Reporting and Investigating Adverse Events Following Immunization Campaigns in Afghanistan: Creating a Tool for Follow-Up

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Problem Statement

To conduct a critical investigation into how adverse events following mass immunization (AEFIs) for women and children are reported and investigated in Afghanistan and to create an operational tool for follow-up investigations of AEFIs.

Overview of the Project

The purpose of this project was to assist the Afghanistan Ministry of Public Health (MOPH, 2002) in developing guidelines for a tool to conduct follow-up investigations of AEFIs. Mass immunization campaigns are currently the main venue for eradication (polio), elimination (measles), and prevention (tetanus) efforts for children and women in Afghanistan. If AEFIs are not followed up carefully and promptly, serious AEFIs can erode public confidence in vaccines and contribute to poor immunization coverage.

Background

In the past 35 years, childhood immunizations have become one of the most efficient and cost effective public health preventative measures in both developed and developing countries. As a result, millions of children have been saved from crippling and fatal consequences from vaccine preventable diseases (Hadler, Cochi, Bilous, & Cutts, 2004). In fact, with the exception of safe water, no other intervention, not even antibiotics, has had such a major effect on mortality reduction and population growth (Plotkin, & Plotkin, 2004). Vaccines have not only assisted with disease prevention and control such as measles elimination programs but disease eradication, with smallpox eradication in 1980 and the prediction of eminent eradication of polio by 2006 (World Health Organization [WHO], 2004).

It is estimated that globally, 70% of the world's children are receiving the traditional childhood vaccination series of bacilli Calmette-Guérin (BCG); oral poliovirus vaccine (OPV); diphtheria, tetanus toxoid, and whole-cell pertussis (DTP); and measles (WHO, 2002). Aside from strong immunization programs in affluent countries, the improving vaccine coverage in developing countries is occurring largely as a result of WHO's Expanded Programme on Immunization (EPI), a program that was established in 1974 as an initiative to increase global immunization programs. The main target is to provide immunization against tuberculosis, tetanus, diphtheria, polio, and measles for all children, and against tetanus for all women of child-bearing age in underdeveloped countries (WHO, 1999).

Aside from disease prevention, vaccines are also considered one of the safest of health interventions (Chen, Davis, & Sheedy, 2004). The importance of keeping vaccines safe is a balance between risk and benefit. To maintain this balance, immunization safety is necessary both from an individual and a societal perspective (Chen et al., 1994). As vaccine-preventable diseases become less visible through effective immunization programs, more public attention will be focused on vaccine-related adverse events. Whether these events are only coincidental or caused by vaccine, AEFIs will become more prominent (Chen et al., 1994).

As immunization programs in developing countries mature, monitoring and assessment of suspected vaccine-related adverse events is critical to immunization safety. In recognition of this and the increasing use of vaccines, WHO (1991) recommended that all countries adopting national EPI programs implement surveillance for AEFIs. The surveillance system is necessary to prevent loss of confidence and public trust in vaccine

programs, decreased vaccine coverage, and the return of epidemics of disease (Pless, Bentsi-Enchill, & Duclos, 2003).

In 1977, MOPH for Afghanistan adopted and implemented the WHO EPI framework (as cited in MOPH, 2002). However, for the last two and a half decades, the EPI program and general health care infrastructure has been severely disrupted as a result of war and political instability. Hence, the WHO (1991) implementation of surveillance for AEFIs has not yet occurred. Although gains have been made in reestablishing a functional regional EPI management system, EPI in Afghanistan remains far from attaining the desired coverage and consistency of routine service delivery (United Nations Children's Fund [UNICEF], 2004b).

Consequently, in Afghanistan, health indicators are among the lowest in the world. The infant mortality is estimated to be 165 per 1,000 live births and the under-5 mortality rate is estimated at 257 per 1,000 (UNICEF, 2002). Measles and other vaccine-preventable diseases are responsible for significant morbidity and mortality among children. Although surveillance systems are limited, passive measles surveillance conducted by the sentinel sites for acute flaccid paralysis (AFP) surveillance in Afghanistan reported 8,762 measles cases in 2001. In addition, a study conducted in Kohistan district in northeast Afghanistan found that 16% of deaths in children aged greater than 5 years were due to measles (Assefa, Jabarkhil, Salama, & Spiegel, 2001). A (2003) survey to determine maternal mortality rates conducted by UNICEF, the U.S. Centers for Disease Control (CDC), and the Afghanistan MOPH reported that in some remote areas, up to 25% of neonatal deaths are attributable to neonatal tetanus. Maternal mortality rates were reported as high as 1,600 per 100,000 deliveries (UNICEF, 2002).

Finally, an ongoing pertussis outbreak in Badakshan and Darwaz provinces resulted in 115 cases and 17 deaths in children under 5 years of age and further illustrated the burden of vaccine-preventable diseases in Afghanistan (WHO, 2002).

Vaccine coverage rates in Afghanistan have remained consistently low throughout the last decade, with BCG at 56%, DPT (3doses) at 54%, measles coverage of children age one year estimated at 50%, polio (3 doses) at 54% in 2003 (UNICEF, 2004a). With such low measles coverage, estimating a conservative case fatality rate of 5%, WHO (2002) estimated that there were 35,000 measles related deaths in children 15 years of age and younger in Afghanistan in 2001. In reality, this number may have underestimated measles deaths because of an underestimation of the population (there has been no census since 1979) and the likelihood that the measles-specific conservative case fatality rate in Afghanistan is higher than 5%. The low vaccination coverage increases the risk of outbreaks, as evidenced by the ongoing pertussis outbreak mentioned previously.

In response to the low vaccine coverage and high impact of vaccine-preventable diseases, the MOPH, along with UNICEF and WHO, has conducted a number of national immunization days (NIDs) for polio, subnational immunization days for polio, and measles campaigns (measles mortality reduction campaign [MMRC]) since 2001. In addition, an ongoing national maternal and neonatal tetanus campaign began in February 2003 and will be conducted in phases until 2006. All of these campaigns in Afghanistan have achieved significant success to date. The number of polio cases recorded in 2004 reduced to 4 cases from 150 cases in 1999. An estimated 10.2 million children have been vaccinated for measles since 2002 (WHO, 2004).

Given the limited capacity to improve vaccine coverage through routine immunization services, campaigns are expected to be the major mode of improving vaccine coverage in the near future. These mass campaigns will lead to more vaccine reactions as well as more coincidental events just by virtue of the increase in numbers of people vaccinated. A well-functioning AEFI reporting and response system is critical to respond quickly to reports of AEFIs, which will assist to minimize their negative impact on community confidence as vaccination programs develop.

Although Afghanistan is a country that is making strides to improve its immunization practices, threats to the success of campaigns in Afghanistan can be related to insecurity, a lack of resources, and AEFIs. The purpose of this project was to address the latter of these caveats by completing a comprehensive and systematic review of AEFIs related to mass immunization campaigns and then to assist the MOPH in the development of an operational tool for use by MOPH EPI staff when an adverse event occurs during or following mass immunization campaigns.

Conceptual Framework

The author utilized Evans and Stoddart's (1990) health field model to develop a framework for the study (see Figure 1). This model, which was based on the determinants of health, provided a broad, multidimensional framework and directed attention to different types of factors and forces that can interact on different conceptualizations of health (Evans & Stoddart). The model encompasses eight factors: social environment; physical environment; genetic endowment; prosperity; well-being; health care; disease; and health function; and shows how the these factors impact on behavior (Evans & Stoddart).

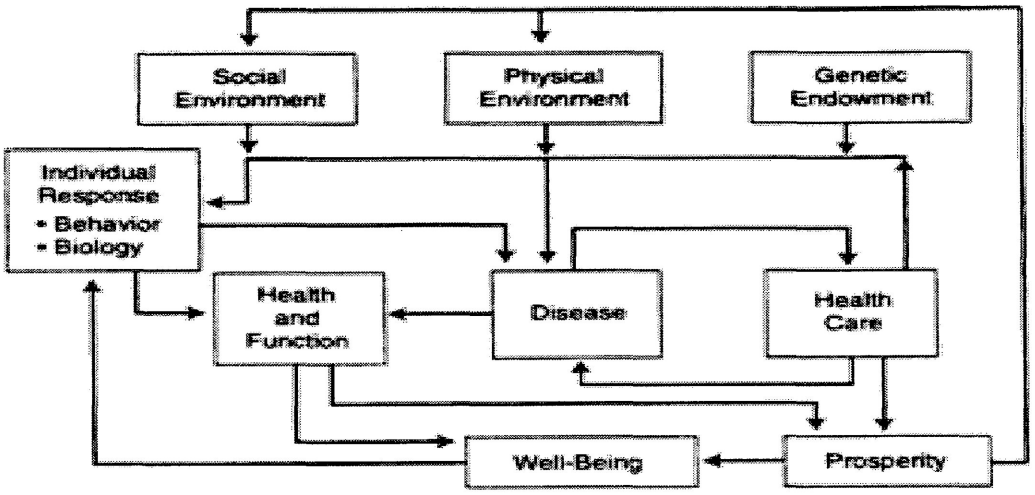

Figure 1. Evans and Stoddart's (1990) health field model.

The model lent itself well to designing a health improvement project such as a tool for AEFI follow-up because how a health behavior is understood is subject to the impact of multiple forces, for example, social and physical environments. This behavior can be a relevant target for intervention, but it is also shaped by the forces acting upon it. In the case of Afghanistan, unstable social and physical environments have impacted the health and well-being of the country greatly.

The author examined this model from a broad perspective to the extent of the health of a nation rebuilding an economic base and improving public health interventions such as immunization. This positive move forward will result in a sense of self-confidence and pride as well as improved health behavior. As Evans and Stoddart (1990) noted, a country that sees itself as hard working, becoming richer, and showing economic promise will yield health benefits.

The health field model (Evans & Stoddart, 1990) also shows how disease can influence health and purpose, which influence well-being. It can be used to assess both

the positive and, in the case of AEFIs, the negative factors that affect the health of a nation. Although these factors can be overlapping, such as the social and physical environments, these factors also are interrelated. Evans and Stoddart suggested that the interrelatedness among factors may prove to be more important than the actions of any single factor and that the outcomes are the product of complex interactions of the factors rather than of individual factors operating in isolation.

The author included an example to show how this interrelatedness is relevant to AEFI follow-up in Afghanistan and how an intervention to improve health, such as follow-up for AEFIs, can be influenced by many factors in the model: For example, if a child has an adverse event related to immunization, such as an infection from a poor immunization technique, it can be compounded further by the child's poor nutritional status and result in a longer healing time. Another example focuses on the many children with challenges related to the close blood relationship of their parents. Interfamilial marriage among close family is a common practice in Afghanistan (Jalal, personal communication, May 17, 2004). In an audiotaped speech to MOPH officials in 2004, Jalal stated:

> An estimated 4% to 10% of the Afghan population has physical disabilities. Those acquired at birth, including mental retardation, reflect the low level of antenatal care, inadequate treatment of infectious diseases, and cultural practices such as the intermarriage of first cousins.

If the children are challenged either mentally or physically, they are often kept sheltered in the home, and parents may refuse to bring them out, even for immunizations. This

illustrates how genetic endowment, which is unchangeable, also may impact a health intervention.

Evans and Stoddart's (1990) multidimensional approach allowed the author to look at fields that are not traditionally encompassed by the medical model in assisting the MOPH with the development of a tool for AEFI follow-up. The author was able to assist the MOPH to recognize that many factors influence health and that these factors should be considered before implementation of a health intervention.

Literature Review

To assist the methodology and development of a tool for follow-up of AEFIs, the author reviewed all major content areas of adverse event follow-up, including (a) a definition and historical overview of AEFIs, (b) a definition and historical overview of mass immunization campaigns, (c) global reporting strategies for AEFIs during mass immunizations, and (d) Afghanistan's current strategies for follow-up of AEFIs.

History and Definition of AEFIs

In 1999, WHO defined an AEFI as "a medical incident that takes place after immunization, causes concern and is believed to be caused by immunization" (p. 9). Pless et al. (2003) commented that AEFI implies no attribution of causality; rather, it merely suggests that something (an event) happened "after" the immunization. They suggested that an adverse "reaction" can be defined as any "untoward" event where the causal relationship supports an association. WHO organized AEFIs into five categories:

1. A **vaccine reaction** is an event caused by or precipitated by the vaccine when given correctly, caused by inherent properties of the vaccine. It can be either a common, minor reaction or a more serious, rare reaction.

2. A **program error** is an event caused by an error in the preparation, handling, or administration of the vaccine. It is preventable and detracts from the overall benefit of the immunization program.

3. A **coincidental event** happens after the immunization, but it is not caused by the vaccine. This is a chance, temporal association and is falsely considered to be caused by the immunization. It is often inevitable after giving a large number of doses, such as in a mass campaign.

4. An **injection reaction** is an event from anxiety about or pain from the injection rather than the vaccine. Individuals and groups can react in anticipation to and as a result of an injection of any kind.

5. An **unknown cause** is one that cannot be identified.

WHO (1999) classified the "cause" of the event into one of six categories: very likely/certain, probable, possible, unlikely, unrelated, and unclassifiable. The first three classifications are used when vaccine reactions or program errors are suspected, categories four and five are used for coincidental events, and category six is used when there is insufficient evidence to make an assessment (WHO).

AEFI follow-up is a relatively new concept, despite the fact that vaccines have been in existence for more than a 100 years. The history of AEFIs is largely connected to a fear of compensation claims and support from anti-immunization lobbyists in developed countries that was first documented in 1967 by Sir Graham Wilson, a former director of Public Health Laboratory Science in the United Kingdom (UK; Chen et al., 2004).

During this time, the UK was also responding to the thalidomide tragedy and a routine surveillance system for vaccine-associated adverse events was implemented (Salisbury, 2002). This was followed in 1986 by the National Childhood Vaccine Injury Act established in the United States to review the adverse events related to childhood vaccinations. In 66% of the adverse reactions that were reviewed, there was either no scientific evidence or inadequate evidence to judge for or against a causal link to vaccines (Howson, Howe, & Fineberg, 1991). The reasons for this scarcity of knowledge included limitations related to a lack of understanding of the underlying biological mechanisms associated with vaccines, poor case reporting, inadequate size and length of studies related to vaccine, lack of systematic surveillance, very few published epidemiological studies, and the costs of vaccine research (Stratton, Howe, & Johnson, 1994). As a result of this earlier work, methods of monitoring immunization safety, including strict pre- and postlicensure monitoring of vaccine manufacturers worldwide and surveillance systems for those agencies that deliver vaccines, have now been implemented in developed countries and most developing countries.

Definition and History of Mass Immunization Campaigns

A mass immunization campaign refers to a program that is taken to most of a group of people within a short time frame at specific times during a year; covers a large population, where large numbers of doses of vaccine are given; and is organized usually at a central level (Dietz & Cutts, 1997). In contrast to this are routine immunization programs, where people attend a health center or receive mobile services on a regular basis. By virtue of the number of doses of vaccine given during a mass campaign, there is

a direct correlation between the doses of vaccine given and the numbers of expected AEFIs (Pless et al., 2003).

Mass campaigns have been in existence since the late 1800s, when the first recorded mass immunization took place in 1899 when a scientist, Almouth Wright, began field trials for typhoid fever by vaccinating 4,000 Indian Army volunteers. Following "satisfying" results, he proceeded to vaccinate 14,000 volunteers from the British Army (Plotkin & Plotkin, 2004). After the Second World War, with the creation of WHO in 1948, mass campaigns became common as an important strategy to control disease and improve vaccine coverage in underdeveloped countries with poor health care infrastructures (WHO, 1988). Early campaigns, however, failed to achieve sustained control of diseases such as tuberculosis and malaria. This led critics to state that in the absence of strong health care service infrastructures, there was little capacity for campaigns to maintain adequate vaccine coverage (Shepard et al., 1989).

Since the 1990s, mass immunization campaigns have become a strategy for disease control and eradication rather than an improvement of vaccination coverage. WHO (1999) recommended mass immunization as a key strategy for the eradication of polio and the control of measles. The secondary effect of mass immunization campaigns is that health care infrastructures such as cold chain equipment, educational materials, and linkages between providers and communities remain in place in many developing countries following campaigns (WHO, 2002).

In developed countries, mass immunization campaigns have been useful in introducing selective vaccines to restricted populations, such as in Canada, when yearly influenza vaccine is given to those in risk categories (Orenstein, Rodewald, & Hinman,

2004). In a mass immunization campaign in Quebec, in 1993, 1.6 million children and young adults under the age of 20 were immunized in an attempt to control sero group C meningococcal disease. This vaccine covered 84% of the target population and had an overall efficacy rate of 79%. De Wals et al. (1996) suggested the existence of herd immunity as a secondary result of this vaccination campaign. Some limits to this study existed. For example, because there was no control group, indirect protection afforded by the vaccine could not be measured, and there was no mention of AEFIs during this campaign.

In developed countries, considering the number of immunizations suggested for children, mass campaigns are not recommended as a major means of improving overall vaccine coverage. For example, in Canada, children receive in excess of 20 doses of vaccine by 18 months of age; therefore, it is too complex to deliver vaccines in mass campaigns (Public Health Agency of Canada [PHAC], 2002).

Global Reporting Strategies for AEFIs during Mass Immunizations

Vaccines today protect nearly three quarters of the world's children against major childhood illness (UNICEF, 2004a). As indicated earlier, AEFIs can be causally related to the inherent properties of vaccines or linked to program errors, but it must be recognized that when large populations are vaccinated, some serious events that occur rarely with or without vaccination will be observed coincidentally following vaccination (WHO, 2002).

To date, intensive surveillance of adverse events during mass campaigns has taken place mainly in developed countries that have existing monitoring systems (Pless et al., 2003). Canada's current vaccine safety system for reporting AEFI is the Canadian

Adverse Events Following Immunization Surveillance System (CAEFISS). In this system, all professionals involved in the administration of vaccines are encouraged to report and potential vaccine-associated adverse events to their local public health authorities (PHAC, 2003). This is a passive surveillance system, and reporting rates vary because some areas in Canada, but not in all provinces and territories, have legislated jurisdiction over reporting. An expert review advisory committee with volunteer membership meets twice a year with a mandate to select potential vaccine-related adverse event cases for review and to determine if they are linked causally to vaccines. Findings are communicated to the provinces and the territories, but the dissemination of this information is left to their discretion. In 2004, there were more AEFIs reported through this system than the total number of cases of reportable vaccine-preventable diseases (PHAC).

Studies showing Canada's history with mass immunization AEFI follow-up is relatively recent. One report (Sciberras, 1996) described a mass immunization campaign in Ontario in 1995 where measles vaccine was given. AEFIs were reported using CAEFISS. More than 1,869,000 doses of monovalent measles vaccine was administered to children aged 4 to 19 years of age, and 751 adverse event case reports submitted. Sciberras suggested that following the expert committee review, most events were thought to be unrelated to immunization.

In British Columbia, 703,850 children aged 18 months to 7 years were vaccinated with measles rubella vaccine in 1996, and 462 AEFIs were reported in this target group (65.6/100,000). There was one serious AEFI reported as anaphylaxis, but the remaining

reactions were expected: rashes, joint swelling, and "measles-like illness." The AEFIs were reported using CAEFISS (Daly & Pielak, 1997).

New Zealand's system for monitoring AEFIs is the Center for Adverse Reactions Monitoring (CARM). This, too, is a passive monitoring system. It receives spontaneous reports from doctors, nurses, and the public. Then on a monthly basis the reports are entered into a database. The information gathered by CARM is provided to the Medicines Adverse Reactions Committee quarterly and to WHO's Collaborating Center for International Drug Monitoring. Despite the ongoing collection of data and monitoring, there is no immediate, up-to-date, accessible information about the incidence of AEFIs in New Zealand (Miller &Turner, 2002).

When New Zealand conducted a mass measles immunization campaign in 1997, adverse events were collected through CARM. Reporting rates of AEFIs were lower during the campaign year than in subsequent years. For example, in 1997, there were 43.6 AEFIs reported per 100,000 estimated vaccinations, as compared to the two previous noncampaign years when the rates were 67.8 and 61.4 per 100,000 administered vaccinations (Pless et al., 2003). The researchers reported that the decreased rates of AEFIs in the campaign year were the result of the nonconcomitant administration of toxoid vaccines that normally are given during routine immunizations.

In the developing world, most of all EPI vaccines are supplied by UNICEF through WHO-recommended sources. Through a process of prequalification, WHO advises UN procurement agencies on the quality, efficacy, and safety of vaccines available, and vaccines are purchased accordingly. Surveillance of AEFIs is not consistent in EPI programs; in 2000, 42% of all EPI programs reported that they had

some monitoring for immunization safety in place. Of these, fewer than 50% had programs that met the WHO (2002) regulatory authority criteria for functioning systems.

In Romania, a mass measles vaccination campaign occurred between October 1998 and January 1999. During this period, more than 2 million school-aged children received measles and rubella vaccines. Surveillance for AEFIs during the campaign followed WHO's AEFI surveillance guidelines because there were no preexisting systems in place for monitoring AEFI. In total, 128 adverse events, including fainting, allergic reaction, and possible anaphylaxis, were reported (Ion-Nedelcu, Craciun, & Pitigoi, 2001).

In 2000, South Korea responded to an increase in measles cases by implementing a 10-week mass immunization campaign. AEFIs were monitored using a coordinated system of vaccine safety monitoring that was introduced in 1999. In all, 1,199 reports of AEFI were received, and nearly 5 million doses of vaccine were given. Only 2 serious AEFIs were found to be "probably" related to immunization (Yang, 2001).

In Costa Rica, a mass campaign was launched to eliminate rubella and congenital rubella syndrome in 2001. There were 1,635, 445 doses of measles and rubella vaccine administered to people aged 15 to 39. AEFIs were reported using the Costa Rica Social Security System, a passive reporting system that monitors vaccine safety. There were 981 adverse events reported (60/100,000 doses), but the symptoms, such as headache, fever, rash, and arthralgia, were mild and expected (CDC, 2001).

Even though most AEFIs are mild, they are a cause for concern and must be investigated. If they are not responded to promptly, serious AEFIs may cause the public to perceive that vaccines are harmful. This misconception can erode public confidence in

vaccines and may contribute to decreased immunization rates, which may lead to a resurgence of vaccine-preventable diseases.

Afghanistan's Current Strategies for Follow-Up of AEFI

Afghanistan is a country that has struggled through decades of war. It continues to rank among the worst in the world in basic health indicators such as infant and maternal mortality. Since the fall of the Taliban in 2001, the MOPH of the Islamic State of Afghanistan, with assistance from international organizations, has started to rebuild the health infrastructure, but insecurity and resource issues continue to plague the country, and the rebuilding process is slow.

Health care to the average citizen is limited. The physician-to-patient ratio is 8:100,000 in rural areas and 1:1,000 in Kabul, where only 12% of the population lives. Hospitals are limited to provincial capitals, and the capacity for caring for the ill is generally poor. Nearly 6% of people admitted to hospital do not recover, and more that 50% of these patients are children (Reilly, Puertas, & Coutin, 2004).

Currently, the majority of health care in Afghanistan is provided through nongovernmental organizations (NGOs), and 80% of functional health care facilities have some form of support from these organizations, which often includes medicine and other basic equipment (WHO, 2002). UNICEF (2004a) provides 100% of Afghanistan's vaccines and funds the MOPH to provide vaccinations for children through the MOPH and EPI, but as many as 45% of children still do not have access to immunization services.

Important progress has been made in measles vaccinations and other immunization programs, as discussed earlier. This progress has had a rapid effect on

improving the health of children and women; therefore, it is important not to jeopardize this progress with a poor response by health care providers to AEFIs. Prior to this project, there has been no formal reporting system for AEFI follow-up in Afghanistan. In a study published in 2003, Dadgar et al. described the implementation of a mass measles campaign in central Afghanistan from December 2001 to May 2002. They reported that "adequate" injection safety was observed during monitoring, however; there was "no systematic monitoring of AEFI" (p. S188).

AEFI surveillance has not until now been adopted in Afghanistan, and to the author's knowledge, there are no published studies related directly to AEFI in Afghanistan to date. EPI managers report anecdotally to WHO or UNICEF offices in their areas, but no processes are in place to capture and analyze this information. The author found five documented but unpublished reports of AEFIs between 2002 and 2004. Three of the reports were deaths related to anaphylaxis following a measles campaign, one was related to abscesses following a measles campaign, and one localized reaction was related to tetanus immunization. However, based on the number of campaigns that took place in Afghanistan during this time, one would expect to see more AEFIs. There were at least 12 countrywide mass campaigns for polio, 3 countrywide campaigns for measles, and ongoing tetanus campaigns for childbearing women during this period (UNICEF, 2005).

An expected anaphylaxis reaction to measles vaccine is 1:1,000,000 (WHO, 1999). Therefore, given that 10,000,000 children were immunized against measles in 2003 alone, there should have been at least 10 expected cases of severe AEFIs. The lack of reports of AEFIs in Afghanistan cannot be attributed only to a lack of a coordinated

surveillance system. It is exceedingly more complex when there are insecurity issues, a minimal health care infrastructure, and communication deficits. A coordinated, well-functioning AEFI reporting and response system is critical to responding quickly to reports of AEFIs. This will help to minimize the negative impact of AEFIs on community confidence in vaccination programs and decrease the potential threat to the health of children and women experiencing adverse events.

Methodology

In 2004, the Afghanistan MOPH's EPI Division requested assistance from the author to assist in developing guidelines for reporting and investigating AEFIs specifically related to mass immunization campaigns. This was the result of previous assistance from the author on vaccine-preventable disease surveillance while working with UNICEF Afghanistan.

In preparation for the development of the guidelines, the author reviewed the literature on AEFI with a specific focus on mass campaigns using Evans and Stoddart's (1990) field health model as a framework. The author, along with the national EPI manager in Afghanistan, then prepared a cross-sectional descriptive survey for regional EPI managers. These surveys would be done independently and returned to the national EPI manager. Although the survey could be described as a mail survey, there is no reliable postal service in Afghanistan, therefore most surveys were hand delivered and hand returned.

Neutens and Rubinson (2002) noted that surveys are widely used in health research and are often the basis for program planning. They also suggested that mailed questionnaires are advantageous because they are inexpensive, allow access to wider

geographical areas, and convenient for the respondent, interviewer bias is eliminated, greater anonymity is assured, and all respondents receive the same questions. Some concerns associated with mail surveys are: some questions will probably be left unanswered, there may be low response rates, there is an inability to record spontaneous comments or use complex questions, and there is no guarantee that the surveys will be returned on time.

The Survey

The survey method was chosen to assist the author in understanding what currently is being done in each EPI region to follow up AEFIs. In addition, the survey method is traditionally used in Afghanistan for other health-related issues such as assessing nutritional status and vaccine coverage rates. The development of the survey was done via e-mail correspondence between the author and the national EPI manager and was pretested on EPI managers in the Kabul area. This pretest was done to assess the viability of the survey and literacy level. The questionnaire was then revised based on the pretest, and the target was expanded to include regional EPI managers, provincial EPI managers, and anyone who was delivering the EPI. The rationale for expanding the target population was to be more inclusive of the MOPH EPI staff who were providing direct EPI services.

The survey had three objectives:

1. To assess the level of understanding and experience that MOPH staff delivering EPI services had with AEFI follow-up.
2. To assess the resources that MOPH staff have to assist with AEFI follow-up.
3. To identify what resources MOPH staff need to assist them with AEFI follow-up.

Unfortunately, because of security reasons, the author was unable to be in Afghanistan for the needs assessment, but the author had recently worked with the national EPI manager and was confident in his ability to administer the survey. Thirty-five questionnaires (see Appendix A) were distributed to 12 regional EPI managers in Kabul on February 7, 2005. The regional EPI managers present were to complete the survey and distribute the remaining copies to provincial EPI managers and other MOPH staff delivering EPI services in their region. The surveys were distributed by February 22, 2005, and returned by March 27, 2005.

Survey Results

Twenty questionnaires (57%) were returned to the national EPI manager by March 27, 2005. The results, sent to the author via e-mail, were as follows:

1. 50% of responders identified themselves as EPI managers (40% of these also identified themselves as physicians), 25% were polio officers, 20% were vaccinators, and 5 % were nurses.
2. 65% of respondents had seen adverse events, which they described as shock, blisters, abscesses, bruises, hives, rash, paralysis, and death.
3. 35% had not seen an adverse event.
4. Of the 65% who seen an adverse event:
    - 80% reported that they would help the child.
    - 20% reported that they would tell the EPI manager.
    - 10% reported that they would report it to the polio officer.

5. 13% of responders stated that they had a guide from WHO on how to follow adverse events, 87% reported that they did not have resources but would like a "book" or "someone to help them."
6. 95% of responders stated that they would like clear guidelines to follow, a clear reporting structure, and training.
7. 5% stated that they would like to go to another country for more training.

Survey Limitations

There were a number of limitations to this survey: (a) The author had no control over the explanation of the study questions to the participants because it was administered by the national EPI manager; (b) only those participants who attended the initial meeting in Kabul could ask questions about the survey, whereas the other participants could not; (c) the survey was written in English, and this is not the mother tongue of the participants, although staff working for EPI are to have a "working knowledge" of English; (d) the response rate was lower than the author had expected; and (e) because of the poor infrastructure (e.g., unreliable mail and telecommunication systems), some questionnaires may have become lost in transit.

Next Steps

Following the survey, a round table discussion on the survey results and the next steps was held. In May 2005, the author was able to travel to Afghanistan and attend this round table meeting of EPI managers from across Afghanistan. At this meeting, the author and the national EPI manager presented the results of the survey, provided education on AEFIs, and began discussions on the next steps. The discussions from this early meeting guided the next actions, which included a review of the literature, a conceptual framework, the formation of a subcommittee of EPI managers who would

assist the author in the development of guidelines as well as an education component for AEFI follow-up.

Draft guidelines were developed for Afghanistan, using an existing framework from WHO (1999). The rationale for using these guidelines was that:

1. The existing WHO framework is being used in developing nations that have implemented the EPI.
2. WHO's AEFI framework is part of the larger EPI framework.
3. If changes in WHO's AEFI framework occur, the Afghanistan MOPH can easily adapt the document to reflect the changes.

Discussion

Because health care and the health care infrastructure in Afghanistan are limited, AEFI follow-up and surveillance have been haphazard and have been restricted to surveillance during and after mass campaigns and only as anecdotal reports. With the implementation of AEFI guidelines, a coordinated effort will assist in limiting the reactions that can be caused by AEFIs.

Although the public health infrastructure in Afghanistan continues to improve with enhanced surveillance of vaccine-preventable diseases, the same principles of AEFI surveillance can be gradually introduced and can apply to routine EPI service. The follow-up tool for AEFIs, which was developed as a stand-alone resource and/or field guide, will assist MOPH EPI staff in their investigations. The author reminds the reader that some of the information in the tool may be a repetition of information previously discussed in the paper. "Summary" boxes are scattered throughout the AEFI follow-up tool. These will provide field staff with a quick synopsis of the data.

The AEFI Follow-Up Tool

Purpose

This document provides a guideline for managers and others responsible for immunization programs on the surveillance and appropriate response of AEFIs in Afghanistan. This document was developed specifically to enhance the recording and monitoring of AEFIs and is particularly targeted at the ongoing campaign for measles elimination. This document was adapted with permission from WHO (1999).

Adverse Events Following Immunization

As mentioned previously, vaccines used in Afghanistan's national EPI are extremely safe and effective. However, no vaccine is perfectly safe, and adverse events can occur following immunization. In addition to the vaccines themselves, the process of immunization is a potential source of adverse events. An AEFI is any adverse event that follows immunization that is believed to be caused by the immunization. AEFIs fall into five categories (see Table 1).

Table 1

Classification of AEFIs

Vaccine reaction:	AEFI caused or precipitated by the vaccine when given correctly; caused by the inherent properties of the vaccine.
Program error:	AEFI caused by an error in vaccine preparation, handling, or administration.
Coincidental:	AEFI that happens *after* immunization, but is **not** caused by the vaccine – an association due to chance.
Injection reaction:	AEFI from anxiety about, or pain from, the injection rather than the vaccine.
Unknown:	Cause of the AEFI cannot be determined.

Source: WHO (1999), p. 9.

Vaccine Reactions

Measles vaccine, which has been used since 1963, has an excellent safety record. It does commonly cause minor reactions and, rarely, more serious reactions (see Table 2).

Measles is a live virus vaccine, and most reactions result from a vaccine virus infection 6 to 12 days after immunization.

Measles vaccine infection causes fever, rash, and/or conjunctivitis, and affects 5% to 15% of nonimmune vaccines. It is very mild, as compared to "wild" measles, but in severely immunocompromised individuals, it can be severe. Current WHO advice is to immunize all children with measles vaccine, regardless of HIV status, and there is no need to screen for HIV status beforehand. However, a child who is seriously ill with HIV or any other cause should not be vaccinated.

Thrombocytopenia (low platelet count) can occur with any viral infection. It manifests by bruising and is usually mild and self-limiting. Although encephalopathy has been identified as a rare reaction to the measles vaccine, it is unclear if it is a true reaction to the measles vaccine or simply a coincidental event. The measles vaccine can also cause a local reaction at the injection site as well as allergic reactions that can rarely be very severe: anaphylaxis. Anaphylaxis, while potentially fatal, is treatable without any long-term effects.

Similarly, other vaccines can result in reactions. Most reactions occur within a day or 2 of immunization and usually last for a few days. Most of these reactions are minor, resolve without treatment, and do not lead to long-term problems. Important vaccine reactions observed with different antigens and their relative frequency are outlined in Table 2. The figures in Table 2, which were adapted from WHO (1999) can be used to calculate the anticipated rate and type of reactions for specific immunization campaigns, identify adverse events that are unlikely to be related to the vaccination, and compare reported rates with expected rates of reactions.

Health care providers should be aware of the common adverse events following vaccination. Parents should be informed of the common reactions following immunization, for example, the possibility of mild measles 6 to 12 days following immunization. Advice should include home management of mild adverse events and instructions to seek treatment at health facilities in the case of severe symptoms. This will serve to reassure parents and prepare them for mild adverse events.

Common vaccine reactions, namely, fever and pain, can be treated with Paracetamol (acetaminophen) 15 mg/kg every 4 hours for 3 to 4 days. In addition, adequate fluids and tepid sponging may be given to febrile cases. For minor local reactions, application of a cold compress may ease pain.

Table 2

Vaccine Reactions, Onset Interval, and Rates

Vaccine	Reaction	Onset Interval	Doses per Reaction	Reactions per Million Doses
Measles/ MMR/MR*	Local reaction at injection site	0-2 days	~1 in10	(~10%)
	Fever >38 deg C	6-12 days	1 in 6 to 1 in 20	(5%-15%)
	Rash	6-12 days	~ 1 in 10	(~ 5%)
	Febrile seizures@	6-12 days	1 in 3,000	330
	Thrombocytopaenia (low platelets)	15-35 days	1 in 30,000	30
	Anaphylactoid (severe allergic) reaction	0-2 hours	~ 1 in 100,000	~ 10
	Anaphylaxis	0-1 hour	~ 1 in 1,000,000	~ 1
	Encephalopathy	6-12 days	< 1 in 1,000,000	< 1
Tetanus	Local reaction at injection site	0-2 days	1 in 10	~ 10%^
	Fever >38 deg C	0-2 days	1 in 10	~ 10%
	Irritability, malaise and systemic symptoms	0-2 days	1 in 4	~ 25%
	Brachial neuritis	2-28 days	0.5 - 1 in 100,000	5-10
	Anaphylaxis	0-1 hour	1 in 100,000 to 1 in 2,500,000	0.4-10
OPV	Fever >38 deg C	0-2 days	< 1 in 100	< 1%
	Irritability, malaise and systemic symptoms	0-2 days	< 1 in 100	< 1%
	Vaccine associated paralytic poliomyelitis	4-30 days	1 in 2.4-3 million	~ 0.4
DTP	Local reaction at injection site	0-2 days	Up to 1 in 2	Up to 500,000 (50%)
	Fever >38 deg C	0-2 days	Up to 1 in 2	Up to 500,000 (50%)
	Irritability, malaise and systemic symptoms	0-2 days	Up to > 1 in 2	Up to 550,000 (55%)
	Brachial neuritis	2-28 days	0.5-1 in 100,000	5-10
	Persistent inconsolable screaming (>3 hours)	0-24 hours	1 in 15 to 1 in 1,000	1,000-60,000 (0.1%-6%)
	Seizures#	0-2 days	1 in 1750 to 1 in 12,500	80-570
	Hypotonic Hyporesponsive Episode (HHE)	0-24 hours	1 in 1,000 to 1 in 33,000	30-990
	Anaphylaxis	0-1 hour	1 in 50,000	20
	Encephalopathy	0-2 days	0 -1 in 1 million	0 -1
BCG	Local reaction at injection site	2-4 weeks	~ 1 in 1	90%-95%
	Suppurative lymphadenitis	2-6 months	1 in 1,000 to 1 in 10,000	100-1,000
	BCG osteitis	1-12 months	1 in 3,000 to 1 in 100 million	0.01-300
	Disseminated BCG infection	1-12 months	~ 1 in 1 million	0.19-1.56

* Reactions (except local reaction and anaphylaxis) do not occur if already immune (~ 90% of those receiving a second dose).

@ Children over 6 are unlikely to have febrile seizures.

Seizure risk is age dependent and lower for older children.

^ Rate of local reactions is likely to increase with booster doses, up to 50% to 85%.

Source: WHO (1999), p. 11.

Program Errors

Program errors result from errors and accidents in vaccine preparation, handling, or administration (see Table 3; WHO, 1999). They are preventable and detract from the overall benefit of the immunization program. The identification and correction of these errors are of critical importance.

A program error may lead to a cluster of events associated with immunization. These clusters are usually associated with a particular provider, health facility, or even a single vial of vaccine that has been inappropriately prepared or contaminated. Program errors can also affect many vials (e.g., by freezing vaccine during transport, leading to an increase in local reactions).

Table 3

Program Errors Leading to Adverse Events

Program Errors	Adverse Events
Nonsterile injection: reuse of disposable syringes or needles. improperly sterilized syringes or needles. contaminated vaccine or diluent. reuse of reconstituted vaccine at a subsequent session.	Infection (e.g., local suppuration at injection site; abscess; cellulites; systemic infection; sepsis; toxic shock syndrome; transmission of blood-borne virus (e.g., HIV, hepatitis B, or hepatitis C).
Vaccine prepared incorrectly: vaccine reconstituted with incorrect diluent. drugs substituted for vaccine or diluent.	Local reaction or abscess from inadequate shaking. Effect of drug (e.g., muscle relaxant, insulin).
Vaccine injected at wrong site: subcutaneous instead of intradermal for BCG. too superficial for toxoid vaccine (DPT, TT). buttocks.	Local reaction or injection site abscess. Local reaction or injection site abscess. Sciatic nerve damage.
Vaccine transported/stored incorrectly.	Increases local reaction from frozen vaccine (and ineffective vaccine).
Contraindications ignored.	Avoidable, severe vaccine reaction.

Source: WHO (1999), p. 13.

The most common adverse event resulting from program error is infection, including blood-borne virus, because of nonsterile injection. The infection can manifest most commonly as a local reaction (e.g. suppuration, abscess). In addition, abscesses may arise from an inappropriate injection technique as well as the use of an inappropriate

diluent. Less commonly, children vaccinated with a contaminated vaccine may develop systemic infection (e.g., sepsis or toxic shock syndrome), or a blood-borne virus infection (e.g., HIV, hepatitis B or hepatitis C).

It is critical to detect clusters of adverse events due to program errors. In the case of campaigns, these clusters could amount to a large number of cases, so their earliest identification with an appropriate response is crucial in maintaining the community's confidence in immunization programs (see Appendix B). Loss of community confidence can lead to decreased uptake during the remainder of the campaign as well as lower uptake of routine EPI services, as evidenced following the cluster of abscesses after the MMRC campaign in Nahrin district (Araki, in press). Response would entail the identification and elimination of the cause (corrective action) followed by an appropriate explanation of the situation to the community. To avoid program errors:

1. Vaccines must be reconstituted only with the diluent supplied by the manufacturer.
2. Reconstituted vaccines must be discarded at the end of each immunization session. They must never be retained.
3. No other drugs or substances should be stored in the refrigerator of the immunization centre.
4. Immunization workers must be adequately trained and closely supervised to ensure that proper procedures are being followed.
5. Careful epidemiological investigation of an AEFI is needed to pinpoint the cause and to correct immunization practices.

Coincidental Events

An event may occur coincidentally with immunization and, at times, may be falsely attributed to the vaccine. In other words, a chance temporal association (i.e., an event happens *after* immunization) is falsely considered to be caused by the immunization. These purely temporal associations are inevitable, given the large number of vaccine doses administered, especially in a mass campaign.

Coincidental AEFIs are predictable. The number of AEFIs to be expected depends upon the size of the population and the incidence of disease or death in the community. Knowledge of these background rates of disease and deaths allows an estimation of the expected numbers of coincidental AEFIs. For example, assume that one million children aged one to 15 years are immunized in a mass campaign and that the background mortality rate for this population is 3 per 1,000 per year. Therefore, 250 deaths can be expected in the month after immunization and 8 deaths on the day of the immunization simply by coincidence. These deaths will be temporally associated with, even though entirely unrelated to, the immunization campaign.

It is important to keep the possibility of coincidental events in mind. Once an AEFI is confirmed to be coincidental, the fact that it is not associated with the vaccine should be communicated clearly to the community.

Injection Reactions

Individuals and groups can react in anticipation of or because of an injection of any kind. This reaction is unrelated to the content of the vaccine. Fainting is relatively common, but it usually only affects children over the age of 5 years. Fainting does not require any management beyond placing the patient in a recumbent position.

Hyperventilation because of anxiety about the vaccination leads to specific symptoms (i.e., light-headedness, dizziness, tingling around the mouth and in the hands). An anxiety reaction to injection may include convulsions in some cases.

These reactions are not related to the vaccine, but to the injection. Some individuals may be afraid of needles, thus aggravating such reactions. In a group situation, mass hysteria is possible, especially if onlookers see the individual faint or have another reaction. Clear explanations about the immunization and calm, confident delivery will decrease the level of anxiety about the injections and reduce the likelihood of an occurrence. In some campaigns, injection reactions are the commonest adverse event. It is important to make the vaccinators aware of the possibilities of such events so that they are not unexpected. This is especially important in campaigns in which older children (adolescents) are being vaccinated.

Establishing AEFI Surveillance

In Afghanistan, given the limited public health infrastructure, it is unrealistic to expect a comprehensive surveillance system that will detect all cases of AEFIs. In addition, minor AEFIs may overwhelm the health care system if they are all reported. Further, rare cases of vaccine reactions may not be detected and may be difficult to verify in the absence of laboratory confirmation.

However, a system to detect clusters of cases following a campaign is important. Preventing AEFIs is crucial, but should they occur, responding quickly and appropriately is equally important. These clusters, as mentioned earlier, are usually the result of program errors, so their early detection enables swift action to address these errors.

Objectives

AEFI surveillance in Afghanistan should aim to:

1. Detect program errors so that they can be addressed quickly and prevented in the future.
2. Maintain the confidence of the community in immunization services by responding rapidly to reports of AEFIs, communicating the findings to the community, and providing reassurance.
3. Ensure that coincidental events are not falsely blamed on vaccinations.

Responsibility for AEFI Surveillance

In Afghanistan, the MOPH should be responsible for all matters pertaining to AEFIs. At the central level, the MOPH national EPI manager will be the person responsible for AEFI surveillance. The UNICEF senior EPI project officer and the WHO EPI team leader will provide technical assistance to the MOPH. At the regional and provincial levels, AEFI surveillance will be coordinated by the head of the regional EPI management team (REMT) and the provincial EPI management team (PEMT), with support from UNICEF regional (health technical advisor) and provincial EPI staff, as well as WHO Regional (regional public health coordinator) and Provincial EPI staff (provincial polio officers). Figure 2 shows the structure of the national EPI program at the central, regional, and provincial levels, with the corresponding structure of the UNICEF and WHO EPI teams.

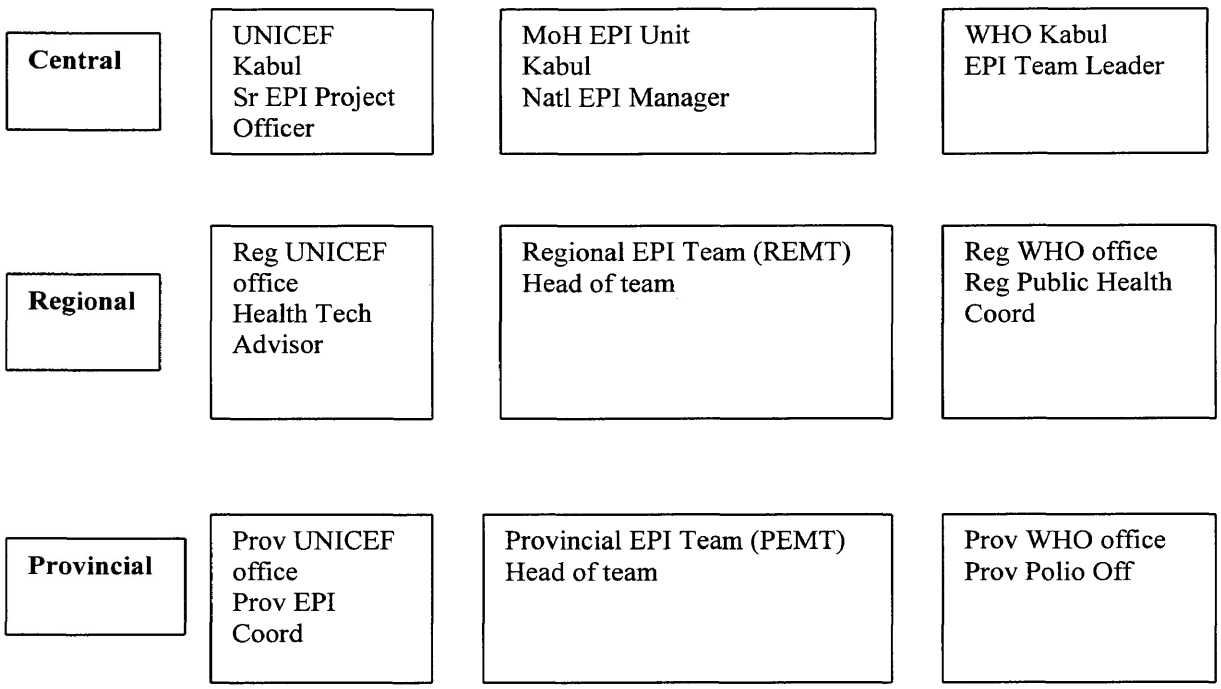

Figure 2. EPI management structure of MOPH, UNICEF, and WHO.
Source: Afghanistan MOPH (2002)

Learning and Training

All measures should be taken to prevent AEFIs during campaigns. Comprehensive precampaign training of all persons involved with the campaign should be standard. A comprehensive module on AEFIs, along with an injection safety module, for the precampaign training of vaccinators, team leaders, and supervisors should be developed and used. This should include common AEFIs; proper vaccine preparation and handling; aseptic injection techniques; disposal of needles, syringes, and swabs; and risk communication. Campaign health workers should be aware of the local perceptions and information about previous AEFIs and any allegations about vaccine safety that need to be addressed. Campaign supervisors and monitors should be trained in the supportive supervision of campaign workers, highlighting the fact that the purpose of AEFI

monitoring is not to apportion blame to individuals but rather to prevent AEFIs from occurring in the first place and, if they do occur, ensuring an appropriate response.

In addition, training to ensure the timely reporting of and appropriate responses to AEFIs at all levels in the system should be foreseen as the surveillance for AEFIs is established. AEFI surveillance and reporting should be included as an integral part of training of vaccinators and supervisors prior to campaigns.

Persons responsible for AEFI surveillance at the regional and central levels need to be kept informed of the latest developments in safety monitoring and current concerns regarding immunizations. Useful Web sites related to vaccine safety are included for staff in the References section. Training for key staff on basic epidemiology should be conducted at the earliest opportunity, with past experiences cited as case studies. The cluster of adverse events following the MMRC campaign in Nahrin in 2002 and other experiences with AEFIs in other locations should be used as case studies for such trainings (Araki, in press).

AEFI Surveillance and Reporting For Mass Campaigns

Currently, AEFI surveillance in Afghanistan is limited to surveillance during and after mass campaigns. As the public health infrastructure in Afghanistan improves with enhanced surveillance of vaccine-preventable diseases, AEFI surveillance following routine EPI will be introduced gradually.

An immunization campaign involves a large number of doses given over a short period, leading to more vaccine reactions and coincidental events. The rate of events remains unchanged, but the increased number of events tends to be noticed by both staff

and the public at a time of intensive social mobilization, particularly when injectable vaccines are used.

Common AEFIs in campaigns:

- A real increase in program errors is possible with staff who are unfamiliar with a given vaccine or situation and under pressure from a lot of children needing vaccine quickly; staff may not observe normal safe injection practices.
- A wider age group (usually older) may be immunized, and staff have less experience in dealing with AEFIs to be expected in this older group (e.g., fainting)
- Antagonism from some sectors, for a variety of reasons, which will add fuel to any concerns about AEFIs during the campaign to justify criticism of the campaign.
- Rumors spread rapidly and damage the campaign before there is a chance to counter them.

Priority AEFIs to be Reported

A number of diverse AEFIs may occur following vaccinations. However, in the context of Afghanistan, priority must be given to reporting AEFIs that may be due to program errors and/or those occurring in clusters. This will enable the timely correction of program errors. Table 4 (WHO, 1999) highlights the most important AEFIs that should be reported. Appendix C outlines case definitions and treatments of common AEFIs following measles vaccination.

Table 4

List of Reportable AEFIs

Time Period	Reaction
Occurring within 24 hours of immunization	Anaphylaxis Toxic shock syndrome (TSS)
Occurring within 5 days of immunization	Severe local reaction (e.g. swelling beyond the nearest joint; pain, redness & swelling of > 3 days' duration; those requiring hospitalization) Sepsis Injection site abscess (bacterial/sterile)
Occurring within 3 months of immunization	AFP
No time limit	Any death, hospitalization, or other severe and unusual events that are thought by health workers or the public to be related to immunization.

Source: WHO (1999), p.23.

It is not useful to report common, minor reactions such as mild, local reactions; mild fever; and self-limiting, systemic complaints. They are to be expected, and if all

such AEFIs were to be reported, the health care system would be overwhelmed. It is important, however, to make patients and/or their parents aware of the possibility of these reactions to allay their fears and anxieties. Severe local reactions (e.g., swelling beyond the nearest joint; pain, redness, and swelling of more than 3 days' duration; events requiring hospitalization) should be reported, especially if they occur in clusters. Recall that even mild, local reactions occurring at an increased frequency and in clusters need to be reported because they may be indicators of program error (see Appendix B).

Mechanism of Reporting

Afghanistan does not have a formal AEFI surveillance system. However, AEFI reporting is being done in an informal manner by community members, health care professionals, and so on. For future campaigns, it is desirable to have a formal protocol for AEFI monitoring to ensure uniformity and consistency across regions. It also will ensure that all persons responsible for the management of the campaigns are aware of issues related to AEFIs and are more vigilant in detecting them. This will increase the probability that AEFI clusters are not missed and that swift action could be taken to address community concerns. The surveillance system needs to be simple, flexible, and rapid.

It is important to decide who will have overall responsibility and who should be the focal point and the spokesperson. At the central level, the MOPH national EPI manager will have overall responsibility and will be the focal point. At the regional and provincial levels, the point person will be the head of REMT and PEMT, respectively. At all levels, technical and logistic support will be provided by UNICEF and WHO EPI staff.

Who Should Report?

AFP sentinel sites will be the primary mechanism of AEFI surveillance. In addition, reports of AEFIs should be encouraged from all possible sources, both technical and nontechnical. Reports could be brought by vaccinators, team leaders, or supervisors, and submitted to district immunization coordinators, or the head of the district health facility, who will be responsible for compiling reports and submitting them to the head of PEMT and then on to REMT. In addition, reports may be received by the district health facility from members of the community, or any patients who have experienced AEFI may themselves report for treatment at health facilities. These cases will also be reported to PEMT and REMT.

When to Report?

Ad hoc reporting of AEFIs as and when they occur should be encouraged. Health care workers or community members should be encouraged to report cases of AEFIs. Key community members (e.g., mullahs, teachers, etc.) should be informed of the possibility of AEFIs, and they should be instructed to report all such cases to the nearest health facility following the process for AFP reporting. Reports should be brought in writing, although no format is suggested because the reports may come from a variety of sources with variable literacy skills. The entire network of AFP sentinel sites and focal points should be sensitized about the probability of postcampaign AEFIs and should be instructed to look out for cases for a period of up to 2 months following each campaign. In addition, two opportunities for contact between PEMT and the community should be utilized for active detection of AEFIs.

1. The provincial polio officers (PPOs) should enquire about AEFIs at the time that they visit district health facilities and AFP focal points. PPOs typically visit each district every 4 to 6 weeks and have links with a variety of health care providers. They could easily detect cases of AEFIs and report them to PEMT. AFP focal points and sentinel sites should be aware of all ongoing and future campaigns and should be instructed to remain vigilant for AEFIs and to promptly report them to PPOs or PEMT.

2. Reports could also be collected from vaccinators, supervisors, and others involved with the campaign when the incentives are distributed after completion of the campaign. This typically occurs 2 to 4 weeks after the campaign. Negative reports (zero reporting) should be mandated and should be an essential condition for the disbursement of incentives. However, it should be stated clearly that reports of AEFIs will not jeopardize vaccinators from receiving incentives and that there will be no negative fall-out from AEFI reporting.

3. Campaign monitors, particularly NID monitors, should also be instructed to look out for AEFIs following all campaigns. There were four NIDs planned for 2003, and the contact between NID monitors and the community could be used to detect AEFIs following the next MMRC campaigns in addition to NIDs.

4. It is important for all AEFIs to be reported in a timely manner. Cases should be reported either to the district health facility or to PEMT as soon as possible. All AEFI clusters should ideally be reported within a week of the onset of symptoms.

Flow of Information

The head of PEMT or REMT, in coordination and collaboration with the head of the district health facility, and supported by UNICEF and WHO), will be responsible for

confirming all reports of AEFIs. PEMT is then responsible for reporting AEFIs to REMT, using the AEFI report form (see Appendix D). REMT will, in turn, report to the central level.

At a minimum, AEFI reports must include:

- Description of the event.
- Timing of the event in relation to immunization.
- Vaccine given.
- Patient's identifying details (name, age, sex, address).

Additional information about the vaccine (manufacturer, lot number); diluents (if diluent used was provided along with the vaccine and from the same manufacturer, possibility of accidentally replacing diluent with another drug stored together, using nonsterile diluent or using other substances as diluent in the event of inadequate diluent supply, etc.); route and site of administration; details of vaccinator/supervisor; and outcome is also desirable.

At the regional level, an expert committee comprising MOPH (heads of PEMT and REMT); UNICEF (health technical advisor); WHO (regional public health coordinator); and other relevant stakeholders (NGOs working in the area, etc.) will review the information and decide on the next steps. It must be determined if a thorough investigation is necessary. The EPI at the central level should be kept informed of the circumstances. During the entire process, regular feedback must be provided to peripheral health care workers and to the affected community. Figure 3 shows the structure of the national EPI program in the context of AEFI reporting and flow of information. All available modes of communications should be used to report AEFI depending on the location.

All regional data should be compiled at the regional level at the office of REMT. Reports from all regions should be compiled at the central level in the MOPH EPI. These aggregated data should be analyzed following each campaign, with technical support from the UNICEF EPI team.

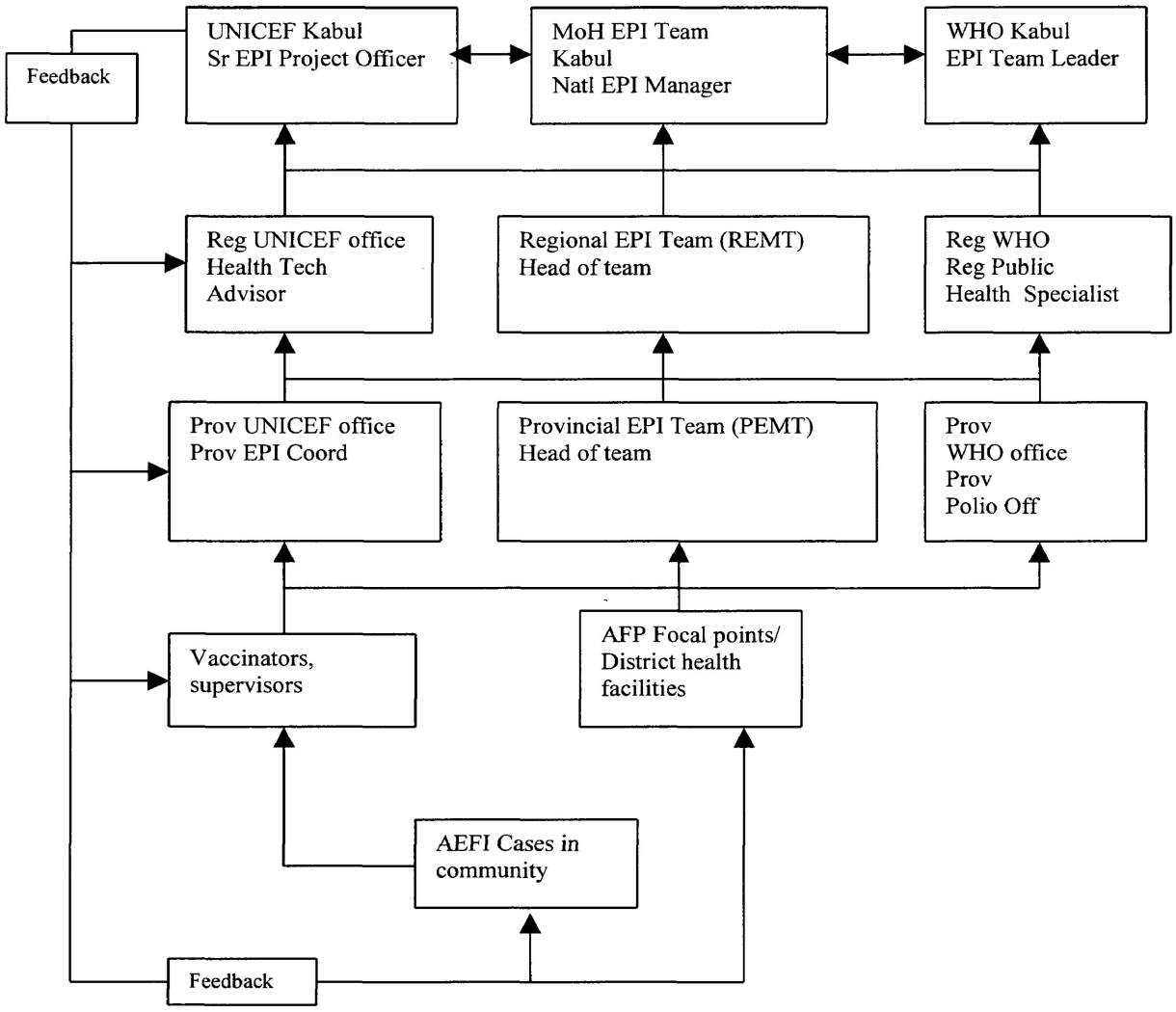

Figure 3. Flow of information for AEFI surveillance.

Barriers to Reporting

It is important to understand the barriers to AEFI reporting. Health care workers may not report cases of AEFIs for a number of reasons:

1. Not relating an AEFI to immunization.
2. Being unaware of the need for and mechanism of reporting.
3. Lethargy.

4. Fear of blame.

5. Guilt.

6. Diffidence about reporting an AEFI when not confident of the diagnosis.

These barriers may be overcome by:

1. Increasing awareness of the importance of reporting, the system for reporting, and making the procedure easy to follow.

2. Emphasizing that AEFI reporting and investigations are about system failures, finding problems, and correcting them rather than assessing blame.

3. Providing regular, positive feedback for reporting.

Unless health care workers appropriately process reports, an AEFI surveillance system will not function adequately. Health care workers must be encouraged to report AEFIs without fear of penalty. Rather, health care workers providing AEFI reports should be given some sort of recognition (e.g., a certificate or letter of appreciation). It should be clarified repeatedly that the main aim of this exercise is to improve the system, not blame individuals.

Precampaign Preparations

Some important precampaign preparations pertaining to the prevention and surveillance of AEFIs include:

1. Stressing the preventive aspect of AEFIs by ensuring comprehensive training of AEFIs, along with the injection safety module, prior to campaigns for vaccinators, team leaders, supervisors, and campaign monitors.

2. Establishing a system for AEFI surveillance involving all stakeholders.

3. Raising awareness of the AEFIs reporting mechanisms among all personnel involved in the campaign. This should include a description of possible AEFIs and their appropriate management and response.

4. Sending a message to all AFP sentinel sites to ensure that they are particularly vigilant in detecting any AEFIs for a period of 2 months postcampaign.

5. Ensuring adequate supervision for all vaccination teams.

6. Ensuring inclusion of injection safety components in the campaign supervisory checklist.

7. Ensuring good logistic support and contingency planning to deal with unexpected situations such as a shortage of diluents, sterile syringes, and so on.

8. Tracking the number of doses distributed by:

    a. Antigen.

    b. Vaccine lot.

    c. Destination point.

Responding to AEFIs

A rapid response to reports of AEFIs is important and is the main point of AEFI surveillance. Health care workers need to be aware of possible AEFIs and how to treat them. Recall that Appendix C outlines the major AEFIs following various commonly used vaccines and mentions possible treatment options.

Investigating Reports of AEFIs

Once a report has been received by REMT, an assessment should be made to determine if further investigation is required. In large campaigns, the number of AEFIs will naturally increase with increased vaccine use. It is essential to calculate the adverse

reaction-reporting rate based on estimated vaccine use. It is usually the rate, not the whole number, of events that requires investigation (see below).

The rate of occurrence of AEFIs:

$$\text{Rate of AEFI} = \frac{\text{\# of cases of AEFI reported}}{\text{\# of vaccine doses administered}} \times 100{,}000$$

Compare the figure with the expected rate of AEFI in Table 2, and determine if there is a real increase in AEFIs. However, all clusters of AEFIs should be investigated, irrespective of the size of clusters, because they are likely to be due to program errors.

Source: WHO (1999), p. 25.

Improved reporting can lead to more AEFI reports without a real increase in reaction rate. The investigation needs to determine if there is a real increase in reaction rate as well as to identify possible causes. For example, a change in vaccine manufacturer or vaccine lot can lead to a change in reaction rate.

The Regional Expert Committee will discuss available information and decide on the next steps. If the cause of an AEFI is clear, and if corrective action is necessary, it can be instituted immediately. If further investigation is needed to determine the cause of an AEFI, REMT can institute the investigation with UNICEF and WHO support.

In general, a report of an AEFI needs investigation if it:

- Is part of a cluster of similar events.
- Is a serious event of unexplained cause.
- Causes significant community concern.

Who Should Investigate?

The investigation should be performed by a team comprised of personnel from REMT, PEMT, UNICEF, and WHO. The exact composition of the team should be specified by the expert regional committee when a decision is made to conduct an investigation. PEMT should be fully involved in the investigation because of their comprehensive local knowledge of the area as well as their capacity building opportunity so that they may take on a more frontline role in future investigations. Where there are

limitations in the capacity to conduct AEFI investigations at the regional level, REMT can call upon technical expertise from the central EPI unit who will provide the necessary support in liaison with UNICEF and WHO.

When to Investigate?

Depending on the magnitude and extent of the problem, an investigation should be started as soon as possible. In light of the constraints on travel because of limited logistic capacity, weather, security, and other factors, it may be difficult to propose an accurate time line. As a general guideline, a decision to investigate should be taken within 24 to 48 hours of receiving a report from PEMT. Once a decision is made, an investigation should be initiated within 3 to 5 days and should be considered a high-priority activity. Timeliness is critical for a successful investigation. As time passes, it may be difficult to locate cases and/or key informants, and reports will be subject to recall errors. In addition, it may be impossible to collect specimens for laboratory testing if an investigation is initiated long after the event.

How to Investigate?

It is important to investigate reports of AEFIs promptly and completely. Investigators will need to examine cases for themselves and gather information from the patient, guardian, health workers, vaccinators, team leaders, supervisors, and community members.

A cluster of similar AEFIs is likely to arise from program errors and warrants a rapid and comprehensive investigation to identify the source. If the event also occurred in unimmunized persons, it may possibly be coincidental. It is important to identify if unimmunized people also developed similar symptoms during the same period of time.

Investigation of a cluster requires:

- Establishing a case definition for the event (if not a well-defined AEFI).
- Identifying all the people in the area who have an illness that meets the case definition.
- Obtaining immunization histories (when and where vaccination occurred and which vaccines and diluent, including lot numbers, were given).
- Identifying any common exposures among the cases.

Source: WHO (1999), p. 29.

If all, or most, cases receive vaccines from the same health worker/facility, and if there are no other cases, program error is likely. If all cases receive the same vaccine lot, and if there are no similar unimmunized cases in the community, a problem with the vaccine is likely. This must be reported to REMT, who will alert WHO. If the AEFI is a known vaccine reaction but is occurring at an increased rate, a program error or a vaccine problem is the likely cause. Finally, if cases include people from the same area in the same age group who were not immunized, then the event is probably coincidental. A simple flow chart for identifying the cause of an AEFI is outlined in Figure 4.

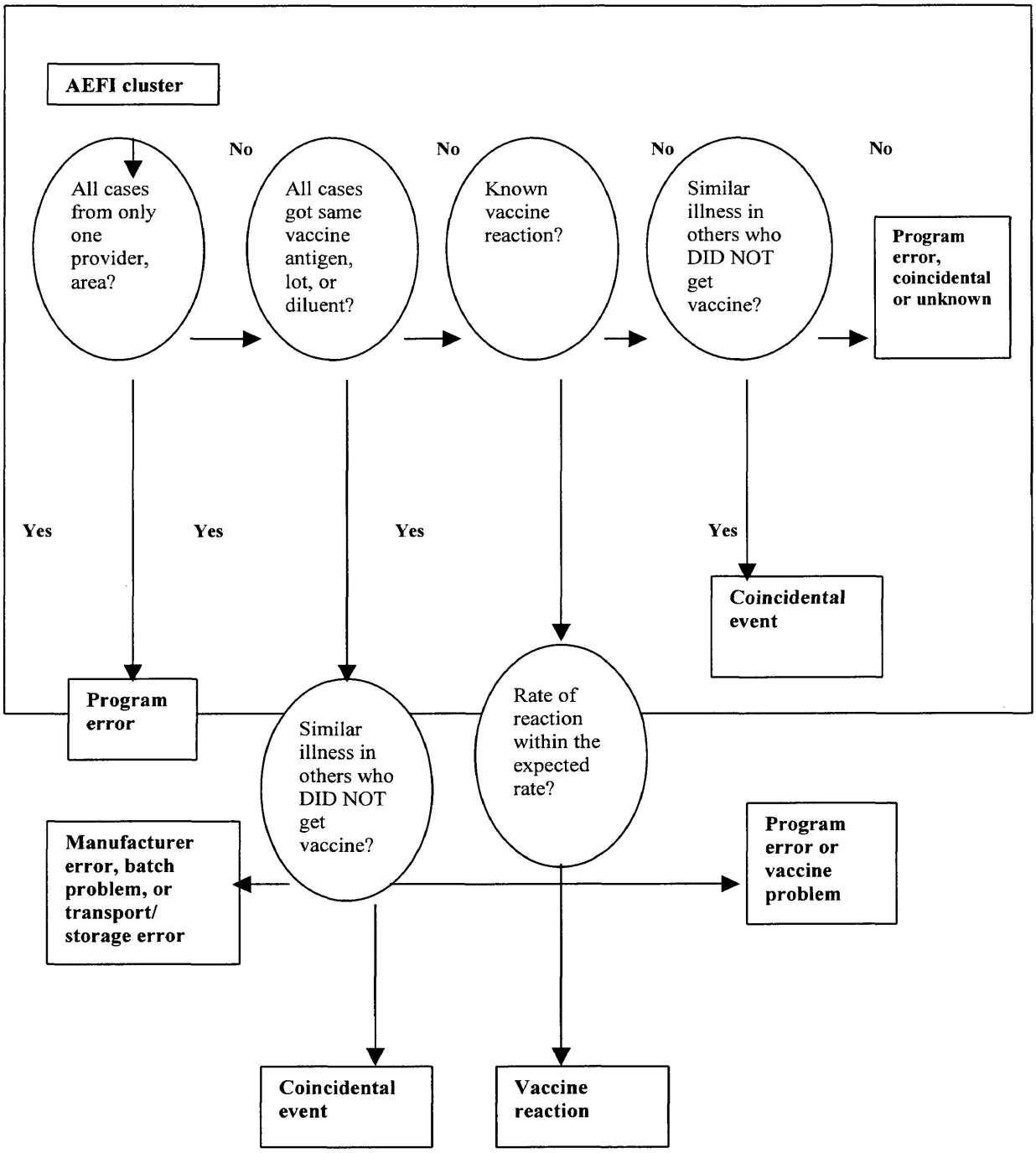

Figure 4. Flow chart for identifying cause of AEFI cluster.
Source: WHO (1999), p. 29.

Outline of an Investigation

An AEFI investigation follows standard epidemiological investigation principles. In addition, an investigation of the vaccine, immunization techniques, and procedures needs to be conducted (see Table 5).

Table 5

Steps in an AEFI Investigation

Step	Action
1. Confirm information in report	• Obtain patient's medical records • Document details about patient through review of medical records • Obtain details missing from AEFI report form Identify any other cases that needs to be included in the investigation
2. Investigate and collect data a. About the patient	• Immunization history • Previous medical history, particularly h/o similar reactions or allergies • Family history of similar events
b. About the event	• History, clinical description, lab results, diagnosis • Treatment, treatment location, and outcome
c. About the suspected vaccine/diluent	• Vaccine and shipping storage conditions • Storage of vaccine prior to arrival to administration site, source, assessment of vaccine monitor card
d. About other people	• Whether others received same vaccine and developed illness • Whether others had similar illness; if they were exposed to suspected vaccine • Investigation of vaccine-administering service
3. Assess vaccine service delivery a. Inquire into	• Vaccine storage, distribution, and disposal • Diluent storage and distribution • Reconstitution process and time • Use and sterilization of syringes and needles • Details of training in immunization practice and supervision • If number of immunizations given were greater than expected
b. Observe	• Refrigerator – Note other contents of refrigerator, labels on vials, storage of medications • Immunization procedures (reconstitution, drawing up vaccine, injection techniques, safety of needles and syringes, disposal of open vials) • Evidence of vial contamination
4. Formulate working hypothesis	• The likely/possible cause of the event
5. Test working hypothesis	• Does case distribution match working hypothesis? • Use lab tests if necessary/feasible
6. Conclude investigation	• Reach a conclusion • Complete AEFI investigation form and write report • Take corrective action, and recommend further action

Source: WHO (1999), p. 30.

A series of cases without comparison of disease and exposure among controls is not likely to reveal the cause of AEFIs, except in the case of program errors. Clear case definitions, defined during the investigation, are essential. The investigation needs to identify all cases of disease in the community similar to the reported AEFIs and determine the outcome of these cases. The risk of disease should be compared for those who received the vaccine versus those who did not. It may be necessary to perform a case control study to determine the cause of AEFIs. Technical support to perform an in-depth study can be sought from the regional or national offices of UNICEF and WHO. In rare instances, it may be necessary to invite external consultants to assist with an investigation.

A working hypothesis should be established as soon as there is sufficient information. The working hypothesis may change during the course of the investigation. The focus of the investigation should then be to seek to confirm the working hypothesis. No action should be taken based on the hypothesis until it is confirmed with reasonable certainty. An AEFI investigation form (see Appendix E) should be completed at the end of the investigation.

Laboratory testing may be relevant in certain circumstances, but it will be difficult in the context of Afghanistan. It is not mandated for AEFI investigations in Afghanistan. However, in cases of abscesses due to vaccinations, it is desirable to culture the offending organism to determine the cause and to guide appropriate antibiotic therapy. In rare instances, it may be appropriate to test the suspected vaccine and diluent for sterility. However, this should only be performed when there is a clear indication and after the formulation of a working hypothesis.

Causality Assessment

The investigation needs to include an assessment of the cause of the AEFIs. The WHO classification of AEFIs has six categories:

1. Very likely/certain
2. Probable
3. Possible
4. Unlikely
5. Unrelated
6. Unclassifiable

For AEFIs, the first three categories are used when a vaccine reaction or a program error is suspected with varying levels of confidence. Categories 4 and 5 would be used for coincidental events, depending on level of confidence, and category 6 would be used for AEFIs where insufficient evidence is provided to make an assessment.

Useful questions to assess causality:

- What is the frequency of occurrence of the event (common/rare/not previously reported)?
- Are similar AEFIs known to occur with other diseases?
- Is the AEFI known to be related to the vaccine?
- Is the AEFI explainable by the biological properties of the vaccine?
- Is the vaccine-event interval compatible with expected?
- Has the patient had similar symptoms in the past?
- Was the patient on any concomitant or preceding drug therapy?
- Did the patient have any concomitant or preceding condition?
- Were there any other contributing factors?

It is never appropriate to discontinue the immunization campaign while waiting for the completion of the investigation.

Communicating with the Community

Upon completion of the investigation, the cause of an AEFI needs to be communicated to the community. This must include information about the steps being taken to remedy the situation and to prevent a recurrence.

Trust is a key component of the exchange of information at every level, and an overconfidence about risk estimates that are later shown to be incorrect contributes to a breakdown of trust among the people involved. Admit uncertainty, investigate fully, and keep the community informed. Avoid making a premature statement about the cause of an AEFI before the investigation is complete. If the cause is identified as program error, it is vital not to lay personal blame on anyone, but to focus on system-related problems that resulted in the program error(s) and the steps being taken to correct the problem.

Communicating Directly with Community Leaders

In communicating with the community, it is useful to develop links with community leaders and peripheral health care workers so that information can be disseminated rapidly. Maintaining lines of communication with the community is important throughout the investigation. The head of PEMT or REMT will be responsible for communications with the committee, with support of UNICEF and WHO provincial teams. Feedback should also be provided to the health care workers or community members who reported cases of AEFIs, and their contributions should be commended.

Communicating with the Media

The media (newspaper, radio, and television) play an important role in public perception. Understanding what the media want from a story will assist communication with them (see Appendix F).

In certain situations, media coverage is likely to raise public concern about immunization. In these situations, it is important to communicate with professional organizations, health professionals, and workers before the media. The communication should include preparations on how to deal with public concern on this issue to minimize the potential harm. It is also useful to have other groups and individuals that have public respect and authority to make public comments to endorse and strengthen key messages.

Designating the spokesperson(s) to communicate with the media limits the possibility of conflicting messages coming from different sources. The spokesperson should have some training in media relations and should be designated and trained before any vaccine safety issues arise in order to develop a relationship with key reporters. The head of REMT or PEMT will be responsible for dealing with the media at the local level. At the national level, the national EPI manager will be the person responsible for liaison with the media. In all cases (and at all levels), support will be provided by UNICEF and WHO staff.

When there is a high level of concern about a vaccine, communication with the community (and the media, if appropriate) can emphasize that:

- The known benefits of immunization in preventing serious disease, compared to the uncertainty if the AEFI(s), are truly caused by the vaccine (presenting data on disease risks vs. risks of vaccine reactions and vaccine effectiveness may be useful).
- The remediable program error or coincidental illness is much more likely to be the cause of the AEFI than serious vaccine reactions because serious vaccine reactions are very rare.
- The appropriate action is being taken to safeguard the public.

Fixing the Problem

The remedy for an AEFI will depend on the cause, if a cause can, indeed, be identified. In all cases, the investigation needs to be clearly documented. It is also useful to disseminate the results of the investigation widely so that others can learn from the experience. It can be a teaching resource in the future.

Program errors will need to be corrected promptly, and there should be a mechanism in place to ensure that the error does not happen again. If a specific vaccine lot is implicated, withdrawal of the entire lot and a change in supplier may be warranted. WHO will then contact the supplier, and batch testing will be completed. In the case of coincidental events, the main task is communication to avoid assessing false blame.

Decisions to suspend the use of or to recall vaccines of a particular lot need to be made swiftly, but they also must be well thought out. The impact on the immunization program, alternate sources of vaccine, and the reliability of the evidence on which the decision is based need careful scrutiny. In particular, there needs to be consideration of the possibility of biased reporting resulting from an alert about a possible problem with a vaccine or a lot. Consultation with the vaccine manufacturer and UNICEF/WHO is advisable before making that decision.

It is essential to ensure that all cases of AEFIs be provided with prompt and appropriate treatment free of cost. The head of PEMT should ensure that the appropriate treatment is provided, and the MOPH should bear the cost of the treatment. UNICEF will later make available reimbursement for this expense through its regional office. Such potential expenses should be budgeted for by UNICEF under campaign costs.

It should be emphasized that no individual should be personally blamed for cases of AEFIs. Any AEFI should be seen as a learning opportunity to improve the quality of future campaigns. The MOPH should shoulder all responsibility for cases of AEFIs, be responsible for the appropriate responses, and ensure that avoidable AEFIs happen to the extent possible in the future.

Table 6

Actions to be Taken Upon Completion of the Investigation

Vaccine Reaction	If a higher reaction rate than expected from a specific vaccine or lot, then obtain information from the manufacturer and consult with WHO to consider: • Withdrawing that lot. • Notify WHO, which will then contact the manufacturer • Obtaining vaccine from a different manufacturer.
Program Error	Correcting the cause of the error. This may involve: • Change in logistics for supplying vaccine. • Change in procedures at the health facility. • Training of health workers. • Intensified supervision. Whatever action may have been taken, it is necessary to evaluate that the errors have been rectified.
Coincidental Events	• Main task is communication to ensure that people are convinced that the AEFIs were coincidental. Such AEFIs may harm the immunization program through false attribution of blame. • Sometimes further expert investigation may be required to convince/ensure that the AEFI was truly coincidental.
Unknown Events	• Depending on the extent and nature of the AEFI and whether it is ongoing, a further expert investigation may be required, although it must be accepted that in some cases, the relationship to immunization is not clear.

Source: WHO (1999), p. 37.

Finally, it is essential that a comprehensive report is prepared at the end of each investigation no later than a month after its conclusion. The report should contain all details of the investigation: dates, participants, methodology, conclusions, and recommendations for corrective actions.

Evaluation of the AEFI Surveillance System

The AEFI surveillance system should be evaluated regularly to determine its effectiveness. This should preferably be performed after each mass campaign. Information gained from the evaluations will guide future adjustments of the surveillance system as the capacity of the public health infrastructure improves and as the needs of the system change. Criteria listed here may be used to evaluate the system.

Criteria for evaluating the AEFI Surveillance System

- Timeliness, completeness, and accuracy of AEFI reporting
- Timeliness and completeness of AEFI investigation
- Audit of corrective action taken
- Sensitivity of the AEFI surveillance system

To assess the sensitivity of the system, injection safety questions should be added to all postcampaign coverage surveys. A simple question that should be added to the coverage survey following campaigns is, "After the vaccination, did your child experience any problem? If yes, please describe." (Keep open-ended. Can be assessed and categorized during data entry). Finally, AEFI data should be presented and discussed at the annual EPI review meeting. This meeting also should address lessons learned in AEFI surveillance during campaigns over the past year and should help to make relevant changes to improve its effectiveness.

Recommendations

After the AEFI follow-up tool is developed, the author recommends that these steps be implemented:

1. Education and training for AEFI follow-up for all providers who deliver vaccine services.
2. Utilization of the tool for consistent, systematic follow-up of AEFIs to ensure best practice.
3. Following each mass immunization campaign, an evaluation of AEFI follow-up should be completed by REMT and forwarded to the national EPI manager.
4. Evidence-based reporting of AEFIs can assist in the expansion of research for AEFIs in Afghanistan that may be beneficial learning for others who assist with vaccine delivery in mass campaigns.

5. Once AEFI follow-up is occurring consistently and effectively after mass immunization campaigns, AEFI surveillance should be extended to routine immunization services.

6. Evaluation of the AEFI tool to determine its effectiveness and validity should occur one year after implementation.

Summary

The author reviewed the literature related to AEFIs, utilized a framework based on Evans and Stoddart's (1990) health field model, and described global initiatives in AEFI follow-up. A simple survey was utilized to gather information on current AEFI follow-up in Afghanistan. Following the discussion of the survey results, input from managers of EPI, and guidance from UNICEF and WHO, the author described her role in the development of a tool for investigating and reporting AEFIs to the Afghanistan MOPH. Although almost half of Afghanistan's children remain unimmunized because of the country's poor health care infrastructure and political instability, those who do are immunized must trust that the vaccines are beneficial and delivered in a safe manner. If problems do arise, this tool will provide a systematic way to report and investigate vaccine-related AEFIs so that future vaccine programs are not jeopardized.

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APPENDIX A

Questionnaire to Assess AEFI Reporting and Follow-Up

> The World Health Organization defines an adverse event following immunization as "any adverse event that follows immunization that is believed to be caused by the vaccination."

1. What is your current title?

- ❑ EPI manager
- ❑ Vaccinator
- ❑ Physician
- ❑ Nurse
- ❑ Other (Please explain)_____

2. Have you ever seen an Adverse Event Following Immunization?

- ❑ Yes (if so, explain what you have seen)

_____

_____

- ❑ No

3. What do you do if you see a child experiencing an adverse event following immunization?

Explain_____

_____

4. Do you have any resources to assist you with follow up of adverse events?

- ❑ Yes (if yes what do you use?)_____
- ❑ No (if no, what do you need?)_____

_____

5. What further kind of information/resources do you need to help you with adverse event following immunization follow up?

- ❑ Guidelines to follow
- ❑ Clear reporting structure
- ❑ Training to understand adverse event follow up

❑ Other (please provide other ideas)_____

_____

Thank you for your time and assistance!

APPENDIX B

AEFI Line Listing

A line listing form may be used at the provincial level to identify trends and clusters of AEFIs and as a means of sending AEFI data to the regional or national level.

Name/ID	District	Date of birth (dd/mm/yy)	Date of immunisation (dd/mm/yy)	Reaction type (code)	Outcome (Recovered/Died/?)	Suspect vaccine (name and dose, eg DPT-2)	Batch number	Onset time (hours, days, weeks)	Date of report (dd/mm/yy)	Investigated? (If yes, date)	Cause (code)	Confidence (code)

Adapted from WHO (1999), p. 52.

Establishing codes for area, reaction type, cause of AEFI, and certainty of cause will facilitate recording, data entry, and analysis. Because of the potential for coding errors, the code should be double-checked.

An example of coding for the cause of an AEFI is shown here:

1. Program error
A) Nonsterile injection
B) Vaccine prepared incorrectly
C) Administration technique/site
D) Vaccine transportation/ storage
E) Other:

2. Vaccine reaction
A) Vaccine manufacturer error
B) Known vaccine reaction at expected rate
C) Other:

3. Coincidental
A) Similar event in unimmunized persons
B) Other:

4. Unknown

Thus: Code '1A' would be for program error [non-sterile injection]
Code '2B' would be vaccine reaction [known vaccine reaction at expected rate], etc.
Coding for confidence could be: certain = 1 probable = 2 possible = 3.

APPENDIX C
AEFI Case Definitions and Treatments

Adverse Event	Case Definition	Treatment
Anaphylactoid reaction (acute hypersensitivity reaction)	Exaggerated acute allergic reaction, occurring within 2 hours after immunization, characterized by one or more of the following: wheezing and shortness of breath due to bronchospasm laryngospasm/laryngeal edema one or more skin manifestations (e.g., hives, facial edema, or generalized edema). **Less severe allergic reactions do not need to be reported.**	Self-limiting; anti-histamines may be helpful.
Anaphylaxis	Severe immediate (within one hour) allergic reaction leading to circulatory failure with or without bronchospasm and/or laryngospasm/laryngeal edema.	Adrenaline injection.
Encephalopathy	Acute onset of major illness characterized by any two of the following three conditions: seizures severe alteration in level of consciousness lasting for one day or more distinct change in behavior lasting one day or more. Needs to occur between 6 to 12 days after measles or MMR vaccine, to be related to immunization.	No specific treatment available; supportive care.
Fever	The fever can be classified (based on rectal temperature) as mild (38 to 38.9°C), high (39 to 40.4°C) and extreme (40.5°C or higher). Fever on its own does not need to be reported.	Symptomatic; paracetamol (acetaminophen)
Injection site abscess	Fluctuant or draining fluid-filled lesion at the site of injection. **Bacterial** if evidence of infection (e.g., purulent, inflammatory signs, fever, culture), **sterile** abscess if not.	Incise and drain; antibiotics if bacterial.
Seizures	Occurrence of generalized convulsions that are not accompanied by focal neurological signs or symptoms. **Febrile seizures**: if temperature elevated >38°C (rectal) **Afebrile seizures**: if temperature normal	Self-limiting; supportive care; paracetamol and cooling if febrile; rarely anticonvulsants.
Sepsis	Acute onset of severe generalized illness due to bacterial infection and confirmed (if possible) by positive blood culture. Needs to be reported as possible indicator of program error.	Critical to recognize and treat early. Urgent transfer to hospital for parenteral antibiotics and fluids.

Adverse Event	Case Definition	Treatment
Severe local reaction	Redness and/or swelling centered at the site of injection and one or more of the following: swelling beyond the nearest joint pain, redness, and swelling of more than 3 days duration requires hospitalization. **Local reactions of lesser intensity occur commonly, are trivial and do not need to be reported.**	Settles spontaneously within a few days to a week. Symptomatic treatment with analgesics. Antibiotics are inappropriate.
Thrombocytopenia	Serum platelet count of less than 50,000/ml leading to bruising and/or bleeding	Usually mild and self-limiting; occasionally may need steroid or platelets.
Toxic shock syndrome (TSS)	Abrupt onset of fever, vomiting and watery diarrhea within a few hours of immunization. Often leading to death within 24 to 48 hours. Needs to be reported as possible indicator of program error.	Critical to recognize and treat early. Urgent transfer to hospital for parenteral antibiotics and fluids.

Source: WHO (1999), p. 41.

APPENDIX D

AEFI Report Form

Family name:	**First name:**	**Date of birth (dd/mm/yy):** / /	**Unique ID:**
Address:		**Sex: Male/Female**	**Ethnicity:**
District:		**Province:**	
Health facility:		**Reporter (health worker):**	

Vaccine(s) given*	**Route**	**Site**	**Lot number**	**Manufacturer**	**Expiry date**

**name and dose number e.g., DPT-2, OPV-2; diluent too, if reconstituted*

Date immunized	**Date AEFI started**	**Onset interval**	**Date of report**

Tick box(es) and describe event: Toxic shock syndrome Sepsis Abscess: sterile or bacterial Severe local reaction: >3 days, beyond nearest joint, or hospitalized Vaccine reaction on list (state): Other AEFI (state):	**Past medical history (including history of similar reaction or other allergies) and any other relevant information (e.g., other cases):**
Recovered: Yes / No / ? **Hospitalized: Yes / No / ?** **Died: Yes / No / ?**	

Province Level Office to complete:

Date report received: / /	**Checked by:**
Investigation needed: Yes / No / ?	**If yes, date started:**
Investigator:	**AEFI investigation ID:**
Causality assessment:	**Certainty: Certain / Probable / Possible**

Source: WHO (1999), p. 50.

APPENDIX E

AEFI Investigation Form

Complete this summary page at end of investigation; file with field report and AEFI report forms

Investigation ID:	AEFI Report ID:	Date Investigation Started: / /
Describe trigger event:		
Diagnosis/case definition of event:		
Community investigation: ☐Yes ☐ No suspect vaccine in time window:	If yes, number of cases immunized with Immunized_____ Not Immunized_____	
Clinic investigation carried out: ☐Yes	☐ No If yes, key finding(s):	
Laboratory investigation(s): ☐Yes	☐ No	If yes, key result(s):

Assessment

Conclusion about cause of AEFI: Tick categories and rank if more than one cause:

Program Error	**Vaccine Reaction**	**Coincidental**	**Unknown**
- Non-sterile injection - Vaccine prepared incorrectly - Administration technique/site - Vaccine transportation /storage - Other:	- Vaccine lot problem - Known vaccine reaction at expected rate - Other:	- Similar event in unimmunized - Other:	

Confidence about conclusion on main cause of AEFI: Certain Probable Possible
Reason(s) for conclusion:
Corrective action taken: Yes No If yes, specify. If not, specify why not.
Further actions recommended: Yes No If yes, specify
Investigator: Signature: Date: / /

Source: WHO (1999), p. 51.

APPENDIX F

Communicating with the Media

Risk communication is an interactive process that requires active listening and discussion. Individuals differ in their perceptions of risk, depending on their life experience and knowledge. Certain risks are more acceptable to people than other risks. If possible, reframe risks using that framework (e.g., emphasizing extensive international use of vaccines and known risks).

Perceptions of risk

Less Risk		Greater Risk
Voluntary	vs.	Involuntary
Individual control	vs.	System control
Omission	vs.	Commission
Natural	vs.	Manmade
Memorable	vs.	Not memorable
Knowable	vs.	Unknowable
Not dreaded	vs.	Dreaded
Trustworthy	vs.	Untrustworthy
Familiar	vs.	Exotic

Source: WHO (1999), p. 53.

The guiding principle with dealing with the media must be one of honesty and building up trust. The effectiveness of our communication is largely determined by whether the audiences perceive us to be trustworthy and believable. Trust and credibility are difficult to achieve; if lost, they are even more difficult to regain. Public assessment of how much we can be trusted and believed is based upon four factors:

- Empathy and caring.
- Competence and expertise.
- Honesty and openness.
- Dedication and commitment.

It is vital to **prepare** before any media contact with:

- Key messages.
- Answers to likely and awkward questions.
- Identifying which issues not to respond to (e.g., blaming an individual or speculating on the cause before the investigation is complete).

Messages need to be as simple as possible. Use simple words and short sentences. It is helpful to tell a story, when possible - create a 'word picture' to get the message across. The **key messages** should be kept to a minimum and are likely to include some of these facts:

- That benefit of immunization in preventing disease is well known.
- It is very risky not to immunize (risk of disease and complications).
- Vaccine-preventable diseases caused millions of death and/or disability before the introduction of vaccines, and that situation would return without the continued use of vaccines.
- Vaccines do cause reactions, but these are rarely serious and hardly ever cause long-term problems (use Tables 2 and 3 to outline known risks of suspect vaccine[s])
- Immunization safety is of paramount importance, and any suspicion of a problem is investigated (advantage of well-established immunization safety surveillance).
- The AEFI is currently being investigated, but it is likely to be coincidental/due to a local problem (depending on type of event), and the immunization program must continue to keep the population safe from disease.
- Action is being taken.

It is essential to present information to the media in a way that will generate a sense of credibility and confidence by being:

- **Honest** - never lie; if you do not know, say so, but promise to find out (e.g., "We don't know at this time, but we have taken steps to answer that question"); note that a lie or a cover-up can become a bigger news story than the initial event.
- **Caring** - create a strong, compassionate, competent image for yourself and the service.
- **Clear** - avoid jargon; use simple phrases and give examples to clarify meaning.
- **Serious** – jokes can be disastrous, and the subject is rarely amusing anyway.
- **Aware** of body language - it is of critical importance in perceptions.
- **Responsible** - do not be defensive, but accept responsibility appropriate to your position and avoid blaming someone else (e.g., "We will see if there is any truth in the report").
- **Responsive** - hold a daily press conference if that is what is needed to meet the needs of the pubic and media; regular contact helps build a trusting relationship with the media.
- **Positive** - reframe the situation in positive terms; use terms such as *vaccine safety* (which has a positive connotation) rather than *adverse event.*

When facing a hostile interviewer, prepare these techniques:

- **Block** - respond to a negative question with a positive answer (e.g., when asked, "How many children have died from immunization?" answer: "Immunization saves lives. Since our immunization program began, 'X' children have been immunized, and of those numbers, 'Y'% might have died from one of these diseases. That is the context in which we must consider the tragic, but thankfully, rare adverse events that follow immunization."

- **Bridge** - having answered a difficult question, move quickly to something linked but positive.
- **Correct what is wrong** - immediately correct information from the interviewer that is wrong. Be assertive, not aggressive, and state the facts simply, factually, and in a friendly way.
- **Stay cool** - no matter how bad it gets, don't get angry or defensive; stay friendly, polite, and warm.
- **Be assertive** - means stating what you want to say in a clear way without getting aggressive; take time to think about the response, and don't be rushed or forced.

Bridge technique

Question: Does vaccination cause abscesses?

Answer: (Face the element of truth) We know that vaccinations may rarely cause abscesses. (here comes the first bridge….) That is why we train staff to avoid them by using a sterile needle and syringe for every child. (Now comes the second bridge) When combining this policy with purchasing only the highest quality vaccines approved by WHO and UNICEF, we are able to assure parents that we have one of the safest vaccine programs in the world.