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Managing Neglected Tropical Disease Partnerships

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Abstract

A key ingredient for success of eradication and elimination initiatives is the formation of an effective partnership among all participating parties. This chapter examines the mechanisms required to manage the partnerships and the delivery of the interventions needed to achieve the eradication and/or elimination goals. Such mechanisms include technical and programmatic leadership; implementation guidelines; supply of diagnostics, drugs, or vaccines; technical and programmatic review; monitoring of progress; evaluation of impact, budgeting and cost management; management of data; safety monitoring and reporting; and inventory management and distribution of drugs and vaccines.

Introduction

The formation of an effective partnership among all participating parties is a key ingredient for success of eradication and elimination initiatives. The concept of partnerships was discussed at an expert colloquium held at the Carter Center (Dentzer 2008), at which Tachi Yamada, from the Bill & Melinda Gates Foundation, stated: "The largest success of the past decade has been the formation of partnerships between private industry, between government, between affected nations and not-for-profit organizations such as ours" (Dentzer 2008:2).

GlaxoSmithKline has participated for more than a decade in the global partnership to eliminate lymphatic filariasis (LF), donating albendazole to reach several hundreds of millions of people in 50 countries. This chapter builds on the GlaxoSmithKline experience and examines the principles of managing a neglected tropical disease (NTD) elimination initiative in partnership with multiple countries to achieve a common goal.

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Background

Effective partnerships are essential for successful eradication and elimination initiatives and may involve:

- national governments of individual countries, as represented by the ministries of health, education, finance, and transportation;
- United Nations organizations (WHO, World Bank, and others);
- international donors (bilateral agencies, foundations, and private individuals);
- the pharmaceutical industry, which contributes financial donations and supplies drugs and vaccines;
- nongovernmental organizations (NGOs), which focus on implementation and patient care;
- civil society (patient care); and
- research institutions and universities, which supply scientific and programmatic support.

Each of these diverse partners brings unique strengths and capabilities to bear on the global challenge of disease elimination or eradication. Every effort should be made to ensure those strengths are used optimally.

Published reviews describing the achievements of the partnerships and the lessons that have subsequently been learned are available for onchocerciasis (Thylfors et al. 2008) and leprosy (Braber 2004).

Mechanisms Needed to Implement the Partnerships

To achieve the goals of elimination, a range of mechanisms are required for both the partnerships and the initiatives: a governance structure and forum, defined roles and responsibilities for each partner, shared strategic plan, advocacy and fund raising, and coordination and communication. These are discussed elsewhere and will thus not be repeated here (see, e.g., Stoever, this volume). For a partnership and NTD program to operate effectively, however, specific mechanisms are needed and will be discussed in turn below:

- lead technical and programmatic authority,
- implementation guidelines,
- diagnostic supply,
- drug or vaccine supply,
- technical and programmatic review,
- monitoring progress,
- evaluation of impact,
- budgeting and cost management,
- data management,

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- safety monitoring and reporting, and
- inventory management and distribution.

Lead Technical and Programmatic Authority

Because of the nature of NTD elimination programs, a coordinated approach is required across all countries engaged in the effort. For most of the initiatives listed in Table 13.1, WHO fulfills this role. It establishes guidelines for implementation, monitoring, and evaluation and appoints regional and technical groups to guide program implementation and strategy.

Implementation Guidelines

Each NTD program has published guidelines, specifically developed for county program managers, on how to implement an intervention. For many disease programs, delineation of these guidelines is carried out by the WHO as part of its normative function. For example, for the LF elimination program, WHO published a program manager's manual (WHO 2000a) that sets out the methodology on how to plan and implement the interventions, including:

- mapping disease prevalence,
- baseline surveys,
- training,
- mass drug administration,
- social mobilization,
- midterm evaluations,
- stopping of mass drug administration, and
- surveillance after mass drug administration.

More recently, with the emergence of integrated control of NTDs, WHO has published guidelines on preventive chemotherapy for NTD control (WHO 2006c).

For trachoma, the International Trachoma Initiative (ITI) has published detailed guidelines for the implementation of the comprehensive SAFE strategy

Table 13.1 Current elimination programs that target neglected tropical diseases.

Leprosy	Global Alliance for the Elimination of Leprosy http://www.who.int/lep/partners/en/
Onchocerciasis	Onchocerciasis Elimination Program for the Americas (OEPA) http://www.who.int/blindness/partnerships/onchocerciasis_oepa/en/index.html
Trachoma	International Trachoma Initiative http://www.trachoma.org/core/
Lymphatic filariasis	Global Alliance to Eliminate Lymphatic Filariasis http://www.filariasis.org/

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(ITI 2010). This publication complements the guidelines for program managers in trachoma control, which was published by WHO (2006d).

Diagnostic Supply

Diagnostics are used to map the prevalence of disease or to identify individual patients for selective treatment. Typically, diagnostic tests are manufactured by for-profit companies and are not donated. Thus a procurement process, with corresponding funding, is necessary.

Depending on the mapping methodology, the size of the country, and disease prevalence, each individual country may require only a relatively small number of diagnostic tests. Typically, however, manufacturers produce tests in batches, and their minimum batch size may far exceed the needs of any one individual country. Coordination is thus required to aggregate small orders from individual countries into large contracts with suppliers. Furthermore, manufacturers often prefer to work with a central procurement organization rather than many individual countries, as this reduces transaction costs. To enable the manufacturer to plan and allocate a slot in the production schedule, it is crucial to coordinate and aggregate forecasts and agree upon a supply schedule in advance. As country needs are clarified, orders can be gathered and combined into large orders to be placed with the manufacturer. Such coordination also enables more effective price negotiation. In the LF elimination program, this coordination role has been performed by the WHO for the provision of immunochromatography card tests. These tests are produced by Inverness and are either financed by the countries themselves, reimbursing WHO directly, or out of donated funds held by the WHO.

Drug or Vaccine Supply

The provision of quality drugs or vaccines in the necessary quantities requires an application process with appropriate reviews as well as a procurement system to ensure delivery to the country program when needed. Once in the country, an effective way of storing, transporting, and controlling products is also required. To ensure the effective supply of drugs or vaccines, the following mechanisms are required and discussed in turn below:

- application, review, and approval process,
- procurement plan,
- quality assurance and control,
- transport,
- in-country storage and logistics,
- warehouse management and control,
- reporting,
- product recalls, and
- an effective way to handle expired drugs and vaccines.

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Applications, Reviews, and Approvals

Whether drugs or vaccines are being donated or purchased, a mechanism is needed to quantify and request or order them. Each donation program has its own application form and process. In the LF elimination program, this process is managed by the WHO and involves a standard application form, which is reviewed by Regional Program Review Groups (R-PRGs). A standard application form is needed to capture all of the relevant information, which in turn enables a review group to make a recommendation on the leadership and management of the program, epidemiological data on treatment areas, implementation strategy, budget and funding, requirement for drugs (including inventory calculation), and delivery details.

Countries prepare elimination plans and submit applications for donated drugs to the R-PRG. In the LF elimination program, the following criteria are used by the R-PRGs to evaluate country submissions:

- Ministerial commitment to the elimination of LF.
- The initial proposal must contain the epidemiological and parasitological data required to begin operations. It must also make provision to expand that data progressively as needed to support the requirements of a national program. A phased approach is generally required for larger countries.
- Potential to integrate with other public health services or programs.
- Presence of a national coordination committee or similar body.
- Clear identification of resource requirements needed to implement the intervention program.
- For applications requesting an expansion of initial operations, evidence must show that the targets for the initial operations are being met, the epidemiological data are available to justify the expansion, and the resources for that expansion are adequate.
- Technical capacity is already present or a clear statement of how such capacity will be created.
- Guaranteed exemption from, or counterpart payments for, fees to cover customs duties, acceptance, and clearance. Evidence of mechanisms in place for appropriate drug handling and warehousing must also be demonstrated.
- A plan to have an impact assessment on transmission on a subset or a sentinel group of the treated population.
- The capacity or adequacy to identify, manage, report, and monitor serious adverse experience with drugs used.
- For reapplications, a progress report must have been received detailing progress achieved in the previous mass drug administration and an accounting of tablets used and remaining in stock.

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Once the R-PRG approves an application, its recommendation is passed on to the WHO for procurement.

Since each donation program has its own application form and review process, some countries maintain that there is duplication and unnecessary complexity involved in making multiple applications for different drugs (e.g., albendazole, Mectizan®, Zithromax®, mebendazole, diethylcarbamazine). In response, the Task Force for Global Health is currently working on a design for an integrated application, based on a template NTD plan, which can be applied for all drugs used in the NTD programs. Thus far, the only example of an integrated application form in use is one that was developed by the Mectizan Donation Program for use in applying for Mectizan® and albendazole for the LF and onchocerciasis programs in Africa.

Procurement

The mechanisms for donated and procured drugs and vaccines are very similar: donated products are simply procured at zero cost. For drugs donated via the WHO for the LF elimination program, a purchase order must be issued by the WHO procurement system with details of the quantity required, delivery address, due date, mode of transport, and detailed shipping instructions. On this standard WHO purchase order, the quoted price for donated drugs is zero. By using this system, orders are tracked and processed by the WHO according to their standard system and procedures. This alleviates the need to create a new system.

For procured drugs and vaccines, WHO uses the same system to place purchase orders. An evaluative process may, however, be used to establish the supplier and price of the products.

In cases where other partners purchase drugs or vaccines, they may need to adhere to the procurement system of the organization that houses the donation program. For example, in the schistosomiasis control initiative, praziquantel is purchased from generic manufacturers according to the procurement system used by Imperial College, where the initiative is based.

Quality Assurance and Control

Most donations of drugs or vaccines for eradication or elimination initiatives are made by major research-based pharmaceutical companies: Merck & Co., Inc. (Mectizan®), GlaxoSmithKline (albendazole), Pfizer (Zithromax®), and others. These companies are internationally recognized as suppliers of high-quality medicines and have high-caliber assurance and quality control systems. As such, WHO and most country governments are content to rely on the suppliers quality control systems and do not require additional independent testing. In a few cases, countries request inspections prior to shipment or may conduct independent quality testing on samples once they arrive in country.

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For initiatives that use nondonated drugs (e.g., diethylcarbamazine for LF or praziquantel for schistosomiasis), WHO usually seeks procurement from generic pharmaceutical companies. To ensure access to good-quality medicines, WHO operates a prequalification process to certify suppliers for inclusion on an approved supplier list. This is a rigorous process which takes time, technical resources, and funds—all of which WHO often lacks.

When an initiative uses nondonated drugs and operates without using WHO as a procurement agent, procurement is arranged directly with generic suppliers. Purchasing medicines from generic suppliers without a prequalification process does not, however, result in the same level of quality assurance. In addition, since different suppliers may be used each time a drug is procured, the drug itself may be delivered in different forms. This can create potential confusion for the user: the tablets provided may look physically different to ones previously used. To assist in the identification of the various drugs used in NTDs, WHO has published an informative newsletter, "Action Against Worms," which contains photographs of the actual drugs used in an intervention (WHO 2006a).

Transport

Drugs and vaccines need to be transported from the manufacturer to the country that needs them. Different programs use different modes of transport—land, sea, or air—depending on the circumstances of each shipment.

Most of the drugs that are used in disease control programs are manufactured in Europe or Southeast Asia, so the opportunity for land transport to countries is limited. One exception is albendazole, which is manufactured in South Africa by GlaxoSmithKline. Albendazole is able to be transported by land to neighboring Mozambique. However, given the poor state of road networks elsewhere, this delivery option is not readily available to other African countries. For land-locked countries in Africa and Asia, overland transport from the port of entry, which may be in another country, is necessary. This has proved especially challenging in several cases, as the transport route changes from one mode to another (often requiring different freight companies) and crosses national borders. For drugs manufactured in the country where they will be used, land transport is the obvious choice. In India, GlaxoSmithKline is able to deliver albendazole, which is manufactured in country, by road to the LF elimination program.

The cost of shipping drugs via sea freight is typically one-tenth of the cost of shipping by air. Thus, from an economic perspective, transportation by sea is preferred. However, sea freight is slow. It takes weeks (and sometimes months) to cross the oceans, and this time lag poses a challenge when planning to ensure that drugs reach the countries in time for the planned distribution program. For the LF elimination program outside of India, GlaxoSmithKline manufactures albendazole tablets in South Africa. The weight and volume of

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consignments precludes use of air freight in many cases, and thus 95% of albendazole tablets are shipped by sea freight to minimize costs. Greater lead time and close attention to forecasting and management of purchase orders is required to ensure that the shipping time does not delay a country's program.

Since the use of air transport is prohibitively expensive, it is only appropriate for small quantities or light products of high value. For example, most of the Zithromax® donated by Pfizer is sent by air to speed up delivery. It is also seen as a more secure mode of delivery for a high-value product.

Regardless of the transport mode, all shipments must conform to the storage requirements of the products (i.e., typically temperature and humidity conditions). Fortunately, the drugs used in the current NTD control programs are stable and do not generally require special conditions during transport.

In-Country Storage and Logistics

Once delivered to a country, drugs and vaccines need to be stored in appropriate warehouses. Storage must be secure to prevent theft as well as damage from heat, humidity, and other causes. The products then need to be transported by road to the districts for use. Typically, drugs and vaccines are shipped internationally on pallets, which can easily be moved into warehouses and onto container vehicles using forklifts. However, since the vehicles used to transport the goods further once in a country are often too small to accommodate a pallet, pallets must be dismantled so that the boxes can be loaded onto vehicles by hand. In-country transport can be a challenge due to limited availability of adequate vehicles and the poor state of many roads in developing countries, particularly during rainy seasons. Similarly, there is often a lack of suitable storage facilities at peripheral health centers, so drugs and vaccines must be stored in clinics or other available buildings.

Warehouse Management and Control

Good warehouse management is important to maintain control over the inventory and facilitate appropriate use. One important warehouse principle—first in, first out—is utilized to ensure that the oldest dated products are always used first. This may seem obvious; however, in a recent case from the LF elimination program, a country had stocks of drugs left over from the previous year's distribution program, and these were supplemented by a new delivery for the following year's program. The newly delivered drugs were subsequently used first, thus leaving the older drugs stored in the warehouse past their expiration date.

To address such problems, the International Trachoma Initiative recently published guidelines for the effective management of Zithromax® (ITI 2010). This excellent document covers in detail the necessary steps and procedures that are recommended for the effective management of Zithromax®, including

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receiving drugs, storage, inventory management, record keeping, managing expiry dates, and disposal of expired drugs and empty containers. The principles and procedures described in these guidelines are equally applicable to drugs used in other disease control programs.

Reporting

It is crucial for countries to report on the progress achieved in a program. Reporting is a vital component for all projects, since it allows progress to be measured against the original plan and for this to be taken into account as the next phase is prepared. For disease control programs, it is important to measure the distribution of drugs or vaccines, compliance, and coverage to evaluate whether the strategy being adopted is working effectively or needs to be refined. Regardless of whether funding is being provided from in-country budgets or external donors, all funders want to know how effectively the investment is being used.

For programs that benefit from donated drugs, reporting is particularly important as donors want to know that the drugs supplied have been used to treat the endemic populations and what quantities remain unused. For the LF elimination program, the template progress report (WHO unpublished) contains a simple table to report the number of people treated and a calculation of the quantity of drugs available at the start, those used, and the quantity that remains. This enables the drugs left over to be taken into account when calculating the requirement for the following year. Experience from the LF elimination program has shown that reporting is often poorly completed. On occasion, the calculations provided were inaccurate or contained missing information, which left open the question of what quantity of drugs remain unused each year. Most likely, this resulted from inconsistencies in record keeping within country, which makes it difficult for the national program manager to know what drugs remain in stock at the district level. Unless addressed, this problem could become acute as NTD programs become more integrated and several different drugs are used for the various diseases.

Product Recalls

Occasionally, due to problems in quality, individual batches of a drug or vaccine may need to be recalled. Fortunately, this happens rarely, and I am unaware of any instance having occurred in the current drug donation programs. If such a problem were to occur, however, the manufacturer would issue a recall notice specifying the batch numbers affected. The manufacturer would know which country/countries the affected batches were shipped to and have an audit trail through to delivery. However, once inside a country, the audit trail and recall process would depend on good record keeping to track where the relevant batches were sent.

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Expired Drugs and Vaccines

Unused drugs and vaccines left over from programs may occasionally exceed their expiry date. In such cases, expired drugs need to be destroyed in an approved manner: usually high-temperature incineration. Since many developing world countries lack a suitable incineration capacity, expired drugs or vaccines may need to be returned to the manufacturer to be destroyed. Good record keeping and stock management are essential to enable the expired drugs to be located, gathered, and packaged for export back to the supplier.

In the LF elimination program, there have been a few cases of drugs expiring unused, and these have had to be returned to the supplier to be destroyed in the country where they were manufactured.

Technical and Programmatic Review

Disease control, elimination, and eradication programs need appropriate review and technical oversight. Different programs have established their own structures. For example, the African Program for Onchocerciasis Control has established several levels of governance: the Joint Action Forum enables donors to have oversight of the program and the Mectizan Expert Committee provides technical and programmatic oversight.

For the LF elimination program, WHO provides technical and programmatic oversight. When the LF elimination program was launched, WHO established a Technical Advisory Group (TAG) to make recommendations and report back to the WHO on scientific, safety, and programmatic aspects of the elimination program. TAG was later incorporated into the new Strategic and Technical Advisory Group (STAG), which now provides this oversight function for all NTD programs. In addition, R-PRGs were established by the WHO to:

- Review and provide guidance to countries in the development of their national plans of action for LF elimination.
- Review the implementation and progress of national programs to ensure consistency with the regional and global strategies and targets, and to make recommendations to WHO regional focal points on the subsequent requests for up-scaling of programs in subsequent years.
- Provide technical guidance in the implementation of the TAG recommendations when relevant for the member countries of the region.
- Identify operational research issues that arise when programs are in the region and refer these issues to the relevant research institutions of the region and WHO.
- Advise the WHO on matters related to verifying the interruption of transmission of LF in countries of the region.

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- Advocate and support the member countries in seeking political commitments from governments and Ministries of Health for the elimination of LF.

These R-PRGs have proved very effective in reviewing progress by the countries, approving applications for donated drugs, and supporting countries as they resolve issues that affect their programs.

Monitoring Progress

The basic strategy behind programs to eliminate or eradicate a disease is to implement an intervention (typically, but not exclusively drug or vaccine treatment) that will bring the transmission of the disease below a specified threshold. Once this has been achieved, the interventions can be stopped and the disease should not reemerge. Program interventions need to be monitored closely to ensure that the treatment strategy is being implemented effectively (particularly the coverage achieved). Once the required number of treatment rounds has been completed, a thorough evaluation of the impact that the program has made on disease transmission needs to be conducted. This is challenging and often beyond the technical capability of a country's ministry of health. External partners such as the WHO, research institutions, and universities have a key role to play in defining the evaluation testing to be conducted. They also provide funds and technical support for the evaluation work and, in some cases, laboratory testing facilities to conduct the large number of sample tests involved. In the LF elimination initiative, this work has been funded by a grant from the Bill & Melinda Gates Foundation. Evaluations are currently underway in many countries engaged in the LF elimination initiative to demonstrate that transmission has been interrupted, and that mass drug administration can be safety stopped.

Stopping an intervention is a critical decision. If terminated too early, it may be difficult to restart the program if necessary. Consequently, country program managers are (rightly) cautious about stopping treatment and tend to take a low-risk approach by continuing treatment. There is the risk that treatment could continue beyond the point where it is actually needed, with consequent wasted effort, resources, and drugs. The cost and effort required to conduct a thorough evaluation upon which to base the decision to stop treatment may, however, be more challenging than the decision to continue to treat. Thus, external support is needed to assist a program manager in establishing the scientific evidence that it is safe to stop.

Evaluation of Impact

Separate from monitoring the progress achieved by the program is the evaluation of the overall impact on public health and economies of the affected

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countries. Disease elimination and eradication initiatives make a significant impact on public health, both for the people treated and for those who are spared the disease because transmission has been interrupted. In addition to health benefits, there are also economic benefits which accrue to individuals and families and the wider national and world economies.

The LF elimination program, for example, has been implemented in over fifty countries for more than ten years. Ottesen et al. (2008) calculate that after the first eight years, the disease had been prevented in 6.6 million newborns who would have otherwise acquired LF. Furthermore, the program averted 1.4 million cases of hydrocele, 800,000 cases of lymphodema, and 4.4 million cases of subclinical disease. A follow-up paper by Chu et al. (2010) reported on the economic benefits of the LF elimination program. They estimate that USD 21.8 billion of direct economic benefits will be gained over the lifetime of the 31.4 million individuals who were treated during the first eight years of the program.

Such evaluations are challenging to perform. However, a robust analysis of health and economic benefits is a powerful advocacy tool to convince governments and donors of the value of investing in disease elimination and eradication programs. It also serves as a motivator to encourage current partners and donors to stay engaged in the program through to completion.

Budgeting and Cost Management

A key mechanism for the implementation of disease control, elimination, and eradication initiatives is budgeting and cost control. This is important both at the level of the international partnership and at the country level where the program is implemented.

At the international level, the partnership needs to budget for funds to perform their roles of supporting the country programs with technical guidance. It is also needed to provide the necessary tools such as purchased diagnostics, drugs, and vaccines.

At the country level, a program manager needs to develop a budget for the implementation activities and fund these using grants from external sources (if available) and government budget. In an ideal situation, the country ministry of health is able to establish a line in the health budget for the program which the program manager can access. However, experience shows that a budget line is not established by the government; thus the program is forced to live somewhat "hand to mouth," seeking approval of funds each year. This is inherently unpredictable, and many programs have suffered delays in conducting interventions due to late availability of funds. In worst cases, programs have simply not been able to progress, and treatments have been missed in certain years.

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Data Management

A disease control, elimination, or eradication initiative generates an enormous amount of data on mapping, treatment interventions, and monitoring of impact. Effective data management is a vital mechanism but can be hugely complex. The required information originates at the peripheral level and must be captured and routed through to the national and international levels. Flows from peripheral agents through district and regional tiers of the health system to the national level are often beset with problems frequently associated with a lack of training, expertise, and suitable data management and transfer systems. Limited capacity in countries often means that most data is captured manually and physically transferred back to the program office. Thereafter, country program managers have to collate the data and provide reports to the ministry of health, donors, and WHO. These challenges are compounded at a WHO regional and global level, since the contributing countries often utilize different systems, resulting in huge challenges for coordination.

New activities are underway in several disease programs to employ modern information technology, such as mobile phones to speed up the capture and transfer of information. This is a new area that has yet to have a major impact on current disease initiatives.

Safety Monitoring and Reporting

Effective safety monitoring is an important mechanism that must be in place to support disease programs that utilize drugs or vaccines. Most drugs and vaccines have side effects, which are usually minor (e.g., headache or nausea); however, very occasionally severe adverse experiences (SAEs) can occur. An adverse event is defined by the U.S. Food and Drug Administration as any undesirable experience associated with the use of a medical product in a patient (U.S. FDA 2009). The event is classified as serious when patient outcome is fatal, life threatening, or disabling or involves the hospitalization of the patient.

Programs to control, eliminate, or eradicate diseases typically treat millions of people with drugs or vaccines. Thus it is vital to have an effective system to capture any reported SAEs. Reliable reporting helps raise confidence of populations in the drugs and vaccines that are used, and ensures that any reported incidents are taken seriously and investigated. Pharmaceutical companies are legally required to report all cases of SAEs so that the reports can be analyzed to detect any signals of potential safety issues. These reports must be made to the relevant regulatory authorities within a strict timetable.

WHO has published guidelines for SAE reporting in NTD programs, which include the forms to be completed for each reported incidence (WHO 2006d). These guidelines are useful for establishing and strengthening pharmaco-vigilance systems in countries where these mechanisms are weak. However, the

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extent to which these guidelines are being used has proved variable in NTD control programs.

Inventory Management and Distribution

Different disease programs have used a variety of mechanisms to distribute treatments to endemic populations. Those countries with well-developed health systems tend to use health care professionals to deliver treatment.

As part of the LF elimination program, for example, Sri Lanka adopted an approach where health care professionals plus volunteers go door to door to distribute tablets. In countries where there is a more limited health care capacity, such as in parts of Africa, a community approach has been necessary. Many countries in Africa have adopted the community-directed treatment approach pioneered by the onchocerciasis program. This approach uses community-selected volunteers to deliver Mectizan® to their communities, often for no direct financial reward. Adapting this approach has proved very effective in the distribution of health interventions in the LF elimination program.

Whichever distribution strategy is adopted, a distributor will typically be allocated a village or series of roads where the tablets need to be distributed. The distributor will be provided with the approximate number of bottles of tablets, and the task is to visit the people and give them the tablets. Often, people are not at home when the distributor calls, thus necessitating additional visits. In addition, some people must be excluded from treatment at the time of the mass drug administration because of illness or pregnancy. The distributor is thus likely to retain some of the unused tablets rather than return them all to the district clinic, so that these people can be treated later. This results in a percentage of tablets being retained by distributors and affects the calculations of unused remaining stock. Such "discrepancies" in the calculation of inventory are an inevitable result of the mode of distribution and need to be understood and allowed for in the inventory management and drug reporting and application processes.

Conclusion

Disease elimination and eradication initiatives present both serious challenges and great opportunities for improving public health. Many of the current programs underway have implemented mechanisms to address the challenges and are making significant progress. The era of single disease programs has evolved, and a new opportunity exists to integrate disease programs, so that an even greater impact on public health can be achieved. The mechanisms that have been established to implement disease-specific programs thus need to adapt and evolve to serve the wider goal of tackling a range of diseases that affect people living in the world's poorest countries.

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