community organizations.

Management of the cold chain within the country is key, but another problem is ensuring the procurement and delivery of spares into the country in the first place. The majority of countries have no manufacturing capacity for the spares themselves. UNICEF, long responsible for the procurement of vaccines for the Expanded Programme on Immunization, has also taken responsibility for procuring cold-chain spares. Mikko Lainejoki, of UNICEF Supply Division in Copenhagen, says: "Whenever we supply a considerable number of cold chain units we always emphasize the need to include spare parts as a part of the initial purchase. The aim is to set up a system for regular routine replenishment of spare parts."

However, for this system to work properly, the government needs to ask UNICEF for enough spares and the spares need to arrive on time. Neither is always the case.

Supplies stuck in port

Recently, some governments have started procuring spare parts for cold chain equipment using their own budgetary sources, rather than having them supplied by UNICEF. Usually, they continue to buy through

UNICEF's own procurement mechanism, as in the case of India. UNICEF itself is exempt from paying import taxes, but if a government is paying for its own spares, the Ministry of Health may have to pay import tax on them. Funds for these taxes—required because countries are attempting to broaden their tax base—are supposed to be covered by a line item in each country's health budget, or may in some countries eventually be reimbursed by the finance ministry. But, whether through lack of funds, communication breakdown, or poor management, tax payments sometimes fail to materialise, leaving supplies in port and causing further delays in the delivery of equipment.

Mary Ann Carnell is technical director of a family health project in Madagascar for John Snow Incorporated, an international health consultancy, and the US Agency for International Development. The project works with the Madagascan Ministry of Health. She says that spare parts for vaccine refrigerators have sat in port there for up to two years in the recent past because of tax problems. The problems are now being resolved, she says, but there are still severely frustrating delays with the delivery and distribution of spares and the Ministry of Health is considering several options, including tenders for domestic suppliers, and tenders by the central medical store, a private non-profit organization, to ensure parts arrive promptly in future.

Funding is another problem. The cost of spares is high relative to the original refrigerators, says Lloyd. Manufacturers tend to make a very small profit on the original goods,

making their profit instead on the sale of spares. With budgets stretched, governments find it difficult to foot the bill. However, few donors have been willing to invest in either spares or cold-chain maintenance, regarding these as recurrent rather than capital costs and therefore governments' responsibility.

A soluble problem

"The entire management of the issue should be addressed," says Dr Dicko. "From forecasting the need for equipment, to installing it, to making sure that the fuel is available, to making sure that spare parts are always available, to making sure that temperature is monitored regularly. All these things are crucial." And, he stresses, while maintenance can be outsourced to the private sector, other important tasks, such as monitoring performance, must still be taken care of by the public sector.

Ultimately, the refrigerator problem seems more soluble than many facing immunization programmes. But it has remained neglected. With the advent of the new "dollars-per-dose" generation of vaccines, donors will be keener than ever to see waste reduced, and governments will want to ensure good vaccine management. "The Alliance partners should be doing much more," says Dr Dicko. "They should start lobbying the donors to focus on this issue." ■

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