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The Impact of Vaccine Hesitancy on the Polio Vaccine in South Asia

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SIT Study Abroad

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Table of Contents

Abstract

A disease that paralyzes hundreds of children each year, polio is incurable but also entirely preventable through vaccination. Though part of the reason some children are not reached for immunization is that they are in areas too volatile for healthcare workers to access, vaccine hesitancy is increasingly being recognized as an important player. The objective of this study is to ascertain the degree to which vaccine hesitancy affects polio vaccine campaigns in Afghanistan and Pakistan, the countries in South Asia where polio continues to be endemic, to assess the drivers behind hesitancy in this region, and to present recommendations for how these challenges might be overcome.

To best assess vaccine hesitancy in Pakistan and Afghanistan and evaluate its causes, this study integrates two research methods: articles and reports from participating NGOs and governments, and formal and informal interviews with experts in this field. Articles and reports were selected with the purpose of either helping to construct an idea of the emotional and social environments in these countries or to provide reference for what research has been done on vaccine hesitancy in other regions or on a more global scale.

The first finding of this study is that vaccine hesitancy is the exception rather than the rule in almost every setting, but that in order to achieve the global eradication of polio, hesitancy must eventually be addressed. This study further finds that while confidence (trust in the safety of the vaccine and the motives of its providers) has historically been the leading cause of hesitancy by a wide margin and continues to account for most incidences of hesitation today, complacency (not deeming the risk of disease to outweigh the effort or perceived risk of immunization) will be a

growing problem in the future as demand for the polio vaccine falls— ironically, as the campaign's success grows and there are fewer observable cases. Finally, this study makes several recommendations for how vaccine hesitancy can be addressed in Pakistan and Afghanistan, taking into consideration current drivers, future risks, and decision-making psychology.

Key Words: *Vaccine hesitancy, confidence, complacency, convenience*

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Preface

One of the most efficient and effective preventative public health measures available, vaccines are estimated to save between 2 and 3 million lives worldwide each year (NVAC, 2015). Unfortunately, the problem of vaccine hesitancy is one of increasing scope and severity in global public health today. Overall vaccination rates of unprecedented height demonstrate the success of campaigns that have brought vaccination supplies and program infrastructure to corners of the globe where such services were not formerly accessible, but also hide the pockets of individuals who have access to vaccines and choose to delay or refuse them.

At the end of 2014 and the start of 2015, just before I began my studies in Switzerland, the United States experienced a measles outbreak that infected dozens of people and had the potential to infect hundreds more. Measles is a vaccine-preventable disease (VPD), and though immunization against it is recommended for all children and required for those entering public school in the U.S.,[*] the majority of those infected during the outbreak were individuals who were unvaccinated—many by choice. This situation combined my studies of public health and of medical anthropology in a way that was both intriguing and alarming, and inspired me to explore in greater detail the issues of vaccine confidence and vaccine hesitancy.

As I began to delve into this topic, its complexity and breadth became quickly manifest; vaccine hesitancy is neither easily defined nor static, and varies greatly depending on geographic location, culture, time, and vaccine. I was particularly intrigued by an article I read about the polio vaccination campaign in India, a country now regarded as the great success story of the

[*] Exemption laws vary from state to state, with various states allowing for religious exemptions, personal belief exemptions, both, or neither. All states allow for medical exemption.

global polio eradication effort, and subsequently decided to focus my research on the polio vaccine. Within this topic, I decided to focus on South Asia, particularly Afghanistan and Pakistan, in order to study trends within the same epidemiological zone. Overall, the process of reaching out to and interviewing experts and sorting though the wealth of information available thanks to universities, organizations, and researchers all over the world has helped me find a niche in academia and improve my skills as a researcher.

Introduction

When the Global Polio Eradication Initiative (GPEI) was launched in 1988, over 350,000 cases were being reported annually from over 188 endemic countries. An incurable and highly infectious virus, polio is spread through person-to-person contact and enters the mouth orally, multiplying in the intestine. From there it leaves the digestive tract, enters the bloodstream, and attacks nerve cells, leaving many victims paralyzed and some dead. This paralysis was a prospect that terrified parents in the early twentieth century as polio reached endemic proportions, flaring up in the warm summer months and claiming hundreds of young lives while sentencing thousands more to a future of immobility. At that point in history polio was one of the most feared diseases of developed countries, but with the breakthrough of effective vaccines in the 1950s and ‘60s these countries were able to swiftly eliminate the virus as a threat to public health. Because of widespread vaccination efforts, polio was eradicated from the Western Hemisphere in 1994.

Underdeveloped and developing countries had a more difficult time garnering international recognition for the severe impact polio was having on their populations. Nevertheless, the 1970s brought control of the virus to many such countries as vaccination programs began introducing routine immunization worldwide. Since the GPEI launch South Asia had been regarded as a region that would pose one of the greatest challenges to global eradication of polio, but skeptics were silenced in 2012 when India, the giant of the region, was removed from the list of polio-endemic countries. Today only three countries remain on that list: Pakistan, Afghanistan, and Nigeria.

In each of these countries, vaccine hesitancy remains a formidable barrier to polio eradication. Vaccine hesitancy, defined by the Strategic Advisory Group of Experts on Immunization (SAGE)[*] in a recent report as a "delay in acceptance or refusal of vaccines despite availability of vaccine services," does not apply to situations where vaccine uptake is suffering due to low availability (e.g. stock outs), unmanageable access due to geographical or security barriers, or poor vaccine campaign organization; rather, it refers to an active choice on the part of individuals or communities to delay or reject vaccinations for themselves or their children (SAGE, 2014, p. 7). For many different reasons, vaccine hesitancy exists to varying extents in a variety of locations and for a number of different VPDs. Polio is a particularly interesting case study because its history in the last half century includes notable success stories—the most famous being India—as well as stubborn failures. Without addressing vaccine hesitancy, these failures will continue to stand in the way of the global elimination of polio.

Literature Review

In October of 2014, the SAGE Working Group on Vaccine Hesitancy issued a report that frames vaccine hesitancy on an international scale. This report also provides terminological distinctions between vaccine hesitancy, vaccine confidence, and vaccine safety and additionally defines confidence, convenience, and complacency (the "3Cs") as they relate to vaccination efforts. A key conclusion in this report is that vaccine hesitancy is fluid and varies greatly depending on context; it is time, place, and vaccine specific, and thus there can be no 'magic bullet' intervention strategy that addresses all instances of vaccine hesitancy. The Working Group

[*] Established in 1999, SAGE is the chief advisory group to WHO for vaccines and immunization. Its responsibilities include advising WHO on global policies and strategies concerning vaccines and technology, research and development, and vaccine delivery and its association with other public health interventions.

emphasizes that while safety concerns are linked to vaccine hesitancy, they are not the only cause and the other determinants need to be further researched.

In February of the following year, a research paper titled "Measuring Vaccine Confidence: Introducing a Global Vaccine Confidence Index," written by Heidi Larson et al. was published, presenting the findings of a survey about vaccine hesitancy and overall confidence in immunization programs across five countries: India, Nigeria, Pakistan, Georgia, and the United Kingdom. Their results demonstrated that among "confidence," "convenience," and "complacency," confidence was the leading driver of hesitancy. This included confidence in the safety of the vaccine itself as well as confidence in the healthcare system, confidence in the organization administering the vaccine, and confidence in the government or political group(s) supporting the vaccination efforts. This study explicitly concludes that "medium-to-high" confidence in vaccines and immunization programs are the standard and that vaccine hesitancy is comparatively rare, but notes that even small groups of resistant or refusing individuals can undermine an immunization program (p. 13).

Most recently, the American National Vaccine Advisory Committee issued a draft report on the state of vaccine confidence in the U.S. This report assesses the climate in the United States on vaccine confidence (distinguished from vaccine hesitancy), drawing several conclusions and making recommendations for what needs to be done to improve vaccine confidence. It emphasizes the importance of involving healthcare practitioners and parents; in fact, a key message of this report is that healthcare providers are the number one source of health information and information about vaccines and VPDs and therefore emphasis should be placed

on ensuring that providers 1) are confident in vaccines themselves and 2) are willing and able to engage concerned parents in discussions about vaccine safety and importance. This report also emphasizes the role of social media and the social environment in which parents find themselves, asserting that vaccine-negative rumors, even unsubstantiated, contribute greatly to hesitancy.

A review of this literature indicates that vaccine hesitancy is not only a widespread and complex issue, but also an elusive one. Each of these reports attempts to assess public sentiment in their region(s) of focus, and each dedicates a substantial portion of the publication to citing the many complications to collecting quantitative data on this topic. There is a clear consensus that the issue is vital and that more research is needed, but unfortunately the factors that make studying vaccine hesitancy difficult are magnified greatly in underdeveloped countries such as Pakistan, Afghanistan, and Nigeria, where polio remains endemic.

Research Question

This study presents and defines vaccine hesitancy as a global issue, distinguishing it from and explaining its relationship with vaccine confidence, convenience, and complacency. Within this topic area it focuses on the polio vaccine and international polio immunization efforts. It further delves into both the causes and impact of vaccine hesitancy in the remaining polio-endemic countries in South Asia, Pakistan and Afghanistan, and in doing so compares them to the successfully completed campaign in India. Finally, this paper examines the drivers at play in vaccine hesitancy in this region and delves into strategies by which these obstacles could be overcome.

Methodology

To best frame the landscape of vaccine hesitancy in Pakistan and Afghanistan and assess its causes, this study integrates two research methods: review of articles and reports from key stakeholders, and formal and informal interviews with experts. Because there has been relatively little research done on vaccine hesitancy levels in South Asia, articles and reports were selected either to help paint a picture of the emotional and epidemiological settings on the ground in these countries or to provide reference for what research has been done on vaccine hesitancy in other regions or on a more global scale. This study uses an anthropological approach to identify the structural drivers of hesitancy unique to this epidemiological region, and uses the categories of confidence, convenience, and complacency (see below) to help cluster these drivers and observe trends.

Updates and reports from GPEI, WHO, and UNICEF, among others, as well as reports from the countries' respective Ministries of Health and international Islamic organizations were used for the analysis of the situation in the region. A combination of quantitative and qualitative data from these sources was used to understand the social, political, and emotional environment and identify causes of hesitancy. Several recent reports from Working Groups specifically dedicated to examining the subject of vaccine hesitancy were used to help define key terms and understand the influence of vaccine hesitancy on a global scale.

These sources also provided a system for breaking down the drivers of vaccine hesitancy that is used in this report, referred to as the "3Cs" discourse. The "Cs" are three categories of hesitancy

drivers, not mutually exclusive: confidence, convenience, and complacency. In this study, *confidence* refers to trust in the effectiveness and safety of a vaccine, in the institution that promotes and/or delivers it, and in the government or policy-makers who decide which vaccines are deemed necessary. *Convenience* refers to a variety of related factors including physical availability (involving geographical ease of accessibility), willingness-to-pay, understandability (language and health literacy), and time investment. *Complacency* occurs and results in vaccine hesitancy when individuals weigh the risks (or perceived risks) of a vaccine against the risk of contracting the VPD and do not deem vaccines to be a necessary preventative action. Ironically, a successful immunization program may eventually lead to pockets of complacency and, ultimately, hesitancy (SAGE, 2014, pp. 11-12). Though security threats and political volatility have a negative impact on polio vaccination coverage rates in many regions of Pakistan and Afghanistan, they are not considered direct drivers of hesitancy.

Interviews were conducted with experts who have field experience specific to vaccine campaigns in developing countries, particularly the polio vaccine. Formal interviews were conducted throughout April of 2015 with a combination of doctors, researchers, and project officers working for WHO, IOM, and the CDC. Though the interviewees were all connected by their experience with vaccine campaigns, they varied in their field locations and specific tasks and hence were able to provide a variety of perspectives. Personal communication via email and over the phone allowed for further insight from other experts.

No ethical concerns arose during this study, as none of the interviewees would be considered members of vulnerable populations by most ethical review boards. Copyrighted publications as well as published and unpublished sources have been cited appropriately, respecting the integrity and rights of other researchers.

Analysis

Polio was the leading cause of childhood disability at the time the GPEI was launched, paralyzing nearly 1,000 children every day. Since then, the number of countries where polio remains a threat to public health has been whittled down to just three, and the 27-year effort to eradicate polio has resulted in an incidence drop of over 99 percent (UNICEF, 2014). Despite the number of cases being reduced now to only a few hundred per year, outbreaks across the Middle East and Africa in 2013 and 2014 prove grimly that polio remains a threat to children everywhere as long as it is endemic anywhere.

Vaccine hesitancy is just one of many impediments to polio eradication in South Asia, and as such it is important not to mistake low coverage rates as a surrogate for high prevalence of hesitancy. Particularly in rural areas of Pakistan and Afghanistan, access remains a formidable challenge to reaching communities with low polio vaccination uptake rates. This includes geographical difficulties with physical access, difficulties finding and tracking down nomadic or migrating communities, and safety challenges due to poor regional security. Unfortunately, when data demonstrates low coverage, it is often difficult to discern what percentage of uncovered persons were unvaccinated due to reasons of accessibility versus problems with hesitancy, and it is even more difficult to further identify the drivers of hesitancy. More research is needed, but how this research is collected remains a problem. Because data on vaccine hesitancy hinges upon emotions, behavior, and social, political, and religious circumstances, and therefore often must be qualitative, language barriers and imperfect translations of various questions or study tools make it hard to accurately compile data or compare between

linguistically different regions.[*] Further, for the same reasons communities may be difficult for immunization teams to reach (geography, security, etc.), researchers trying to collect more detailed data on vaccine hesitancy may have a difficult time accessing communities with poor uptake rates. Despite this, the GPEI was able to map out the percentage of children missed due to refusal as well as those missed due to "social reasons" in Afghanistan, Pakistan, and other polio endemic and high-risk countries, and for a period of time provided annual reports on this information. The last of these reports were published for the period of April-August 2012, however, and therefore do not reflect the changing sentiments of the region or the impact of the vaccination ban in Waziristan (see *Pakistan*). More contemporary data is needed in order to accurately tailor immunization programs to address the greatest challenges in specific regions.

The Story of India

By 2006, India was one of the last four polio-endemic countries in the world.[†] A nation of many languages and cultures, constant political and religious tensions, and over a billion people, India was thought by many to be the greatest challenge to the dream of eradicating polio worldwide when the World Health Assembly first launched the GPEI in 1988. In the mid 1990s as the Western Hemisphere celebrated the successful eradication of polio, an estimated 150,000 polio cases were being reported annually in India (Coates et al., 2013). Low routine immunization coverage, dense and often mobile population groups, poor sanitation, and low access to health services intensified India's vulnerability to polio, particularly in the states of Uttar Pradesh and Bihar. Structural shortcomings in these states were manifest, and it showed; of the 741 polio

[*] This was cited as a difficulty in Larson et al.'s study *Measuring Vaccine Confidence: Introducing a Global Vaccine Confidence Index*, where researchers concluded that linguistic differences between the countries being studied resulted in different translated meanings of phrases such as "a little" and "not very much" (2015, p. 13)

[†] The other three, Pakistan, Afghanistan, and Nigeria, remain endemic today.

cases reported in 2009, 602 were from Uttar Pradesh alone and another 117 were from Bihar (Coates et al., 2013).

The massive size and diversity of India's population presented a formidable challenge to the GPEI. In Uttar Pradesh alone, the government's 1985 Universal Immunization Program requiring the immunization of every child under the age of five with minimum three doses of oral poliovirus vaccine (OPV) meant that vaccinators needed to reach over forty million children in every campaign (Coates et al., 2013). Steep population growth meant that the number of children under the age of five who needed to be reached was rising, and the country's immense population further included a high percentage of vulnerable demographics including migrants and slum-dwellers that were often mobile and/or difficult to track down for Supplemental Immunization Activities (SIAs). Another quickly identified challenge to the polio eradication effort was that of low vaccine confidence due to the local concern and mistrust that shrouded the immunization campaign in many parts of the country. Combined, these challenges meant that thousands of children were not receiving their vaccinations because of their parents' hesitancy relating to convenience, confidence, or both.

Vaccine hesitancy is derived from and intensified by a multitude of drivers. Particularly among impoverished people and other vulnerable populations, public mistrust is often a leading cause. In India, groups who received little in the way of basic aid or health benefits from NGOs or the government were suspicious of their dedication to polio eradication, which seemed to ignore long-standing and serious health issues such as malnutrition, diarrheal disease, malaria, and tuberculosis (Coates et al., 2013). Not only did religious leaders often refuse to abet the polio

eradication effort, but many actively worked against it; some Islamic leaders even went so far as to issue *fatwas* (Muslim legal decrees) condemning childhood vaccination efforts. Historical drivers proved to be an unexpectedly difficult challenge as well; in some communities, it was believed that the polio campaign was an extension of forced population control measures of the 1970s, when the local government forced people with two or more children to be sterilized (Coates et al., 2013). Further, children in Uttar Pradesh and some other regions often needed more than the recommended four doses of OPV to be fully protected, so local suspicion and resistance toward vaccine efforts intensified when children were paralyzed by polio despite having received the recommended number of doses.

To combat challenges of low confidence and inconvenience, the Indian government, UNICEF, and several local and global NGOs collaborated to create the Social Mobilization Network (SMNet). The goal of SMNet was to "improve access and reduce family and community resistance to vaccination," which it did by training thousands of individuals from high-risk areas to encourage childhood vaccination, visit individual households, collect data on immunization coverage, and persuade local opinion leaders to voice their support for the cause (Coates et al., 2013, p. 68). The program was extremely successful; though it worked in the highest-risk communities with the poorest vaccination records, data indicates that SMNet communities often had higher coverage rates than district averages (Coates et al., 2013). SMNet is just one example of the multifaceted and thorough polio eradication campaign in India, which amazed the world in 2012 when it announced that, having gone over a year with no new cases of polio reported, it was officially polio-free.

Endemic Countries in South Asia

There are three countries that the World Health Organization (WHO) still considers to be polio endemic: Pakistan, Afghanistan, and Nigeria. In 2014, however, Somalia, Equatorial Guinea, Iraq, Ethiopia, and Israel were listed with Afghanistan and Nigeria as states infected with wild poliovirus (not exporting) and Cameroon and the Syrian Arab Republic were reported (in addition to Pakistan) as countries currently exporting the virus (GPEI, 2014). Under the new International Health Regulations (IHR 2005), States are required to report the occurrence of wild type poliovirus in non-endemic countries to WHO immediately, so that action can be taken to protect other countries and develop a strategic response. A polio outbreak in a non-endemic country is considered an "always notifiable" Public Health Emergency of International Concern (PHEIC), meaning that it is determined to constitute a public health risk to other states and would potentially require an international response. In May of 2014, the upsurge of wild poliovirus cases led to the declaration of polio as a PHEIC.

Pakistan

With 306 reported cases of wild poliovirus[*] in 2014 and 21 so far in 2015, Pakistan is the country farthest from achieving its goal to become polio-free. After initial improvements following the GPEI launch, a study funded by the Poliovirus Research subcommittee of WHO, the Royal Society, and the Medical Research Council found that vaccination coverage decreased between the years 2006 and 2011, especially in the Federally Administered Tribal Areas (FATA), Balochistan, and Khyber Pakhtunkhwa in Pakistan and in southern Afghanistan (O'Reilly et al., 2012). This increase in incidence of poliovirus occurred because of sharp

[*] There were also 22 cases of type 2 circulating vaccine-derived poliovirus (cVDPV2) reported in 2014. No new cases of cVDPV2 have been reported in 2015.

declines in vaccination coverage, despite the development of more effective vaccines during this time period.

Perhaps the greatest setback to the polio eradication effort in Pakistan came on May 1, 2011: the night that Osama Bin Laden was assassinated in Abbottabad. An investigation by *The Guardian* found that the CIA, with the help of a senior Pakistani doctor, had organized a fake vaccination program in the town where it believed Bin Laden was taking refuge. Early in the year the doctor had gone to Abbottabad claiming to have funds for a vaccination drive, and proceeded to pay off low-ranking local government health workers for their participation in the operation, which they were unaware had any connection to the hunt for Bin Laden. In the past the Bin Laden compound had been almost exclusively closed off, but historically health workers had been some of the few individuals to gain access, administering OPV to some of the children. It is unclear how Bin Laden's DNA was obtained from his children—or indeed whether it was at all—though many speculate that the nurse who entered the compound (who was also unaware of the program's ulterior motives) had been trained to withdraw a small amount of blood into the needle after administering injected vaccines (Shah, 2011).

Regardless of how it was done, the CIA operation was a huge setback to the polio vaccination campaign in Pakistan, particularly in terms of challenges with confidence and hesitancy. Momin Kazi, a researcher who studied safer methods of vaccination coverage assessment in Karachi, noted that there was already a general suspicion surrounding the polio vaccine in Pakistan because it was almost always promoted and administered by Western countries, but that after Bin Laden's assassination and its connection to childhood vaccinations "a lot of parents refused the

polio vaccine because it was part of this 'war on terror' with America" (personal interview, 17 April 2015). This plummet in public trust caused vaccine hesitancy in Pakistan to soar, particularly for reasons of confidence. Around the same time, other misconceptions were rampant; Kazi and other field workers who have spent time in Pakistan refer in particular to two widespread rumors. The first was that the polio vaccine contained ingredients that were *haraam*[*], such as pork. The second was that the polio vaccination program was secretly a Western plot to sterilize Muslims in an attempt to cut off the proliferation of Muslim families (Kazi, personal interview, 2015; Giboux, 2012).

Between the CIA's hoax and the wildfire rumors, hesitancy in Pakistan became rampant. The following year in Waziristan and the FATAs, local leaders went so far as to issue *fatwas* banning immunizations and would publicly punish anyone they found vaccinating children or promoting polio immunization (Niaz, 2014). The GPEI, however, responded quickly; in 2012 after the release of the study demonstrating vaccination coverage decline between 2006 and 2011, Pakistan implemented a national polio emergency action plan with the goal of reversing the negative coverage trend. The plan focused on combatting challenges that were preventing all children from being systematically reached with OPV and increasing technical support for the areas whose coverage rates were worst (GPEI, 2012). According to Kazi, an unprecedented alliance was forged between the government, local and global NGOs, and donor agencies to unify their efforts (personal interview, 17 April 2015). The emergency action plan included ambitions to address vaccine hesitancy related to both confidence and complacency, both of which were recognized as important drivers. Much ground had been lost in the fragile struggle

[*] An object or action that is considered sinful; refers to something that is forbidden by Allah

to establish vaccine confidence, and the GPEI hoped that by making district-level leadership more accountable and earning the support of community religious leaders they could begin to rebuild public trust. Through social mobilization and publicizing immunization as a civic duty, the campaign hoped to combat hesitancy due to complacency by increasing demand for vaccines (GPEI, 2012).

In a May of 2014 the WHO Emergency Committee convened to discuss the current state of the polio eradication initiative, sharing updates on and assessments of recent progress in eliminating the virus. Ultimately, the Committee advised that "the international spread of polio to date in 2014 constitutes an 'extraordinary event' and a public health risk to other States for which a coordinated international response is essential" (WHO Statement, 2014). The Committee unanimously agreed that the conditions for a PHEIC had been met, and on 5 May, WHO Director-General Margaret Chan declared it as such. This decision was reached due to the spike in cases in early 2014, the time of year generally considered the 'low season' for transmission of polio, which included three situations of the virus being exported to other countries (GPEI, 2014). One of these exporting countries was Pakistan.

The declaration of the polio epidemic as a PHEIC impressed an element of emergency upon the movement in Pakistan. As part of a PHEIC, the country was required to:

- Declare at the national level the interruption of poliovirus transmission to be a national public health emergency
- Require all residents and visitors staying more than four weeks to receive a dose of OPV or IPV (inactivated poliovirus vaccine) prior to international travel[*] and provide travellers with an International Certificate of Vaccination to serve as proof
- Maintain all of these measures until 1) over six months pass without new cases of poliovirus exportation and 2) there is proof of high quality and sustainable eradication initiatives in all high-risk areas[†] (WHO Statement, 2014)

These measures are designed to quell the threat that polio poses to international public health, but do not address the root problems that keep polio from being eradicated in Pakistan: lack of access to children in some areas, attacks on health workers administering and promoting the polio vaccine, and vaccine hesitancy caused by misconceptions about mass vaccination campaigns and mistrust of their administrators.

Afghanistan

Though polio is still endemic in Afghanistan, the country is better positioned than its eastern neighbor to eradicate the disease in the near future. In 2014 Afghanistan documented just 28

[*] Between 4 weeks and 12 months prior to departure; if it is impossible for travellers to comply with this (e.g. the trip is unexpected and/or urgent), they are still required to receive a dose of either OPV or IPV before the time of departure

[†] If there is no documentation of this, PHEIC measures must be maintained until minimum 12 months has passed without exportation of poliovirus

cases of polio, and in 2015 there has been only one confirmed case.[*] When asked, one WHO representative for Afghanistan stated that he did not believe vaccine hesitancy to be a common problem. Historically, however, the road has not always been smooth. The same report that demonstrated polio vaccination coverage decline between 2006 and 2011 in Pakistan indicated the same negative trend for Afghanistan, and the regions that border the Pakistani FATA experienced similar drivers of vaccine hesitancy. The response of the Polio Eradication Initiative for Afghanistan to this information was swift. According to a 2012 Annual Report by the Ministry of Public Health, interventions in 2012 included the declaration of poliovirus by the government as a public health emergency (following a recommendation by the World Health Assembly to do so); coordination with the ICRC and local leaders and organizations to improve access, spread accurate information, and ensure the safety of vaccination teams; special trainings to enhance the capacity of providers; and the revision of communication strategies toward the goal of increasing demand for vaccines, thereby reducing complacency.

Given Afghanistan's volatile recent history, it is tempting to blame shortcomings of polio vaccination coverage on instability, conflict, and poor security. Recent analysis, however, suggests otherwise: in 2012 only 20 percent of unvaccinated children in Afghanistan were missed because they lived in regions that were unreachable to healthcare teams for security reasons, meaning that the remaining 80 percent were missed in areas where vaccinators should have had access to them (Ministry of Public Health Afghanistan, 2012). The most likely explanations for this phenomenon are either that the vaccination teams did not visit the homes of these children (which would demonstrate a serious problem with accountability and/or

[*] Wild poliovirus type 1; there were no cases of Circulating Vaccine-Derived Poliovirus (cVDPV) in Afghanistan in 2014, and there have been none to date in 2015.

supervision and monitoring within the campaign) or that either by accident or on purpose, the children were not present when the vaccination teams visited their homes. Improvement of management and accountability within the campaign is a goal of the National Emergency Action Plan (NEAP), but the absence of children during SIAs suggests persisting issues of hesitancy (Ministry of Public Health Afghanistan, 2012). Absence of children during SIAs due to coincidence or accidental circumstances indicates low community demand (complacency), and absence due to purposeful avoidance on the part of parents demonstrates a challenge with confidence that needs to be addressed.

These challenges are reflected in the updated NEAP for July 2014- December 2015, which prioritizes intensifying the campaign's focus on the southeastern region of the country. Of the three main challenges NEAP identifies, two relate directly to combatting hesitancy. The first of these challenges is the quality of campaigns in areas that *are* accessible to vaccination teams, including specifically the need to address refusals due to misconceptions or religious reasons. The second is the region's weak political context, considering its new provincial governor and the relatively low engagement of district governors, which has a detrimental effect on public trust[*] (Polio Eradication Initiative of Afghanistan, 2014).

[*] The third challenge listed is insecurity and inaccessibility, which is undeniably an important issue but is also less in the control of the eradication campaign and is unrelated to vaccine hesitancy

Unfortunately, one of the greatest challenges to eradicating polio from Afghanistan is that transmission is continuously complicated by steady migration to and from its neighbor, Pakistan, over the border it shares with Pakistan's FATA (see Figure 1). In one two-month period in 2013 after the Pakistani military commenced operations against militants in Northern Waziristan,* an estimated one million individuals were displaced from Northern and Southern Waziristan and the surrounding areas ("Reaching the Unreached," 2013). The GPEI responded immediately; as tens of thousands of families fled across the Afghan border, over 35,000 children under the age of 10 received OPV along with other basic humanitarian aid. In spite of this, the region continues to boast the highest concentration of polio cases in both countries ("Reaching the Unreached," 2013). In September of 2012, only months after the immunization ban in Waziristan had been enacted, then-president Hamid Karzai announced his endorsement of NEAP and the polio vaccination campaign, officially signing the plan in an effort to combat the negative press that the ban was giving the campaign. The ban on polio vaccination in Northern and Southern Waziristan in 2012 has caused outbreaks not only in other regions of Pakistan but also in other countries, particularly Afghanistan, where the number of confirmed wild poliovirus cases doubled from 2013 to 2014 (Larson et al., 2015).

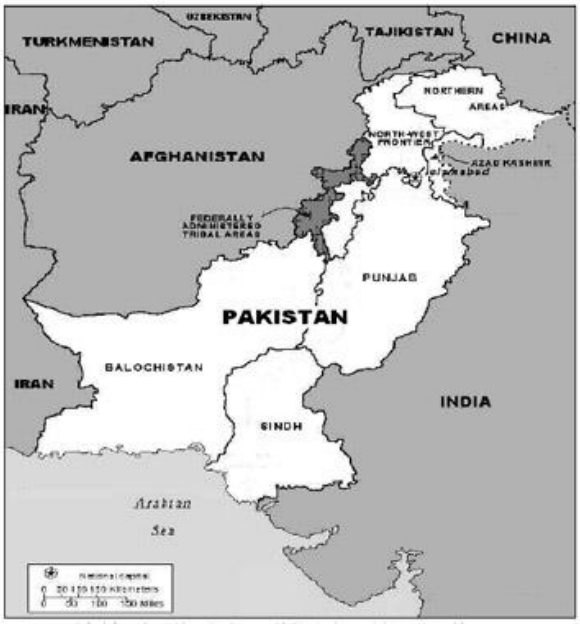

Figure 1: Pakistan, Afghanistan, and the Federally Administered Tribal Areas (Source: Council on Foreign Relations)

* Part of the Federally Administered Tribal Areas (F.A.T.A.); see figure 1 (Appendix)

While it is true that Afghanistan has been unable thus far to successfully interrupt polio transmission, it should be acknowledged that the majority of the country is polio-free. Indeed, the Afghan Ministry of Public Health in conjunction with WHO and UNICEF estimated in 2012 that the country's eradication program had been successful in protecting 84 percent of the population from exposure to this paralyzing virus. Further, the distribution of confirmed cases has been confined almost exclusively to a few blocks of densely populated districts in the southern region, suggesting that if the campaign remains thorough and well organized, Afghanistan could be well positioned to halt poliovirus transmission in the near future (Ministry of Public Health Afghanistan, 2012).

Public Trust

Vaccine confidence as a driver for hesitancy includes not only confidence in the effectiveness and safety of the vaccine itself but also in the entity that administers and supports it as well as the government and/or specific policymakers that approve and promote it (SAGE, 2014). The public trust that produces this confidence, however, is fragile; in his book *Thinking, Fast and Slow*, Nobel laureate Daniel Khaneman states that the brains of humans as well as other animals "contain a mechanism that is designed to give priority to bad news," meaning that negative emotions and information weigh more heavily into decision making than their positive counterparts (p. 293). Khaneman also cites the findings of psychologist Paul Pozin, who asserts that not only are bad experiences more impressionable but also that they are "more resilient to disconfirmation" (2011, p. 293). In the context of the polio vaccine, this means that even one event that would give the public a reason to distrust the polio vaccine or its administrators could

set confidence in the entire campaign back considerably. In Nigeria, for example, the northern state of Kano was the site of a polio vaccine boycott in 2003 and 2004; today, research shows that the state still has the highest rates of refusal (72 percent of hesitant parents) in the country (London School of Hygiene and Tropical Medicine, 2015).

In Afghanistan and Pakistan, the assassination of Osama Bin Laden and the exposure of the CIA's fake vaccine campaign constituted such an event. Public trust was further damaged by the immunization ban in Waziristan shortly thereafter, and has been slowly recovering ever since. The politicization of the polio vaccine following these events is no small contributing factor; the campaign's perceived link to the War on Terror has increased suspicion surrounding the vaccine in South Asia, and the SAGE Working Group reported that situations of organized resistance to polio immunization were typically based on political opposition to a government or institution supporting immunization efforts (2014).

Though negative events certainly deteriorate public trust, in any given situation of low confidence there are a multitude of factors at play. CDC Project Officer Mimi Larselere stated that she believed there to be less hesitancy in the Pacific Islands where she works because of the culture, in which she believed people were not raised to be suspicious or to question the healthcare provided (personal interview, 20 April 2015). This differs starkly from the culture in the FATAs, where a history of warfare has taught families to be wary of anyone outside of their immediate village or tribe. The political context is also important, and was identified by the Afghan Ministry of Public Health as an area in which they needed to intensify their focus. In the volatile region on the Pakistani border, power changes hands quickly and often violently and the

tribal communities may have low trust in centralized leadership that has historically abused them or failed to protect them from abuse. Despite this, the eradication program in Afghanistan, with the help of the ICRC, has had greater success maintaining the neutrality of its campaign than Pakistan (Ministry of Public Health, Afghanistan, 2012).

A tragic occurrence that harms public trust in the polio vaccine is when children receive the prescribed dosage of IPV or OPV and contract polio anyway. This was a problem the Indian campaign faced, particularly in Uttar Pradesh, where for unclear reasons children often needed more than the recommended four doses of OPV to be fully protected. Understandably, hesitancy and refusal in the state grew when children were paralyzed by polio despite having received their four doses of OPV (Coates et al. 2013). A separate but arguably even more tragic phenomenon that happens extremely rarely is that children are infected with polio not just *despite* having received a vaccine, but *because* of the vaccine itself. In 2014, the GPEI reported a total of 55 cases of vaccine-derived poliovirus (VDPV), nearly all of which were in Pakistan and Nigeria. Research is ongoing but thus far inconclusive on understanding how to eliminate VDPV risks. For families and communities whose children have been victims of either of these circumstances, it is neither surprising nor without justification that they may feel deceived and therefore lose trust in the vaccine campaign, the government supporting it, and perhaps even the wider healthcare system.

In analyzing the role of public trust in hesitancy, it is important to consider the reasons *why* individuals or populations would be inclined not to trust a vaccine or the institution administering it. In Pakistan, for example, heart disease, cancer, and lower-respiratory infections

draw a three-way tie for leading causes of death (CDC, 2013). Strokes and diarrheal diseases account for another 6 percent of annual deaths each, followed by neonatal encephalopathy, chronic obstructive pulmonary disease, tuberculosis, pre-term birth complications, and diabetes (CDC, 2013). Most of these causes of death are non-communicable diseases (NCDs), which could be delayed or prevented with lifestyle changes or the right medications. Others, like diarrheal diseases, could be prevented with relatively low-cost health interventions focusing on water access, sanitation, and hygiene. Statistically, Pakistanis are hundreds of times less likely to be paralyzed by polio than to die of an NCD or a diarrheal infection, and in Afghanistan where the number of cases is even lower, the likelihood of contracting polio is even more miniscule. To the people experiencing these epidemiological circumstances, this begs the question of—why polio? Each year, health workers embark on expeditions to reach the most remote villages with OPV, sometimes sacrificing their lives. Billions of dollars are funneled into the cause. To a parent who may have already lost children during childbirth or due to a communicable disease associated with poor living conditions and limited access to medical care, the focus on polio might seem odd at best and at worst, suspicious or ill-intentioned.

The answer to the "why polio" question is that polio eradication has become a major focus of Bill Gates and his foundation, which in 2012 and 2013 when the ban in Waziristan began and regional public trust was perhaps at its lowest was number one source of funding for the World Health Organization (WHO, 2013)[*]. WHO's second largest donor at the time was the United States, which Gates has been encouraging to increase its donation to the eradication effort, and

[*] The Bill and Melinda Gates Foundation is still the top voluntary contributor to WHO, whose voluntary contributions make up around 83 percent of its budget. (WHO Overview of Funding - Approved Programme Budget 2014-2015)

the fourth largest was GAVI, the Vaccine Alliance. With this information, it is suddenly much less mysterious why so much money and effort is being dedicated to this cause when more lives per dollar could be saved elsewhere. In an interview on NPR's *All Things Considered*, Gates told Robert Siegel that polio was "special" to him and estimated that if the virus were properly eliminated, it would save $2 billion per subsequent year that could be put toward other causes (Doucleff, 2013). According to a BBC report, in 2013 Bill and Melinda Gates had already given $30 billion to the polio eradication cause and pledged billions more (Walsh, 2013). Saving children from incurable paralysis is certainly an admirable cause, and to someone examining the issue on a global scale it makes sense why WHO, UNICEF, and the GPEI would want to make a push for eradication now when case numbers are lower than ever rather than allowing them to climb again and spread to countries that had previously been declared polio-free, but to someone on the ground whose family and neighbors are in desperate need of other medical care, such single-focused dedication may seem frustrating and inexplicable. This inexplicability is where public trust enters the equation: if the people do not trust the funding source(s), they will be more inclined to think that there is an ulterior motive for the vaccine.

Local historical, political, and social circumstances are all important contributors to the legacies of mistrust that pave the way for rumors to take root. While an unsubstantiated rumor that vaccines are going to cause sterilization may seem far-fetched and an outsider may not understand why a community would be so hostile toward an unarmed aid worker who is just bringing medicine, in some ways these things are eerily reminiscent of past events—the 1970s government sterilization programs in India, the healthcare workers who were pretending to vaccinate children when in fact they were doing secret work for the CIA. Further, the regions

most at risk for polio have been caught in both political and literal crossfires between local warlords, terrorist groups such as Al Qaeda and the Taliban, the United States, and their own government, and may not have reason to believe that *their* best interests are what anyone is fighting for.

There are several strategies that, if well executed, can help build public trust in vaccines. In Muslim countries, leadership and involvement from other Muslim countries that have successfully eradicated polio can rebrand the campaign as being supported by Islam rather than promoted exclusively by Western Christian nations (see *Religious Opposition*). Further, data indicates that the confidence of the general populace in their own countrymen is significantly higher than in foreign aid workers; data from Pakistan demonstrates that locals' trust in local health organizations was significantly higher (99 percent) than in international health organizations (only 70 percent) (SAGE, 2014).

Vulnerable Populations

Though poliovirus certainly has no inhibitions about who its victims are, there are particular populations that are more vulnerable to infection than others. One such population is migrants, of whom there are many in the polio endemic countries of South Asia. One IOM doctor, Teresa Zakaria, cited numerous reasons that migrant populations are more susceptible to polio and other VPDs, beginning with the irregular status of many migrants in the Middle East and South Asia (personal interview, 27 April 2015). In her experience at border entries in the Middle East, irregular migrants were often wary if not outright fearful of individuals they viewed as authority figures, including health workers. For this reason, particularly if a medical issue is not viewed as

an emergency, many migrants not only refuse but actively avoid healthcare— including vaccine campaigns. This fear is often compounded by the dozens of traffickers, thieves, and other crooks who constantly take advantage of migrants' vulnerability along their journey, leaving the migrants suspicious of lies and false promises and unsure of whom they can trust. Other significant drivers of hesitancy among migrant populations include language and cultural barriers, which Dr. Zakaria noted have high potential to complicate healthcare interactions and possibly lead to miscommunication or even accidental offense (personal interview, 2015).

Most of these problems reflect issues with confidence, but complacency also plays a significant role. When Dr. Zakaria was working in Yemen, WHO had just asked the IOM to extend polio coverage there and make polio vaccination a priority. Many incoming migrants come to Yemen from Ethiopia and Somalia, both countries that reported cases of wild poliovirus in 2014, and would virtually never have received childhood vaccinations—much less have a record of it. Because of this, the Minister of Health had made the decision to have the IOM vaccinate all migrants, regardless of status. Many sending countries are experiencing some combination of internal violence, civil unrest, and political instability, none of which are conducive to an effective healthcare system. This means that in most cases, not only do citizens not receive healthcare services but they also often do not regard health as a priority unless it is a life-or-death situation. Migrants moving between Afghanistan and Pakistan are often fleeing war zones, and may not prioritize preventative healthcare measures such as vaccines, particularly for a relatively uncommon virus such as polio.

Low education levels also make families more likely to be vaccine hesitant.[*] Poor literacy is usually indicative of poor health literacy, and families who do not have members who understand the risks of VPDs compared to vaccines or who can sort out information based in fact from misinformation and rumors will likely have low demand for immunizations. Low demand ultimately leads to hesitancy, as these families may be less likely to go out of their way to receive vaccinations on an NID (National Immunization Day) and/or more likely to be absent during an SIA. Kazi also reported low literacy and education levels for health and vaccines to be a cause for parents delaying or refusing vaccinations (personal interview, 17 April 2015).

Religious Opposition

In Pakistan and Afghanistan, both Islamic states, religious leaders have an enormous sway in the community and religious decrees often carry the rule of law, de jure or de facto. In Pakistan in particular, rumors that suggest immunization is anti-Islamic in any way have had detrimental effects on vaccine confidence in the country. The rumor that the polio vaccine would cause sterilization is similar to one that challenged the polio eradication campaign in India several years previously: marginalized communities, particularly in the states of Uttar Pradesh and Bihar, were easily swayed by opposition from religious leaders and rumors that the polio vaccination campaign was a continuation of coercive population control measures from the 1970s, when the government forcibly sterilized certain individuals for having two or more children (Coates et al, 2013). The fact that people in Pakistan were so ready to believe this rumor as well as the widespread rumor about vaccines containing ingredients that are *haraam*

[*] The 2014 Report of the SAGE Working Group on Vaccine Hesitancy stated that education could be associated with either higher or lower levels of vaccine hesitancy, however, country-specific studies point to more definite trends. No data on Afghanistan is offered in this report but studies demonstrate that in Pakistan education is a promoter of vaccine acceptance.

demonstrates a problem with vaccine confidence that goes beyond mistrust of the polio vaccine itself and extends to suspicion of the organizations that sponsor, promote, and operate the campaign.

Following the polio vaccination ban that was imposed on Waziristan in 2012, over 70 percent of polio cases in Pakistan the subsequent year were from that region ("Reaching the Unreached," 2013). The ban not only led to hesitancy due to fear of punishment at the hands of the militants enforcing it but also created a false association between the polio vaccine and the factions of the Western world that were at war with Afghanistan. The religious ban, combined with the increasing volatility of the region, posed a serious global health threat: in the summer of 2014, military operations in North Waziristan caused over a million people from the region to leave with their families, and as thousands of unvaccinated people fled the area, fear grew that they would carry the virus with them to other countries and other regions of Pakistan (Niaz, 2014).

Just as the powerful influence of religious leaders in their communities has driven up vaccine hesitancy following negative events and rumors, so too can their influence be used to build confidence and encourage immunization coverage. India's SMNet had a great deal of success with this, convincing many religious leaders who had previously issued *fatwas* forbidding polio immunization to instead promote participation in childhood vaccination services and events and even announce upcoming NIDs and SIAs during services and religious meetings (Coates et al., 2013). In Pakistan, a mostly Sunni country with a significant Shi'a minority, the polio eradication campaign took on an advocacy movement in which famous religious leaders from

both sects came on TV and on the radio announcing their support of polio immunization (Kazi, personal interview, 17 April 2015).

In addition to the support of local Imams and Islamic leaders, the GPEI has benefited greatly from the public support of the global Muslim community. In March of 2013 the Grand Imam of Al-Azhar in Cairo called for the protection of Muslim children against poliovirus transmission by ensuring that they receive the adequate number of OPV doses in a timely manner, stating that "crippled children lead to a crippled Muslim Ummah[*]" (WHO/EMRO, 2013). The following year, the Grand Imam of the Holy Mosque of Mecca along with other leading Islamic scholars stated that protection against VPDs was not just admissible but obligatory under Shariah law, and that actions against preventative healthcare like vaccinations do harm to humanity and are "un-Islamic." The group of scholars emphasized the safety and acceptability in Islam of vaccinations against polio in particular, stressing that it would be sinful to expose innocent Muslim children to such an unnecessary risk (Jeddah Declaration, 2014). Further, to ease the hesitancy of communities who are wary that the polio vaccine is a plot conceived by the West to make them break Islamic law or sterilize them, pro-immunization Imams and community leaders use the example of Saudi Arabia and its eradication of polio due to successful vaccination coverage. Saudi Arabia is held in high esteem by many other Muslim countries because it is home to Islam's great holy cities, so its acceptance and promotion of the polio vaccine builds confidence among other Muslim populations (Kazi, personal interview, 17 April 2015). To address the rumor that the vaccines contain pork or some other ingredient forbidden by Islam,

[*] Arabic word for "nation" or "community"

OPV now has a stamp of *hilaal*[*] to prove its acceptability (Kazi, personal interview, 17 April 2015).

The Role of Conflict and Civil Strife

Afghanistan and Pakistan have both experienced a great deal of political turmoil and instability in recent years, and violence and civil unrest continue to be commonplace in certain regions of both countries. In Afghanistan in particular, following the 9/11 attacks and the commencement of the War on Terror, everything became politicized. The polio eradication campaign, funded and organized primarily by governments and NGOs from the United States and Europe, drew a great deal of suspicion; perhaps it seemed distrustfully ironic that the same country dropping bombs on their villages and swarming their cities with troops would also care so greatly about protecting their children from polio. In 2012 in Waziristan, political motives further worsened the state of vaccine confidence, already weakened by religious suspicions. Recognizing an opportunity for leverage, the militants enforcing the ban on the polio vaccination linked the ban to their demands to stop drone strikes (Larson et al., 2015). Afghanistan's 2012 Annual Report stated that insecurity was worsening in the southeastern region of the country on the Pakistani border, driving up the number of children who are inaccessible for vaccination (Ministry of Public Health Afghanistan, 2012). In Pakistan, the atmosphere of mistrust created by constant civil strife has led to violence, in many cases deadly, against health workers involved in polio vaccine efforts: since December 2012, 27 health workers have been assassinated during polio immunization campaigns (Kazi, 2014). This greatly limits the ability of WHO, UNICEF, and the

[*] Permitted or acceptable according to Islamic law; generally refers to food and drink

GPEI to track vaccination coverage, much less collect information on vaccine hesitancy and confidence.

Internal conflict and political instability are generally not conducive to functional healthcare systems, which means that vaccination rates in areas of civil unrest often drop considerably. This effect is compounded by the fact that vaccine demand tends to plummet in situations of violence, where VPDs are not at the forefront of people's medical concerns. A joint statement by WHO and UNICEF in July of 2014 reported that Syria's polio immunization rates plunged from over 90 percent before the conflict to less than 52 percent at the time of the statement. Syria, which had been polio-free since 1999, was caught unprotected and off guard by a polio outbreak in 2013 caused by a Pakistani strain of the virus (Larson et al., 2015). All nine countries that reported cases of wild poliovirus in 2014 are experiencing conflict and/or political instability.[*]

Globalization and the Information Age

Because it is driven by such a multitude of factors, vaccine hesitancy tends to affect certain communities and specific vaccines more than others. In the Pacific Islands, for example, CDC Project Officer Mimi Larselere reported that confidence was high and resistance to or refusal of vaccines was, in her experience, extremely rare. A great deal of the difference in attitude between this region and the polio-endemic countries of South Asia can be attributed to cultural and religious differences as well as cultural and political histories, but Larselere also attributed the high confidence in the Pacific to the isolation of the island communities, many of which do

[*] Pakistan, Afghanistan, Nigeria, Syria, Cameroon, Somalia, Equatorial Guinea, Iraq, and Ethiopia

not have Internet access (personal interview, 2015). Without Internet access, parents are not reading articles and blog posts about vaccine concerns and controversies, or news stories about immunization boycotts. They do not do their own "research" in the form of Google searches, relying on top hits that may or may not relay accurate information. This does not mean that distant communities are never exposed to false information or propaganda—news always finds ways to travel, and radios in particular are often common even in remote areas—but it does make the transfer of information slower and limits isolated communities' full connectivity with the massive database that is the rest of the world.

The technological advances of this millennium have drastically altered the way information is shared as well as the speed at which it moves. The Internet today enables people to share their suspicions and concerns about vaccinations, ask questions about vaccine safety, and discover hoards of readily available information, both accurate and inaccurate. In their effort to remain balanced and unbiased, media sources can also have harmful effects on vaccine hesitancy if they give the same weight and attention to rumors and perceived dangers as they do to scientific evidence of safety and value. In a 2015 Draft Report assessing the state of vaccine confidence in the United States, the National Vaccine Advisory Committee asserted its wariness of social media platforms, calling them " virtual echoing chambers for fostering questions about vaccine safety and reinforcing false information and myths" (p. 23).

Globalization and the ready availability of information on the polio vaccine can increase hesitancy when the information is incorrect, but the internet and social media also have potential to work as platforms from which the GPEI can demonstrate the sentiments of the rest of the

world, including the vast majority of countries that are polio-free, the Imams and Islamic scholars who have voiced their support of polio immunizations, and parents whose children have been paralyzed because their children were not vaccinated who want to spare others from suffering the same fate. In 2012 GPEI reported that several famous cricket stars from Afghanistan and India had come together to publicly announce their support of their countries' commitment to eradicate polio. As such statements amass not only from cricket heroes and celebrities but also from religious leaders, people who follow these figures in the news and on social media are more likely to feel confident about the polio vaccine and recognize its importance.

The availability and use of phone service and the Internet varies widely within and among countries in South Asia. Hence, the problem with relying too much on media campaigns and globalization to carry positive messages is that often the regions that need to hear them most—namely, the FATAs where the incidence of polio is highest—do not have the technology to receive them. With this in mind, it is important in these areas to focus on personal communication and the development of individual relationships of trust in order to win the hearts and minds of the leaders who hold the most influence in their communities.

Recommendations

This study recommends the following strategies to address the challenges that vaccine hesitancy poses to the polio eradication effort in South Asia:

1) Emphasis should be placed on constant, personal communication with high-risk communities in order to develop and enhance public trust.
2) As part of this communication effort, the focus of the campaign should be communicating with individuals who have the greatest amount of influence within their communities, particularly within the realm of medical advice.
3) The polio vaccine should be administered alongside other public health services of which target communities are in need.
4) Efforts to reduce vaccine hesitancy should focus on the growing threat of complacency in addition to the current challenges of confidence.
5) For all of these strategies, particularly (4), healthcare workers and campaign organizers should consider the psychology of how individuals make decisions about vaccinations and what role the media and globalization can and will play.

Direct, personal communication was critical to the successful eradication of polio in India, where thousands of local health workers were mobilized to promote polio vaccination in their communities, have conversations with hesitant parents about the benefits and risks of vaccines, visit individual households, and engage in dialogs with prominent community figures to garner their support. While media has an increasingly significant influence on much of the world, including South Asia, establishing regular interpersonal communication is especially crucial in

areas that do not have access to television and/or radio. These areas, like most of the high-risk areas for polio immunization in Afghanistan and Pakistan, are often rural communities and conflict zones. Patience and persistence is critical in this effort, and if communication is effective it can have a positive impact on behavior by reducing refusals among hesitant individuals; according to UNICEF communication data used in a WHO report, as much as 50 percent of parents who initially refuse the polio vaccine are later convinced of the vaccine's importance (Giboux/WHO, 2012).

In studies of vaccine hesitancy in developed countries, healthcare providers are consistently listed at the most trusted source of information on immunization. According to the World Bank, however, Pakistan has roughly a third of the physicians per capita that the United States has, with only .8 physicians per 1,000 people (2010), and Afghanistan has just over a tenth, with .3 physicians per 1,000 people (2013). These figures do not take into account the regional density of doctors, who are likely to be concentrated in metropolitan areas and few and far between in rural and volatile regions like the FATA. Therefore, polio eradication campaigns in these areas must work to discover who *is* being trusted to offer medical recommendations; in India, SMNet listed interpersonal communication as being fundamental to the campaign's success in building trust and reducing hesitancy. SMNet's community mobilization coordinators (CMCs) sought out not only doctors and other healthcare personnel but also religious leaders, school teachers, local political figures, and other respected individuals to build and maintain local networks of trust and to train these influential community members to respond effectively to fears and misconceptions about the polio vaccine (Coates et al., 2013). According to the U.S. National Vaccine Advisory Committee, the most effective communication strategies are usually those tailored to the specific

apprehensions or questions of a particular population (2015). This requires continuing evaluations of existing and developing sentiments toward the polio vaccine, which unfortunately are difficult to carry out in the unstable regions where polio persists.

In Uttar Pradesh, an Indian state that had an especially difficult time eradicating polio, underserved communities began questioning why the government regularly provided OPV and was so insistent on its administration and meanwhile appeared to have little concern for or resources to allocate toward combatting other long-standing healthcare challenges such as diarrheal diseases, poor sanitation, malaria, tuberculosis, and malnutrition (Coates et al., 2013). These questions and unmet needs contributed to hesitancy and ultimately resistance to the polio vaccine, and SMNet responded with great success by incorporating sanitation activities and other healthcare services to their immunization drives. Dr. Zakaria reported a similar strategy in her work with migrant communities, where the mobile clinics that reached the most at-risk individuals included emergency health services, basic provisions such as food and water, and clothing and shoes in addition to the polio vaccine[*] (personal interview, 27 April 2015). The GPEI has begun to recognize the success of this strategy, particularly for migrants, and work to provide displaced persons along the Afghan-Pakistani border with not only OPV but also basic humanitarian aid, including food, water, and shelter. Improving access to these services alongside immunizations instead of unilaterally focusing on polio helps prove to communities that public health and well-being is the motive behind vaccination campaigns, and can therefore improve trust in the vaccines as well as the groups providing them.

[*] The Minister of Health had requested that the IOM extend polio vaccination coverage to all individuals in at-risk areas, therefore making it a priority service.

Challenges of vaccine confidence will need to be addressed in order for the complete eradication of polio to be successful, but a challenge that has potential to grow as eradication efforts are more and more successful is that of complacency and low demand for vaccines. As the U.S. National Vaccine Advisory Committee put it, the "near invisibility of [VPDs] speaks to the value and success of vaccines" but at the same time emphasizes the "importance of constant—and greater—vigilance" in monitoring vaccine hesitancy (p.9). Public health experts agree that it is almost always emotion rather than reason that drives people to action, so to achieve this end, there are ways that campaigns can use decision-making psychology in conjunction with media influence to reach populations at an emotional level. In his book *Thinking, Fast and Slow* Khaneman explores this notion, delving into further detail on why people make intuitive decisions about things they know relatively little about, such as vaccines. He argues that when people have a difficult "target question" for which they want to produce an assessment, they tend to unconsciously substitute it for a "heuristic question"—a simpler question that they can answer instead (p. 97). In most cases, the heuristic question frames the easy question of 'how do I feel about it?', the answer to which is used as the answer to the more difficult question of 'what do I think about it?' or the impossible question of 'what is right?' (p. 137). In the instance of the polio vaccine where the target question may be 'is this vaccine safe?', 'is this vaccine necessary?', 'does taking this vaccine or allowing my child to receive it go against my religion?', or any number of other difficult questions, the heuristic question may be along the lines of 'am I afraid of the Western powers who are funding this vaccine?', 'do I trust the people or entity that are promoting and providing this vaccine?', or 'am I more afraid of anti-vaccine militants or of polio?'.

This psychology is important to understand, because as fewer and fewer cases of polio are reported each year, the potential threat of complacency grows. In his section on availability, emotion, and risk, Khaneman asserts that while victims and near-victims are very concerned with a threat while it is present and immediately after, memories of the disaster "dim over time" along with the concern and diligence associated with them (p. 136). Further evidence from Khaneman's research indicates, however, that the media portrayal of negative events can manipulate public perception, keeping community diligence high and ensuring that VPDs like polio continue to be treated with the seriousness they deserve. This is because popular perceptions of cause of death are warped by media coverage; unusual events such as rare diseases and accidents draw disproportionate attention and are consequently perceived as less uncommon than they actually are[*] (pp. 136-137). Further, as previously mentioned in this study, negative events have a more powerful and lasting impact on emotions than positive ones.

With all of this information in mind, polio eradication initiatives in Afghanistan and Pakistan as well as other countries where immunization rates are falling could benefit greatly from a media campaign with pathos appeal. If every polio case receives dramatic media coverage, the general public will likely perceive it as a greater risk, therefore keeping demand for vaccines high. Even when polio cases are not being reported, propaganda sharing the tragic stories of children being paralyzed by this entirely preventable disease would not only keep attention on the issue but also utilize the psychology of the heavy and lasting impact of negative information. The challenge that the future of the polio eradication initiative will likely face in the future, one that is key to

[*] Khademan offers several examples proving this, including that in various studies conducted on perceived causes of death, tornadoes were seen as more frequent killers than asthma (although the latter cause 20 times more deaths), death by lightning was judged less likely than death from botulism even though it is 52 times more frequent, and death by accidents was judged to be more than 300 times more likely than death by diabetes when the true ratio is 1:4.

influencing the decisions of hesitant individuals, combatting complacency, and keeping vaccine demand high, will be ensuring that the fear of the crippling effects of polio remains a stronger emotional force than wariness or ambivalence toward the polio vaccine.

Conclusion

Vaccine hesitant individuals, particularly those who go on to outright refuse immunization, are relatively rare. Medium to high confidence in vaccines and immunization programs are much more common, even in areas with security challenges and complicated historical legacies of mistrust—in Pakistan, for example, an average of only 2 percent of the population refuses vaccinations for religious or other personal reasons (Giboux/WHO, 2012). The goal of GPEI is to entirely eliminate polio from the world, however, and 2 percent is still too high a figure when the aim is to reach every last child.

In truth, though "every last child" is the catchphrase of the GPEI and would certainly be ideal from a public health standpoint, polio can be eliminated without reaching literally every single child in the world. Rather, the need is to improve access and reduce hesitancy until *almost* all children are vaccinated—enough that the unimmunized would be protected by what is known as 'herd immunity.' Herd immunity occurs when there are such high levels of vaccine-induced immunization in a community that the likelihood of a transmitting case to encounter a susceptible host is extremely low, thus terminating transmission and preventing exposure to

others in the community who are unprotected[*] (NVAC, 2015). For this phenomenon to take place, not only must there be extremely few people who are unvaccinated, but unvaccinated individuals must not be concentrated. One of the problems with vaccine hesitancy in South Asia is that while hesitant individuals are a only a small fraction of the population, they exist in pockets, therefore putting their communities at risk and making herd immunity impossible. Unfortunately, these unimmunized pockets are often self-reinforcing; evidence indicates that parents' confidence in vaccinations are heavily influenced by community attitudes and social norms, so the more community members there are who are vaccine hesitant the more likely it is for others to follow in suite (NVAC, 2015). Because of this, children who are unvaccinated due to refusals are often geographically clustered, and data shows that these geographical areas with high refusal rates also have higher rates of VPDs (NVAC, 2015).

Available data indicates that confidence is the primary driver of hesitancy. New research introducing a Global Vaccine Confidence Index reported that the highest percentage of reasons for hesitancy was attributed to confidence issues, which accounted for 69 percent of hesitant individuals in India, and 33 percent in Pakistan, making it the highest driver in both countries[†] (Larson et al. 2015). An important part of confidence is trust, or a person's willingness to rely on the expertise or advice of someone else—in this case, their recommendations concerning the polio vaccine. Studies of vaccines in developed countries show that doctors and other healthcare workers who interact with parents regularly and administer vaccines have a great deal of sway in helping ease the concerns of hesitant individuals. In the United States, for example, studies

[*] There are many reasons that a community member may be unvaccinated other than inaccessibility and hesitancy. Other unprotected groups include the rare individuals who cannot be vaccinated for medical reasons as well as infants who have not yet received the full course of OPV doses.

[†] Afghanistan was not one of the countries included in this study

consistently demonstrate that the vast majority of parents (over 80 percent) look to their child's healthcare provider for information on immunizations and advice on VPDs. Logically, when health workers are able and willing to engage parents in dialogs about vaccine benefits and risks as well as the value and need of vaccines, parents are more confident in immunizations (NVAC, 2015).

Considering the low ratio of physicians per capita in Pakistan and Afghanistan, particularly in Waziristan and the FATA where poliovirus transmission is most concerning, it is unlikely that communities are able to regularly seek vaccination advice from doctors. The concept of certain community members being especially influential in decision making and offering advice and recommendations about immunizations still applies, however: the role of medical consultant may be filled by any number of community members, including pharmacists, traditional healers, shrine keepers (Afghanistan), Mullahs, Imams, elders, or even children enrolled in school. These are the individuals with the most power to boost confidence and influence vaccine decision-making, and are therefore the ones that should be the focus of communication from vaccine teams.

Convenience, referring primarily to physical availability, willingness to pay, understandability (language and health literacy), and time investment appears to play a smaller role in polio vaccine hesitancy than confidence. Though geographical proximity can make vaccination efforts more tedious, GPEI highlights that even when access to vaccination is difficult in rural parts of Pakistan, many parents try to have their children immunized (SAGE, 2014). Willingness to pay and time investment are also not cited as problems, as OPV consumption is quick and the

vaccinations are provided free of charge, leaving understandability as the remaining factor contributing to challenges with convenience. Though it still does not play as significant a role as confidence, language has potential to be a barrier for the region's many migrant populations, and low health literacy can cause confusion and mistrust toward vaccines or ambivalence toward VPDs.

Like convenience, complacency is overshadowed by confidence as a driver for vaccine hesitancy in South Asia. Unfortunately, however, it stands the greatest chance of growing in its importance as a driver in the future. Complacency, which occurs when individuals do not feel that the threat of a VPD outweighs the risks associated with a vaccine or the effort that would need to be invested to receive it, rises as demand for vaccines like polio falls. Depending on the circumstances there can be a variety of causes for this, one of which is that in a situation where violence has erupted, security is threatened, or other basic health and living amenities are not being met, vaccination and other preventative healthcare measures are not top priorities. Another cause, ironically, is that as fewer and fewer children are crippled by polio, reminding the rest of the world how devastating the virus can be, younger generations in particular feel less threatened by it. This makes them more ambivalent toward the vaccine, and less likely to deem perceived dangers associated with immunization to be a smaller threat than a virtually absent VPD.

Vaccination rates are on the rise and qualitative evidence from polio eradication campaigns in South Asia indicate that vaccine hesitancy is resulting in fewer and fewer situations of refusal, but the 2012 plummet in public trust in the region followed by the 2013-2014 outbreak in which

numerous non-endemic countries were contaminated for the first time in decades show how unpredictable vaccine hesitancy trends can be. As the GPEI pushes toward its goal of eliminating the virus entirely, it must address both accessibility failures and situations of hesitancy and refusal. Building and maintaining strong public confidence and high vaccination demand is critical to the success of polio eradication, and only by eliminating hesitancy within the pockets of communities whose immunization coverage rates are lowest will the rest of South Asia be able to share in India's success of protecting their children from polio forever.

Competing Interests:

None declared.

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Abbreviation List

GPEI	Global Polio Eradication Initiative
IHR	International Health Regulations
IOM	International Organization for Migration
IPV	Inactivated Poliovirus Vaccine
NEAP	National Emergency Action Plan (Afghanistan)
NID	National Immunization Day
OPV	Oral Poliovirus Vaccine
PHEIC	Public Health Emergency of International Concern
SAGE	Strategic Advisory Group of Experts on Immunizations
SMNet	Social Mobilization Network
SIA	Supplementary Immunization Activity
UNICEF	United Nations Children's Fund
VDPV	Vaccine-Derived Poliovirus
VPD	Vaccine-Preventable Disease
WHO	World Health Organization

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