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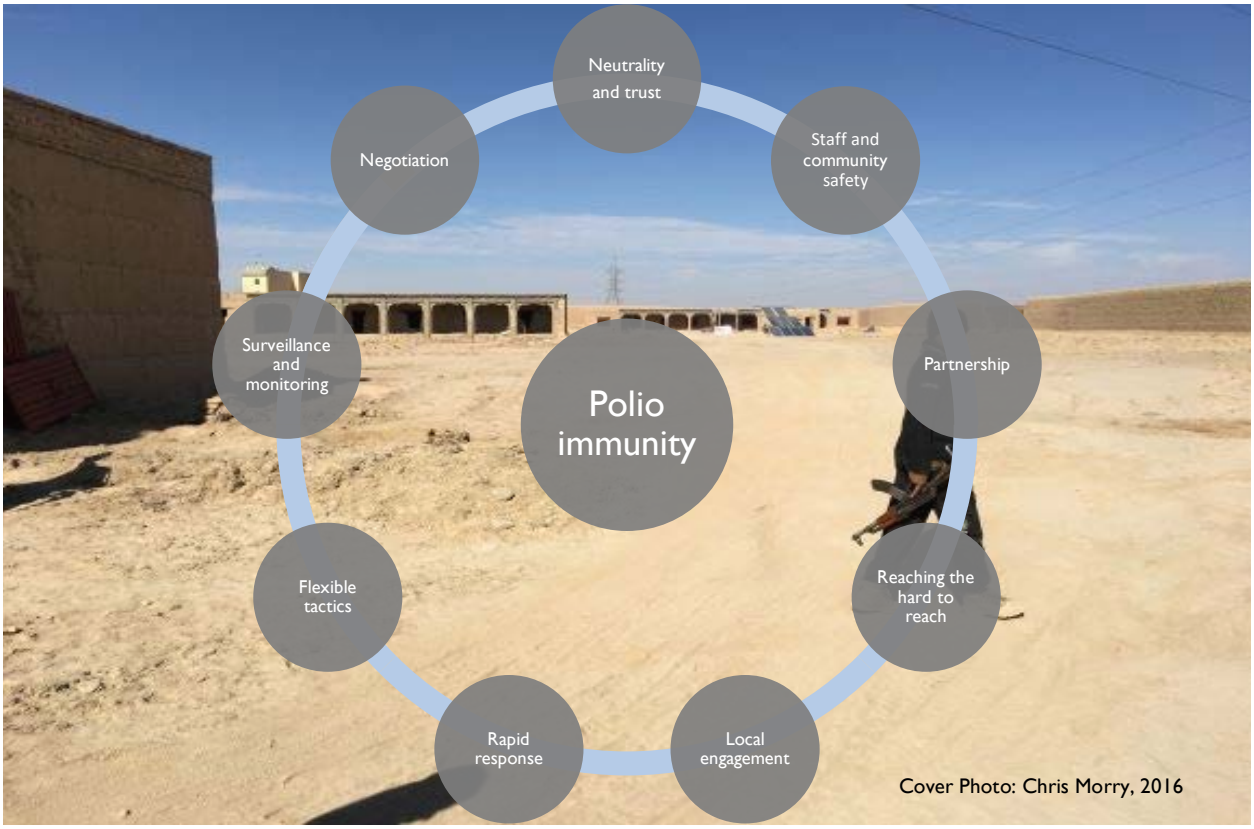

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Reflections on Polio Lessons from Conflict-Affected Environments

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The Maternal and Child Survival Program (MCSP) is a global, $560 million, 5-year cooperative agreement funded by the United States Agency for International Development (USAID) to introduce and support scale-up of high-impact health interventions among USAID's 25 maternal and child health priority countries,* as well as other countries. The Program is focused on ensuring that all women, newborns and children most in need have equitable access to quality health care services to save lives. MCSP supports programming in maternal, newborn and child health, immunization, family planning and reproductive health, nutrition, health systems strengthening, water/sanitation/hygiene, malaria, prevention of mother-to-child transmission of HIV, and pediatric HIV care and treatment.

* USAID's 25 high-priority countries are Afghanistan, Bangladesh, Burma, Democratic Republic of Congo, Ethiopia, Ghana, Haiti, India, Indonesia, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Nepal, Nigeria, Pakistan, Rwanda, Senegal, South Sudan, Tanzania, Uganda, Yemen and Zambia.

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Introduction

The Global Polio Eradication Initiative (GPEI) has worked in conflict zones since it began in 1988. During this time, it has successfully stopped transmission of wild poliovirus (WPV) in all but three endemic countries and outbreaks of vaccine-derived poliovirus in conflicts as severe as the Syrian civil war. It has also learned many lessons about the strategies and operational approaches that enable such success. However, the documents that capture those lessons are limited and often broadly thematic and suggestive rather than strategic and programmatically specific. Nevertheless, as GPEI program staff and researchers have reflected on experience, they have identified strategic approaches and operational tools that today constitute core elements of a communication and operational framework for working in conflict-affected environments.[1]

What follows looks back at lessons captured—albeit sometimes only summarily—across several points in time: at the end of the 1990s and the first decade of the GPEI; after the polio outbreaks in Central Africa, the Horn of Africa, and the Middle East in 2013; and more recently in the context of the remaining three endemic countries: Afghanistan, Pakistan, and Nigeria[2] (GPEI 2017; Nnadi, Etsano et al. 2017; Rubenstein 2010; Tangermann et al. 2000). As might be expected, understandings of necessary polio program capacities and operational and communication requirements have evolved and been sharpened over time. However, certain elements had emerged during GPEI's first decade that have become the foundations upon which today's operational thinking is based—the ability to **negotiate** with all parties, the need to ensure **health infrastructure for vaccine delivery and surveillance**, the importance of **routine immunization services** as the foundation for vaccine delivery, the necessity of **building trust with communities,** and the struggle to ensure that even **the hardest to reach and most marginalized are vaccinated**.

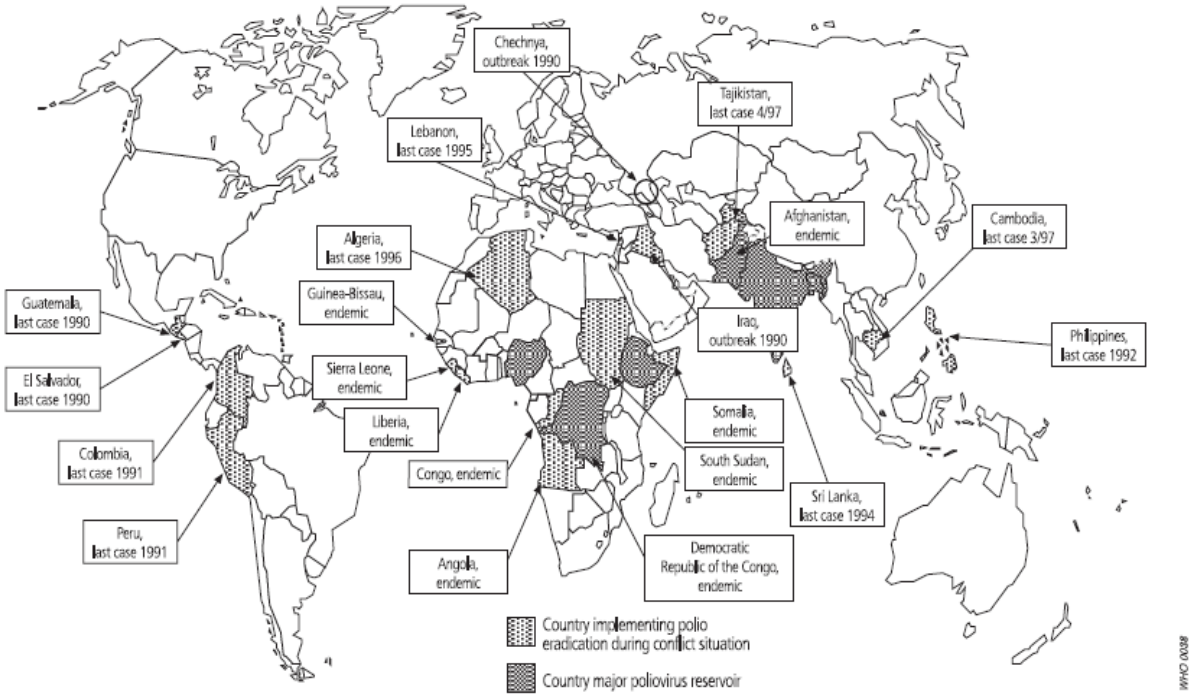
This document is neither a literature review nor an academic paper. Rather, it seeks to outline the evolution of strategies and tactics and how they demonstrate an increasingly complex and sophisticated response to conflict. It is also a reflection on how the simplistic, often almost bullet-point nature of the relatively few attempts to distill lessons seems inadequate to the context the polio program now faces. What follows attempts to describe the foundations and framework that guide today's polio interventions in conflict-affected areas while arguing that more systematic research is needed to help refine and critically analyze strategies and approaches in ways that strengthen future work. Given the certainty that polio eradication will need to take place in the context of significant conflict in Afghanistan, Pakistan, and Nigeria, as well as in several outbreak or high-risk countries such as the Democratic Republic of the Congo (DRC), Somalia, and Niger, understanding these lessons in greater detail should be a central concern for the GPEI and its stakeholders.

[1] For the purposes of this document, "conflict-affected environment" refers to a geographic location, within a country or region, that is experiencing or emerging from a period of violent political or civil conflict (Campbell 2017). The term can refer to interstate violence, but in relation to the GPEI it is more common that conflict and insecurity are found at subnational levels and among nonstate actors either against the state or among themselves. Such conflicts can be wide-scale with different actors controlling significant territory or more fragmentary with localized and often transitory violence.

[2] August 21, 2019, marked 3 years since Nigeria has had a WPV case, but as of writing, it had not been declared polio-free and remains on the endemic list.

A Brief History of the GPEI in Conflict-Affected Environments

Figure 1: Polio eradication status in countries affected by conflict, 1990–1999, and countries that were major reservoirs of poliovirus.



Source: Tangermann RH, Hull HF, Jafari H, Nkowane B, Everts H, Aylward RB. 2000. Eradication of poliomyelitis in countries affected by conflict. *Bull World Health Organ.* 78(3):330–338. http://www.who.int/bulletin/archives/volume78_3/en/. Accessed August 26, 2019.

The GPEI's history of working successfully in conflict zones goes back to its earliest days. As lessons have accumulated, they have coalesced into a kind of evolving toolbox of strategic and operational approaches based on a growing body of experience. As the map in Figure 1 shows, for the period 1990 to 1999, poliovirus circulation was successfully stopped in a number of countries that had ongoing conflicts, such as Cambodia, Colombia, El Salvador, Peru, the Philippines, and Sri Lanka (Tangermann et al. 2000). In 2000, the GPEI was still working in a number of countries with major conflicts, such as Angola, the DRC, Liberia, Sierra Leone, Somalia, what is now South Sudan, Afghanistan, and Tajikistan.[3] Several of those conflict-affected countries have become polio-free (Liberia, Sierra Leone, and Tajikistan—though the first two remain at high risk for reintroduction). However, the world has seen increasing instability in regions where the poliovirus still circulates, and nearly all of the remaining endemic and outbreak countries, and many of the high-risk countries, are affected by conflict to degrees serious enough to have an impact on the operations of the GPEI.[4]

[3] In the case of Tajikistan, while the civil war ended in 1997, a new government had just been established in 2000, with postwar recovery still in its early stages (Matveeva 2009).

[4] As of August 2019, the GPEI lists the following countries in these high-risk categories:
Endemic: Afghanistan, Nigeria, Pakistan.
Outbreak: Angola, Benin, Cameroon, Central African Republic, China, DRC, Ethiopia, Ghana, Indonesia, Mozambique, Myanmar, Niger, Papua New Guinea, Somalia,.
High risk for reintroduction: Chad, Equatorial Guinea, Guinea, Iran, Iraq, Kenya, Lao People's Democratic Republic, Liberia, Madagascar, Sierra Leone, South Sudan, Syrian Arab Republic, Ukraine. (GPEI 2019)

Polio eradication is driven by the need for very high levels of immunity accomplished through routine immunization and supplemented with large-scale and necessarily high-quality campaigns designed to reach every child possible. Nearly all children need to be vaccinated multiple times in order to achieve the "herd immunity"[5] needed to interrupt WPV transmission. Reaching such levels of coverage means there can be no groups of missed or inaccessible children large enough to sustain circulation,[6] vaccines need to be safely transported and stored for distribution, confidence in knowledge as to whether and where the virus is circulating has to be high, and communities have to be willing to accept the vaccine each time it is offered. All of this is obviously more difficult to achieve in the midst of conflict. By the 1990s, the GPEI had recognized the importance of **negotiation**, **health infrastructure, surveillance,** and **community-level trust** as foundational strategies for ensuring each of these potential gaps was filled.

Negotiation to establish ceasefires or "days of tranquillity" was essential if large-scale immunization campaigns were to access children in areas where ongoing conflict would otherwise make it impossible.[7, 8] Where **health infrastructure** such as health centers and cold chains was inadequate or had been destroyed, it had to be replaced or at least supplemented to ensure full vaccine availability and distribution through routine immunization supplemented by campaigns.[9] Disease **surveillance** systems had to be reviewed and brought up to acceptable standards to ensure polio cases were dependably identified. **Building trust** with very marginalized, vulnerable, often suspicious, and war-damaged communities was essential to having them accept the vaccine and vaccinators, as well as for developing alternative strategies to identify hard-to-reach groups. Approaches to building community trust during the 1990s often focused on such things as combining polio campaigns with other similar health services that could be delivered concomitantly, such as vitamin A supplements.

The 1990s ended with the GPEI missing its first eradication deadline and, though most remained optimistic that the new deadline of 2005 was attainable, it was clear that conflict would remain a common feature of many of the countries where poliovirus still circulated. The past decade had proven that succeeding in conflict-affected environments was possible, but it had also demonstrated that eradication would take longer, cost more, and be vulnerable to setback. Of course, 2005 came and went, and while conflict was not the only factor that led to missing this and subsequent deadlines, it was and remains one of the most important.

Each new conflict has slowed progress and challenged those working on the front lines to continue the task of polio eradication under dangerous and sometimes deadly circumstances.[10] The years following 2000 saw the GPEI continuing to operate in conflicts that disrupted health delivery systems, undermined surveillance, displaced personnel, interrupted vaccine supply, destroyed cold chain systems, cut off financial resources, threatened neighboring countries with large movements of displaced people, and reduced demand for immunization, as basic survival became the major priority for many families. While new challenges continue

[5] A simple definition of herd immunity can be found on Vaccines Today, where it is described as "a form of immunity that occurs when the vaccination of a significant portion of a population (or herd) provides a measure of protection for individuals who have not developed immunity" (Vaccines Today 2015). For a more nuanced explanation of the historical, epidemiologic, theoretical, and pragmatic public health perspectives on this concept, see Fine et al. 2011.

[6] When conflict denies access to immunizing large numbers of children, as seen in Afghanistan today, the problem is obvious, though negotiations need to also focus on small groups and areas. See, for instance, the work of Duintjer Tebbens et al. 2019 on polio eradication certification for insight into how small subpopulations can support low-level circulation.

[7] It is worth noting that negotiation sometimes had ancillary benefits by creating a neutral basis (the protection of children from disease) to bring otherwise opposed groups to the table and occasionally even became the first phase of more wide-ranging discussions between combatants. For example: "The planning and conducting of NIDs [national immunization days] may also open channels of communication for further negotiations between the parties on other issues of common interest. Working together on common goals encourages cooperation and helps to build the trust necessary for permanent solutions. The creation of days of tranquility was an important step on the road to such solutions in El Salvador and the Philippines" (Tangermann et al. 2000).

[8] While there have been questions raised on the ethical issues surrounding engagement with violent antigovernment groups, the GPEI has taken the position that vaccination campaigns "operate on the belief that children who are innocent victims of war, should not be further victimized by refusing to engage with groups that could help facilitate immunization against polio and other childhood diseases" (Rubenstein 2010).

[9] Routine immunization services are often disrupted in times of conflict or provided by nongovernmental organizations (NGOs) or other agencies, if government services have stopped. Campaigns can compensate for low routine immunization coverage, but ideally, and wherever possible, routine vaccination needs to be supported, especially when antigovernment groups are willing to allow such services to continue.

[10] For instance, over 100 polio workers have been killed in Pakistan since 2012 (Press Trust of India 2017), as have workers in other countries such as Afghanistan (Radio Free Europe 2016) and Nigeria (Smith 2013).

to emerge, lessons from the 1990s remained relevant and formed a basic foundation that has been enhanced and built on over time.

Writings on polio lessons from conflict-affected areas in the 2000s are sparse, but a brief from the United States Institute of Peace titled *Defying Expectations: Polio Vaccination Programs amid Political and Armed Conflict* (Rubenstein 2010) captures challenges and successful approaches to negotiating with such disparate antigovernment forces as *Sendero Luminoso* (Shining Path) in Peru, multiple rebel groups in the DRC, and the Taliban in Afghanistan and a page on the GPEI website, entitled *Reaching the Hard to Reach: Ending Polio in Conflict Zones* (GPEI 2017), broadly captures lessons from the response to 2013's polio outbreaks in Central Africa, the Horn of Africa, and the Middle East. These sources build on the already-established foundations of negotiation and community trust mentioned above, but expand on both and add some new ideas. **Negotiating access** through respected interlocutors and maintaining **neutrality** continue to be critical when control of territory is contested or in the hands of different factions in conflict. In relation to **building community acceptance and trust,** knowing the concerns and priorities of the communities that the polio program needs to access is viewed as an essential first step but it is also essential to reach transparent agreement on logistical details so there are no unexpected incidents as vaccination campaigns are implemented. Practical suggestions for building trust include recruiting local vaccinators and engaging trusted local leaders from within conflict-affected areas to advocate for, and participate in, polio immunization campaigns.

These sources also identify speed and preparation as important, with emphasis placed on having the capacity to **vaccinate when and where opportunities arise**. This means being prepared to launch campaigns as soon as access becomes available or, when access is lost, being ready to quickly set up alternative vaccination opportunities. Examples of these alternatives are transit points set up around inaccessible areas to vaccinate children moving in or out, and health camps that bundle polio immunization with other basic health services to attract families to travel to vaccination points outside the inaccessible area. Another lesson focuses on building **alliances with military and/or police forces,** where possible, to help ensure the safety of polio staff. Such partnerships have been used successfully in several countries, including Pakistan, Nigeria, and Angola (Fekadu et al. 2016; Habib et al. 2017; Nkwogu et al. 2018). In some cases, however, this kind of partnership jeopardizes neutrality, and negotiation with those controlling an area is the only option.

To sum up, this listing of lessons on the GPEI website and the work of Rubenstein and others, while brief and in some cases focused on single issues such as working with police and military forces, underscore the importance of strategies focused on **program neutrality** and **community trust** and add ideas for accomplishing these ends, such as the local engagement of vaccinators and influencers. They incorporate the importance of having significant program capacity for **opportunistic vaccination** and the usefulness of forging **partnerships with police or military,** where possible. Interestingly, there is no mention of building health infrastructure or surveillance systems, though endemic countries have increasingly supplemented existing health infrastructure with large-scale polio social mobilization and vaccination programs,[11] and, in conflict-affected environments, much progress has been made in establishing robust surveillance systems.

A detailed account of the strategic and operational approaches most widely used by the GPEI in conflict-affected environments was published in the *Journal of Infectious Diseases* (Nnadi, Etsano et al. 2017). This article built on previous lessons but went more deeply into specific types of activities and the contexts they are most suited to—whether it be negotiating access with nonstate actors, reaching populations in areas where access is not possible, or reducing threats to workers in accessible areas that are security compromised. Each country presents a different context, but the GPEI now utilizes some combination of the strategies and activities identified by Nnadi, Etsano et al. in every conflict-affected environment in which it operates. The next section will focus largely on the strategies and tactics identified in this article.

[11] While these large-scale social mobilization and vaccination programs have proven effective at reducing (if not yet eradicating) polio, they have also generated considerable debate and controversy as to the degree to which they have negatively impacted on government provision of basic health services. See, for example, Closser et al. 2014.

Lessons: Strategies and Activities

It has been said in many a United Nations (UN) security briefing that security objectives have shifted over the past decade or so from "how to leave," to "how to stay," to "how to stay and effectively deliver programs." This shift in focus has resulted in a number of changes, such as more nuanced **security risk assessments** and greater collaboration between those responsible for security and those implementing programs. Staff safety remains the priority, but security analysis has become a more integral part of GPEI program planning to provide detailed, geographically specific, and localized knowledge of risk levels that can be applied to plans for fieldwork. The polio program has used these security analyses to determine with greater accuracy where and when staff can and cannot go and, wherever possible, updates them regularly to develop a dynamic picture of field risks. This information enhances the ability to quickly move vaccination resources into areas as risk levels permit. New technologies such as **satellite imagery** also help with such things as identifying where populations are, approximating how many people are in an area, understanding the extent to which people are moving, and detecting new settlements such as informal refugee camps or populations of internally displaced persons (IDPs).

Of course, having a better understanding of risk levels and where people are will not help if there is no access. The capacity to **negotiate** ceasefires in areas of active combat or access for vaccine delivery or surveillance into areas not controlled by government was as important to Nnadi, Etasano et al., as it was to the other researchers—as is neutrality, so that all sides perceive the negotiation to have no agenda other than the health of children and the eradication of polio. This can be a complex and difficult thing to do, given the variety of actors and the changing and kinetic environment in which they operate. The addition of professional security risk assessment helps reduce the danger and uncertainty, but it is no substitute for negotiating acceptable terms for safe and effective access.

These negotiations are complex. Matters such as control and decision-making among those denying access are not always clear. Decisions and agreements made with senior leadership in a conflict can sometimes be blocked by local leadership and vice versa. Access may be allowed in one area but denied in an adjoining area, creating the need for new and different negotiations. A polio campaign's standard operating procedures are not always acceptable to groups in the midst of conflict and can be viewed with suspicion.

Eradication levels of immunity require **deep engagement—not only with communities but with each household in the community**. In the best-case scenario, teams of well-supervised, mostly female vaccinators go to the door of every household and enter those households to identify and vaccinate each child. Vaccinators mark the left little or pinky finger of the child to indicate they have been vaccinated. Careful records are kept of each household to document information such as how many children under 5 years of age live there; whether they are visiting or permanent; if they are absent and, if so, where and for how long; and whether caregivers are refusing and, if so, for what reason. Chalk markings are written on the door of each house indicating numbers of children and whether any have been missed. If any are missed, follow-up visits are organized. If refusal is an issue, local influencers go to the house to try to convince caregivers to allow their children to be immunized. Following the campaign, monitors go through communities checking to see that these records are accurate and that coverage rates match campaign records. Special surveys are done based on methods of lot quality assurance sampling and market surveys are conducted to identify children who have not had their pinky fingernail marked by vaccinator teams after vaccination, adding multiple layers of cross-checking. All of this means that a properly run polio campaign requires a lot of community engagement, information gathering, and monitoring (including supervision with zero tolerance for falsification of information). This can be difficult to accept for communities and groups who are suspicious of outsiders, possibly facing attacks from the air and ground, and worried about informers and intelligence gathering.

Negotiations need to begin with trying to get access under conditions that give the best chance of high levels of coverage. However, when this is not possible, compromises that may impact on performance sometimes need to be made. This can involve allowing frontline workers to be selected and supervised locally, male

vaccinators to be used instead of female,[12] and local monitors who may not be as independent as they could be. Other possible compromises include setting aside recordkeeping for missed children, not marking houses, and replacing house-to-house campaigns with approaches that require caregivers to bring or carry their children to fixed sites. In some cases, compromise can go as far as simply supplying vaccines to those in control of an area and letting them do the vaccination without any outside supervision or monitoring.

Each of these compromises can impact quality and reduce overall campaign coverage. None should be taken lightly, but the realities of negotiation during a conflict will sometimes make them necessary in order to keep an immunity gap from growing more than it would without any vaccination. However, when compromises are made to multiple components of eradication strategies and approaches, coverage suffers, and the virus has more opportunity to continue to circulate. When negotiations require significant compromise, they are usually considered temporary measures to build trust so that more effective operations can resume after further negotiation. Of course, "temporary" can be a relative term, especially in the context of a prolonged conflict. It is important to be as rigorous in the design and implementation of temporary measures as in any vaccine delivery strategy and to keep transparent lines of communication open that continue to identify and address reasons for missed children.

Beyond negotiating with combatants and antigovernment elements (AGEs), Nnadi, Etsano et al. also note the essential role of **engaging with, and understanding the concerns of, local communities**. Involving traditional and religious community leaders, providing respectful and accurate answers to questions, listening to local voices from all sides of a conflict and jointly identifying solutions, engaging local people as vaccinators and mobilizers, conducting ongoing education and training on vaccination, and building relationships with local gatekeepers who can help advocate for polio access and create an atmosphere where the vaccine and polio program are trusted, are all critical. While not simple to develop, such engagement can help build local trust and demand and create pressure on groups controlling a given area to provide access and/or improved campaign quality.[13]

Close coordination with other agencies delivering other health services is important for a number of reasons. Conflict creates complex humanitarian crises requiring the delivery of a range of emergency services, including vaccination, sanitation, food, and shelter. When people are displaced, they often move to safe havens like refugee camps. Ensuring that services are delivered in a coordinated fashion is not only common sense in terms of efficiency but may also improve the uptake of different services by increasing overall demand through bundling (Cronin et al. 2007; Warigon et al. 2016). A desperate family may be more likely to make the effort to go to a vaccination point if that point can also address a range of other (and potentially more pressing) needs.[14]

Conflict can sometimes continue over an extended period of time and at a level where access is severely compromised, leaving children unvaccinated for years. This can result in significant numbers of older children being un- or undervaccinated. **Increasing the age for target populations** to be immunized can help provide

[12] Male vaccinators have more freedom to move around their communities, especially when those communities have conservative/patriarchal values related to male and female roles and appropriate behavior. Female vaccinators in such communities can be restricted in their ability to move about the community without a male family member accompanying them. On the other hand, conservative communities often deny males access to households unless they are related or well known to the family. This can create a serious challenge whereby males can get to the doorway but not inside and females can get inside the household but not to the doorway. Without access to households, male vaccinators cannot be sure they have vaccinated all eligible children in a household and can easily miss newborns and sleeping or sick children. Solutions have been found, but have to be identified and agreed by the community itself. For instance, in some areas female vaccinators have been allowed to move around their communities if they are accompanied by a male relative; in other cases older (postmenopausal) women are acceptable, especially those who have other work that takes them out into the community, such as midwifery. The importance of community involvement in solving such challenges cannot be underestimated.

[13] Building such networks requires cultural understanding and often peer-to-peer discussions. Some of these complexities are captured in publications such as the toolkits found on the GPEI/UNICEF Rhizome website https://poliok.it or in this toolkit developed by Islamic Relief Worldwide (Salek 2014).

[14] This assumption needs to be taken with some caution as it is important to recognize that demand for health services does not abate when the state is unable to provide them. In areas where the state is unable to function, other providers will fill the void. They may be beneficial or harmful and often form a complex patchwork of health services. It is critical to understand this sphere of nonstate adaptation when implementing integrated or incentivized initiatives such as health camps (Hill et al. 2014; Pavignani et al. 2013).

immunity to missed older cohorts,[15] and **using antigen combinations of oral polio vaccine and inactivated polio vaccine can help boost immunity** more quickly in areas where access is fragile or temporary or where immunity gaps need to be closed urgently.

Where access is not possible, alternatives to campaigns need to be implemented. Setting up **vaccination points** strategically around an inaccessible area can provide immunization for children leaving or entering that area, protecting against virus being imported or exported and improving population immunity within the area. Setting up health camps that provide a wider range of highly sought services than just polio vaccination can also help motivate people to come to a vaccination point. In some cases, **collaboration with military or police** can also facilitate access, provide greater security to polio staff, and/or improve coverage at vaccination posts by requiring vehicles to stop at checkpoints. Collaboration of this kind in Pakistan and Nigeria has helped improve access and security (Nkwogu et al. 2018). Of course, this is not always possible when the conflict is between state and antistate actors. **Transit and cross-border vaccination points** are used in both conflict and nonconflict situations at strategic internal and international border crossings, railway and bus stations, or other points where people and their children are known to pass in significant numbers.

Other approaches noted by Nnadi, Etsano et al. are **permanent vaccination teams** wherein local people are recruited from insecure areas to vaccinate members of their own communities. As they are local, they are more likely to be trusted, and as they are permanent, they can vaccinate continuously without reference to campaign dates. They are resupplied with vaccines as needed and supervised only when it is safe to do so. **Vaccination within repatriation, refugee, or IDP camps—**in coordination with other agencies, also mentioned above—has proven to be useful in immunizing large numbers of children efficiently and for conducting surveillance.

In cases where the polio program itself has become a target in a conflict, creating a **strategic media profile** can be important. In the case of Pakistan, campaigns were intentionally not promoted with high-profile events, and polio materials were rebranded to disassociate the polio program from international donors and agencies. The focus of the new media campaigns and materials was on humanizing the vaccinators and other frontline workers and on emphasizing the local nature and ownership of the polio program. The campaign focused on vaccination being carried out by local community members to achieve an important good for their children. Vaccinators were presented as local heroes to be respected.

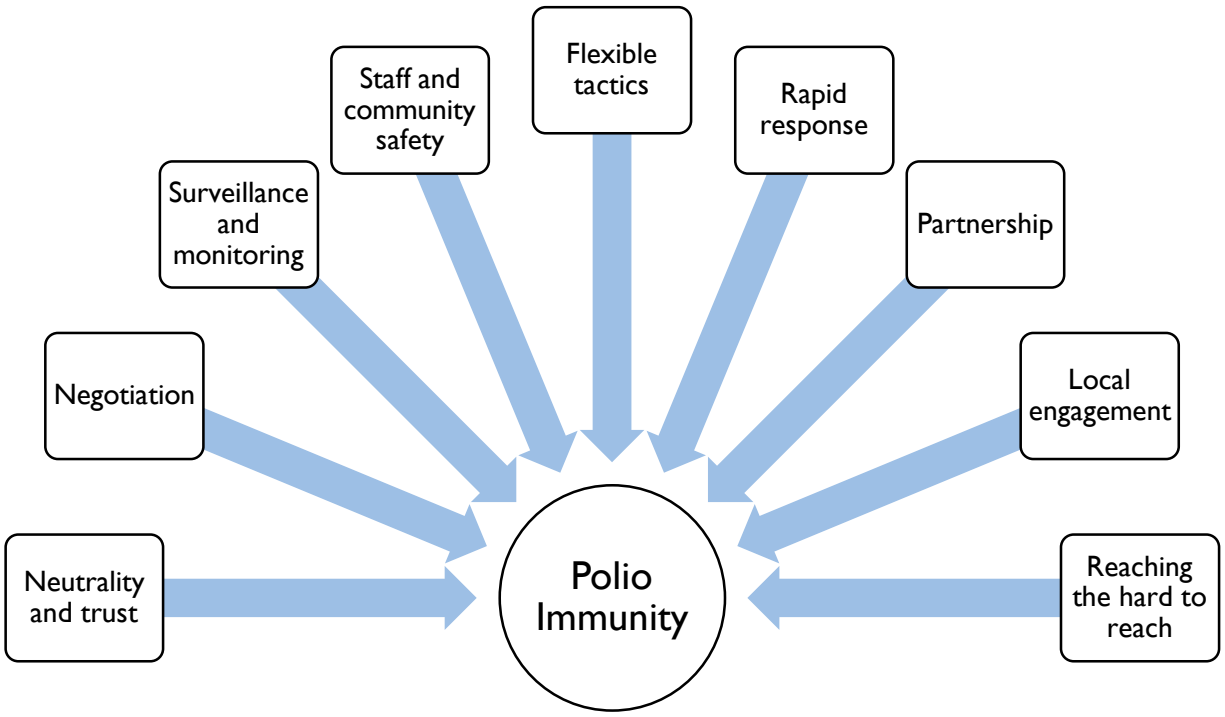
[15] Changes in cohort age need to be approached with caution, especially among populations where rumors are widespread and support for vaccination may be weak.

In Summary

Over the past 30 years, and in spite of severe challenges, there have been multiple instances of successful eradication programs in conflict-affected environments. As the lessons from these experiences have coalesced, several critical strategies and approaches have emerged.

Figure 2 illustrates major strategies that have been applied over the years and serve as broad outlines for organizing polio eradication efforts in conflict-affected environments:

Figure 2: Conflict zone strategies designed to maximize polio immunity



- **Neutrality and trust** are critical to the polio program's ability to operate in any context and have to be founded on widespread belief that the GPEI has no agenda other than polio eradication and the health of children. This has not always been the case; there are many instances where rumors and misinformation have led to suspicion that the GPEI has hidden and negative agendas linked to outside interests and/or that the polio vaccine is a tool for reducing fertility or spreading diseases like AIDS.[16] In conflict situations, misinformation and distrust are constant companions, and the GPEI has had to work hard to maintain and, sometimes, regain public trust and belief in its neutrality. Neutrality can be maintained only if the polio program is conscious of its actions, partnerships, and communication as critical elements of how others perceive its agenda. It is also essential that this belief in program neutrality be strongly held at all levels—from government or AGE leadership to local communities to the most vulnerable and marginalized populations.
- **Negotiation** is profoundly linked to neutrality and trust. Without acceptance of, and trust in, the GPEI agenda, it becomes almost impossible to negotiate successfully at any level—whether it be for arranging ceasefires, gaining access to areas controlled by nonstate actors, or being allowed into a community or

[16] The spread of misinformation about the GPEI and the polio vaccine have a long and complex history in which both have been linked to modern political struggles (Peckham 2016), political events (Scientific American 2013), and misinformation that emerges, disappears, and then reemerges over time (Larson 2014).

minority group suspicious of outsiders. Equally, trust and neutrality are not sufficient in themselves without well-developed technical and communication capacities that support negotiation with different actors at different levels from national to local.

- **Surveillance and monitoring** are essential for confirming coverage and being able to verify if the virus is still circulating. Surveillance of acute flaccid paralysis cases is the most important tool to identify polio cases and each case is investigated thoroughly (World Health Organization 2019). Each acute flaccid paralysis case is analyzed to determine if it is polio or not, the number of polio vaccinations the child has received is checked, and the virus is genetically tested to determine its genotype, which can help identify its origin. Because the virus can circulate without cases of paralysis appearing, environmental sampling is also done. However, for surveillance to work, it needs to reach into conflict zones.[17]
- **Safety** of staff, caregivers, and children in conflict-affected environments has to underpin every action. Risk to safety needs to be measured using well-informed security assessments and responded to in ways which can range from stopping all activities in an area to adjusting campaign tactics, changing communication materials and mass media approaches, or engaging with new partners who may have better relations with those in the conflict-affected area.
- **Flexible tactics** are also important. This is especially true where access needs to be negotiated and conditions that compromise quality may need to be accepted. Nevertheless, regardless of the tactics negotiated, the goal has to remain reaching enough children on a sustainable basis to increase population immunity to eradication levels. Where routine immunization is low and negotiated changes have led to lower-quality campaigns, negotiations need to continue building trust and highlight where the gaps are so that ongoing problem-solving dialogue to reduce missed children (at all levels from the very local to the most senior representatives of all parties to the conflict) can lead to a level of intervention sufficient for eradication. Where routine immunization services are available, they should be neutral, encouraged, and strengthened—every dose provided helps. In some cases, catching up after a period of limited or no access requires considering immunizing older children and using combinations of oral polio vaccine and inactivated polio vaccine to quickly boost immunity (Duintjer Tebbens et al. 2014). Where health services have entirely broken down and reliable, recurring access for campaigns cannot be negotiated, or when negotiations are moving slowly, other tactics have been developed that focus on surrounding the inaccessible area with a range of alternative opportunities for vaccination.[18]
- **Rapid response** is essential to enable the polio program to respond quickly and at scale when the opportunity for access arises. This is no small thing; it involves vaccination teams, vaccine, ice packs, vaccine carriers, transportation, training, supervision, monitors, and much more, all prepared for deployment at a moment's notice and matching negotiated strategy.
- **Partnerships** have been used for many aspects of the polio program to engage the support of religious groups and leaders, medical associations and professional staff, humanitarian and UN agencies, nongovernmental organizations (NGOs), and government ministries. In conflict-affected environments, religious, traditional, and medical leaders can help counter misinformation and rumors. Humanitarian and UN agencies can help with contacts to different actors in the conflict and help with incorporating polio vaccination into the delivery of emergency services to displaced populations. NGOs that have existing relations with marginalized groups or operations in otherwise inaccessible areas can facilitate access, provide much-needed services, and conduct community-based surveillance. Government ministries can help with a range of things such as education, transportation, vaccination sites, policing and security, and public support of influential leaders. Partnerships play a major role in building trust, maintaining neutrality, countering rumors, coordinating and bundling services, and extending program reach.

[17] Such systems vary depending on the context. In Syria, for instance, two systems were set up for areas under versus not under government control (Ismail et al. 2016). In Afghanistan, a single acute flaccid paralysis (AFP) tracking system compares "silent reporting" areas against statistical expectations to map areas where surveillance may be inadequate (Martinez et al. 2018).

[18] As mentioned previously, such tactics include vaccination transit points or sites at strategic places of entry and exit which help by providing a kind of "firewall" around an inaccessible area that can immunize children as they move in and out. Health camps that bundle polio with a range of other services can attract families to travel to fixed points outside the inaccessible area. Events like religious ceremonies, naming ceremonies, marriages, and funerals also provide opportunities to immunize children moving from inaccessible to accessible areas. None of these tactics offers systematic approaches to ensuring high coverage and they are not alternative eradication strategies, but they do offer ways to keep population immunity higher than it would have been otherwise and can help build community solidarity for immunization.

- **Local engagement** is important in any context to build trust, gain knowledge of local realities and perceptions, help identify solutions to seemingly intractable problems, and identify appropriate people to work for, or support, the polio program. Because conflict and security issues manifest themselves at all levels, it is just as important to focus on gaining the trust and involvement of local communities as of government or AGE leaders. This is done by being engaged with, and listening to, those communities. As much as possible, staff need to be local and supported by trusted local influencers. Information about local issues and concerns needs to be an integral part of program planning and implementation. Communities need to feel engaged in that they have a voice that is not just heard, but has an impact on program approaches and how they relate to each community's needs and priorities (Habib et al. 2017; Hussain, et al. 2016).
- **Reaching the hard to reach** is in part an aspect of local engagement, but it requires a deeper understanding of community groups and of social, cultural, and economic differences among them. Some groups may be marginalized by religious or ethnic identities, others by gender, class, or citizenship, and still others through mobile lifestyles, as in the case of migrant workers and nomads. Challenging terrain, weather, or illicit activities may make accessing some communities difficult for extended periods. Newborns and pre-walking children can be missed due to cultural practices that limit exposure outside of the house or make such children inaccessible if there is no female vaccinator. Inability to keep up with new birth cohorts can increase the number of susceptible children.

There are many reasons for groups to become marginalized. In conflict situations, a significant issue is often around population movement, which creates large numbers of people who have only a transient relationship to a particular area. Whether they be nomads, seasonal laborers, IDPs, refugees, or ethnic or religious minorities, there are populations that have less access to, or lower expectations of, services such as health care. These groups are harder to identify and reach in any context, but in conflict-affected environments they can be larger in number, in poorer health, and harder to access. Population movements need to be tracked, strategic vaccination points need to be set up along the routes that people take, new settlements of refugees or IDPs need to be identified, and partnerships need to be formed with appropriate agencies and organizations to ensure polio vaccination is incorporated across multiple health interventions. In many cases, traditional patterns of movement among nomadic and mobile populations are disrupted. These changes need to be identified and polio program activities adjusted accordingly. Technologies such as satellite tracking can be used to help with locating new settlements, but equally important are close relationships with other agencies working with these populations and with members of the communities they settle in, whether temporarily or more permanently.

Conclusion

Eradication requires sustained high levels of population immunity, which can be difficult to achieve, even in areas where access and conflict are not major issues. Given the conflict-affected context in the three remaining endemic countries, those with outbreaks of circulating vaccine-derived poliovirus (cVDPV), and those at high risk of reintroduction, sustaining such levels will be much harder, even if WPV eradication seems tantalizingly close. Understanding the experience and history of the polio program's work in security and conflict-compromised areas is arguably more important at this stage than ever before. Clear, evidence-based lessons need to be drawn from previous experience and brought to bear on new challenges and evolving old ones.

Looking to the next 5 years the polio program will need to face and overcome several critical issues. "Temporary" compromises in campaign and surveillance strategies to gain access may extend over long enough periods of time that they become a kind of "new normal." Once a temporary situation becomes normalized, constant refinement of negotiated strategies and activities to reduce the numbers of missed children to eradication levels will become essential. Such refinement will require ongoing negotiation and listening to local concerns on all sides of a conflict to seek solutions that identify and continually reduce numbers of missed children. It will require different strategies in different places. Afghanistan, for instance,

may need to look at vaccine delivery strategies that do not include house-to-house vaccination, door marking, or household-level data collection, and utilize different approaches to monitoring. This would mean major adaptations for the polio program, potentially combining campaigns with improved routine immunization, mobile population vaccination, and different approaches to monitoring and identification of missed children. In the context of continuing conflict, approaches to negotiation will need to draw on past experience and build new partnerships with local groups with capacity to deliver vaccines and/or engage local-level authorities in assessing and improving immunity levels over time. Negotiation in this context needs to go beyond appeals based on biomedical or global social good to engage more directly with the urgent needs of impending or existing humanitarian crisis. Nigeria, on the other hand, where antigovernment groups like Boko Haram refuse to negotiate and are against vaccination and where outbreaks of cVDPV have been persistent, will present a different set of issues (Nnadi, Damisa et al. 2017).

The very long-term nature of conflicts in countries such as Afghanistan means that communities are being forced to adapt their own long-term strategies for accessing health and other essential services. It can be easy to assume that as conflict destroys or radically weakens health infrastructure, there is a void created. The reality is often quite different. Demand for health care does not abate as those services become harder to access during a conflict. As communities and individuals continue to seek such services, the "void" left by deteriorating formal health care infrastructure can be filled by an often uncoordinated and usually poorly distributed range of new providers with varied effectiveness. Some of these may provide traditional medicine, some may be itinerant opportunists or quacks, some will be local but partially equipped or understaffed clinics operated by NGOs, religious organizations, or expatriate-funded groups, others may be operated by groups controlling the area (Hill et al. 2014). To work effectively in such environments requires a well-informed understanding of the various actors, the services they provide, and which actors can be effective partners in delivering vaccination and other health services. It also requires a strong understanding of the perceived health priorities of communities living in these areas and respectful engagement with local leaders. Communities and their leaders need to be engaged to support polio vaccination, with consideration given to the adaptations they have made to the conflict, their knowledge of local providers, and their priority health care needs.

Reaching the hardest to reach will require an ongoing focus on identifying clusters of missed children and the communities in which they live. This will mean finding ways to identify and access all children, including newborns and children who are too young to walk, those who are travelling or away from their houses, those who have been displaced or resettled due to conflict, and those living in communities where outsiders are looked upon with suspicion. It will also be necessary to work with communities to increase female involvement in vaccine delivery to support better access to the youngest children and to identify and establish close relationships with other organizations working with displaced or mobile populations or in areas controlled by AGEs.

Eradicating WPV is a necessary first step, but it is not the final one. It will be equally essential to respond to cVDPV outbreaks and to sustain high levels of immunity for years after WPV eradication, both of which will have to be done through building long-term partnerships with a broad range of organizations that can help deliver vaccines wherever and whenever they are needed. Sustained eradication will require stronger routine immunization programs, vaccine delivery and surveillance strategies that are effective and adapted to be acceptable to all sides of a conflict, and a range of tactics suitable to identifying and reaching children whether they be in insecure areas, displaced from their homes, or part of marginalized mobile groups. Facing these and other challenges of conflict-affected environments will require a combination of learning from past experience and finding solutions to new or evolving issues.

The lessons outlined above have been captured in a small number of reports, research papers, and guides for field staff. Even within this circumscribed literature, a more complex discourse can be seen emerging, as reflection on new lessons and new experiences is added to prior understanding. The polio program itself has become larger and more complex, as has its ability to develop and implement strategies specifically designed for operating in conflict-affected environments. There is a great deal of program experience—together with a large and growing database on the impact of multiple program initiatives—that suggests it is possible to

systematically review the relative merits of the different tactics and strategies described above. Furthering research[19] and expanding the literature on the GPEI's experience could make an important contribution to the much richer realm of research focused on humanitarian work in conflict zones and other facets of health service delivery. More importantly, in the short to medium term, such a contribution can be a significant resource for a program operating in the midst of severe, ongoing, and complex conflicts. As the GPEI enters the final phase of stopping WPV while building the foundations for the sustained high levels of immunity required to achieve global eradication, navigating the complex environments it finds itself in requires a better understanding of past experience and further evolution of its strategies.

[19] While this document has not looked at questions of research ethics in conflict-affected environments, any sustained effort to systematically and rigorously research the GPEI's experience, even if small, will need to pay attention to this relatively recent but growing field of enquiry. See, for example, Campbell 2017.

References

Campbell SP. 2017. Ethics of research in conflict environments. *J Global Security Stud.* 2(1):89–101. doi: 10.1093/jogss/ogw024.

Closser S, Cox K, Parris TM, et al. 2014. The impact of polio eradication on routine immunization and primary health care: a mixed-methods study. *J Infect Dis.* 210(suppl 1):S504–S513. doi: 10.1093/infdis/jit232.

Cronin AA, Shrestha D, Cornier N, Abdalla F, Ezard N, Aramburu C. 2007. A review of water and sanitation provision in refugee camps in association with selected health and nutrition indicators—the need for integrated service provision. *J Water Health.* 6(1):1–13. doi: 10.2166/wh.2007.019.

Duintjer Tebbens RJ, Kalkowska DA, Thompson KM. 2019. Global certification of wild poliovirus eradication: insights from modelling hard-to-reach subpopulations and confidence about the absence of transmission. *BMJ Open.* 9(1):e023938. doi: 10.1136/bmjopen-2018-023938.

Duintjer Tebbens RJ, Kalkowska DA, Wassilak SGF, Pallansch MA, Cochi SI, Thompson KM. 2014. The potential impact of expanding target age groups for polio immunization campaigns. *BMC Infect Dis.* 14:45. doi: 10.1186/1471-2334-14-45.

Fekadu L, Okeibunor J, Nsubuga P, Kipela JM, Mkanda P, Mihigo R. 2016. Reaching the unreached with polio vaccine and other child survival interventions through partnership with military in Angola. *Vaccine.* 34(43):5155–5158. doi: 10.1016/j.vaccine.2016.05.069.

Fine P, Eames K, Heymann DL. 2011. "Herd immunity": a rough guide. *Clin Infect Dis.* 52(7):911–916. doi: 10.1093/cid/cir007.

GPEI. 2017. Reaching the hard to reach: Ending polio in conflict zones. GPEI website. http://polioeradication.org/news-post/ending-polio-in-conflict-zones/. Published June 21. Accessed August 26, 2019.

GPEI. 2019. Where we work. GPEI website. http://polioeradication.org/where-we-work/. Accessed September 3, 2019.

Habib MA, Soofi S, Cousens S, et al. 2017. Community engagement and integrated health and polio immunisation campaigns in conflict-affected areas of Pakistan: a cluster randomised controlled trial. *Lancet Glob Health.* 5(6):593–603. doi: 10.1016/S2214-109X(17)30184-5.

Hill PS, Pavignani E, Michael M, Murru M, Beesley ME. 2014. The "empty void" is a crowded space: health service provision at the margins of fragile and conflict affected states. *Confl Health.* 8:20. doi: 10.1186/1752-1505-8-20.

Hussain SF, Boyle P, Patel P, Sullivan R. 2016. Eradicating polio in Pakistan: an analysis of the challenges and solutions to this security and health issue. *Global Health.* 12(1):63. doi: 10.1186/s12992-016-0195-3.

Ismail SA, Abbara A, Collin SM, et al. 2016. Communicable disease surveillance and control in the context of conflict and mass displacement in Syria. *Int J Infect Dis.* 47:15–22. doi: 10.1016/j.ijid.2016.05.011.

Larson H, Fleck F. 2014. Underlying issues are key to dispelling vaccine doubts. *Bull World Health Organ.* 92(2):84–85. doi: 10.2471/BLT.14.030214.

Martinez M, Shukla H, Ahmadi M, et al. 2018. Progress toward poliomyelitis eradication—Afghanistan, January 2017–May 2018. *MMWR Morb Mortal Wkly Rep.* 67(30):833–837. doi: 10.15585/mmwr.mm6730a6.

Matveeva A. 2009. *The Perils Of Emerging Statehood: Civil War And State Reconstruction In Tajikistan; An Analytical Narrative On State-Making.* London, UK: Crisis States Research Centre. Working Paper 46. http://www.lse.ac.uk/international-development/Assets/Documents/PDFs/csrc-working-papers-phase-two/wp46.2-perils-of-emerging-statehood.pdf. Accessed August 26, 2019.

Nkwogu L, Shuaib F, Braka F, et al. 2018. Impact of engaging security personnel on access and polio immunization outcomes in security-inaccessible areas in Borno State, Nigeria. *BMC Public Health*. 18(suppl 4):1311. doi: 10.1186/s12889-018-6188-9.

Nnadi C, Etsano A, Uba B, et al. 2017. Approaches to vaccination among populations in areas of conflict. *J Infect Dis*. 216(suppl 1):S368–S372. doi: 10.1093/infdis/jix175.

Nnadi C, Damisa E, Esapa L, et al. 2017. Continued endemic wild poliovirus transmission in security-compromised areas—Nigeria, 2016. *MMWR Morb Mortal Wkly Rep*. 66(7):190–193. doi: 10.15585/mmwr.mm6607a2.

Pavignani E, Michael M, Murru M, Beesley ME, Hill PS. 2013. Making sense of apparent chaos: health-care provision in six country case studies. *Int Rev Red Cross*. 95(889):41–60. doi: 10.1017/S1816383113000726.

Peckham R. 2016. Polio, terror and the immunological worldview. *Glob Public Health*. 13(2):189–210. doi: 10.1080/17441692.2016.1211164.

Press Trust of India. 2017. Polio worker shot dead in Pakistan, over 100 killed since December 2012. *Hindustan Times*. https://www.hindustantimes.com/world-news/polio-worker-shot-dead-in-pakistan-over-100-killed-since-december-2012/story-7nt0hXxatmuGNwrFe2wCsJ.html. Published July 2. Updated July 27. Accessed August 26, 2019.

Radio Free Europe/Radio Liberty (RFE/RL). 2016. Three polio workers killed in eastern Afghanistan. RFE/RL website. https://www.rferl.org/a/polio-workers-killed-afghanistan/27537282.html. Published February 7. Accessed August 26, 2019.

Rubenstein L. 2010. *Defying Expectations: Polio Vaccination Programs amid Political and Armed Conflict*. Washington, DC: United States Institute of Peace. Peace Brief 64. https://www.usip.org/sites/default/files/PB%2064%20-%20Polio%20Vaccination%20Programs%20Amid%20Political%20and%20Armed%20Conflict.pdf. Accessed August 26, 2019.

Salek LV. 2014. *Working in Conflict: A Faith Based Toolkit for Islamic Relief*. Birmingham, UK: Islamic Relief Worldwide. http://www.islamic-relief.org/wp-content/uploads/2014/06/A_Faith_Based_Toolkit_for_Islamic_Relief.pdf. Accessed August 26, 2019.

Scientific American. 2013. How the CIA's fake vaccination campaign endangers us all [originally titled "The spies who sabotaged global health"]. *Sci Am*. 308(5):12. doi: 10.1038/scientificamerican0513-12.

Smith D. 2013. Polio workers in Nigeria shot dead. *Guardian*. https://www.theguardian.com/world/2013/feb/08/polio-workers-nigeria-shot-dead. Published February 8. Accessed August 26, 2019.

Tangermann RH, Hull HF, Jafari H, Nkowane B, Everts H, Aylward RB. 2000. Eradication of poliomyelitis in countries affected by conflict. *Bull World Health Organ*. 78(3):330–338. http://www.who.int/bulletin/archives/volume78_3/en/. Accessed August 26, 2019.

Vaccines Today. 2015. What is herd immunity? Vaccines Today website. https://www.vaccinestoday.eu/stories/what-is-herd-immunity/. Published February 7. Accessed August 26, 2019.

Warigon C, Mkanda P, Muhammed A, et al. 2016. Demand creation for polio vaccine in persistently poor-performing communities of northern Nigeria: 2013–2014. *J Infect Dis*. 213(suppl 3):S79–S85. doi: 10.1093/infdis/jiv511.

World Health Organization (WHO). 2019. WHO-recommended surveillance standard of poliomyelitis. WHO website.

https://www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/active/poliomyelitis_standards/en/. Accessed August 26.