# THE IMPACT OF THE POLIO ERADICATION INITIATIVE ON THE DEVELOPMENT OF NATIONAL HEALTH SYSTEMS AND OVERALL PUBLIC HEALTH

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# ABSTRACT

This work attempts to identify the impact of the Polio Eradication Initiative (PEI) on national health systems and its relationship to overall public health. This goal is achieved by analyzing existing research on the impact of the PEI on national health systems to see if this impact is accompanied by a corresponding change on overall public health in three African and three Asian countries. Public health impacts are primarily measured by noting changes in life expectancy, maternal mortality and under 5 child mortality rates, although other quantifiable factors which could impact the existence of positive spillovers and overall public health are also taken into consideration.

This thesis finds that positive spillovers from the PEI onto national health systems can be, but are not always, accompanied by positive changes in overall public health status. In the six countries analyzed, this thesis identifies a minimum threshold under which countries did not experience positive changes to overall public health.

This thesis concludes by building on existing policy recommendations and suggesting new policies which capitalize on the potential for using disease eradication campaigns to foster improved public health. In an effort to foster improved public health, this thesis also strongly advocates for eliminating the use of such disease eradication campaigns when they only provide short-term, disease-specific benefits.

Finally, this work encourages further research into whether this minimum threshold under which the studied countries did not experience positive changes to overall public health is applicable in other countries. If so, this thesis suggests we should consider foregoing disease eradication initiatives in favor of overall health capacity building campaigns in the countries which fall below the threshold.

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# LIST OF ABBREVIATIONS

AFP- Acute Flaccid Paralysis

AIDS- Acquired Immune Deficiency Syndrome

AIIMS- All India Institute of Medical Sciences

CDC- Centers for Disease Control

CIA- Central Intelligence Agency

**GDP-** Gross Domestic Product

HDI- Human Development Index

HIV/AIDS- Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome

HRRI- High-Risk Response Immunization

IMF- International Monetary Fund

NEM- New Economic Mechanism

NID- National Immunization Day

NORAD- Norwegian Agency for Development Cooperation

PDR- People's Democratic Republic

PE- Polio Eradication

PEI- Polio Eradication Initiative

**PPP-** Purchasing Power Parity

SNIGS- National Health Information and Health Management System

**TB-** Tuberculosis

UK- United Kingdom

UNICEF- United Nations Children's Fund

USAID- United States Agency for International Development

WB- World Bank

WHA- World Health Assembly

# WHO- World Health Organization

#### INTRODUCTION

The global Polio Eradication Initiative (PEI) has attracted wide attention; millions of dollars of international aid have flowed into countries for the purpose of eradicating polio, and yet in recent years the number of polio cases has actually risen in some countries. Critics of the PEI point to the increase in both aggregate and cost-per-eradication costs, as well as the varied and inconclusive evidence affirming the presence of positive spillovers onto national health systems. Supporters of the PEI justify the high costs by claiming that disease eradication is a public health strategy in and of itself.

This thesis examines this last point in more detail, because in order to classify the PEI as a public health strategy, the PEI should have a direct impact not only on polio incidence but also on the development of national health systems and overall public health as well. In reality, little formal research has been conducted on the impact of the PEI on the development of national health systems, with roughly a dozen countries looked at to date. A literature review of the body of existing research reveals that there is little conclusive evidence of either a positive or negative impact of the PEI on the development of the larger health system (Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Nsubuga et al. 2002). To the best of my knowledge, there is no literature exploring the relationship between disease eradication campaigns, specifically the PEI, and overall public health.

This thesis begins with an introduction to the PEI, focusing on the history and analysis of the campaign to date. This analysis shows that the World Health Assembly's (WHA) initial effort was to strengthen national health systems through the PEI, although in practice the disease eradication campaigns have not always been intentionally designed to do so. Country analyses contained in Chapter 2 will highlight the impact of the PEI on national health systems in Benin, Cambodia, Cote D'Ivoire, Lao PDR, Nepal and Niger.

The paper then moves to demonstrate whether an impact on the national health system is accompanied by a corresponding change in overall public health. As such, Chapter 3 looks at changes in life expectancy, under 5 mortality rates and maternal mortality rates in the six countries studied, to detect any health trends that could be related to the PEI. Other quantifiable factors which could impact the existence of positive spillovers and overall public health are also analyzed. Using this data, I will attempt to draw some conclusions about the use of disease eradication programs such as the PEI as public health strategies, contrasting health indicators which confirm that the PEI can successfully prompt changes in overall public health with economic indicators which indicate that a minimum level of development is required to allow for the desired spillovers onto both national health systems and overall public health. Several unexpected findings will also be revealed.

Chapter 4 will attempt to draw conclusions about using disease eradication campaigns to promote improved public health by identifying looking at characteristics of the six studied countries which either contributed to or impaired the countries' ability to capitalize on the PEI for improved public health. Common policy recommendations, including the use of disease eradication as a public health strategy, will be challenged, and I will propose a new policy approach for achieving maximum synergies from disease eradication programs.

In conclusion, this paper will summarize and discuss the resulting policy implications for the PEI and for the larger strategy of using disease eradication campaigns to foster improved public health.

# Chapter 1 – HISTORY AND ANALYSIS OF THE PEI

This chapter traces the history of the Polio Eradication Initiative (PEI) and explores the arguments in support of and against the campaign.

# 1.1 A Strong Start Followed By Limited Progress

In the late 1980s and early 1990s, the World Health Organization (WHO), Centers for Disease Control (CDC) and United Nations Children's Fund (UNICEF), with massive support from international donors such as Rotary International, launched a world-wide effort to eradicate polio, an infectious disease which normally strikes children and can lead to permanent paralysis. Vaccination campaigns began in nearly every country around the world, with a goal set to eradicate polio by the year 2000.

In the early days of the campaign, efforts were made to design and operate the PEI not simply as another disease eradication campaign, but as an intentional effort to strengthen national health systems, an idea that forcefully emerged from the 1978 International Conference on Primary Health Care held in Alma-Ata (Aylward et al. 2002). As such, at the launch of the PEI in the late 1980s, the World Health Assembly (WHA) committed to global eradication of polio in ways which "strengthen national immunization programmes and health infrastructure," without specifically outlining the ways this was to be accomplished (Goodman et al. 2000, p.305). However, many early campaigns were operated independent of national health structures, and only recently have PEIs applied a more horizontal approach and worked within the existing health system (Melgaard et al. 1999).

From the late 1980s to the early- to mid-1990s there was a significant decrease in global funding for disease eradication efforts (Levin et al. 2002). However, following the success of polio eradication in the Americas, even in countries with weak health systems or those affected by conflict (Aylward et al. 2003), the PEI received renewed attention and many countries and international donors increased spending on health and dedicated more

resources to the campaign (Garrett 2007). In parts of Africa, for example, health spending went from less than 3% of the budget to 11-13% by the early 2000s (Garrett 2007). Coordination efforts between African countries also increased, and surveillance and response capacities were strengthened by integrating infectious disease surveillance programs in 1998 (Nsubuga et al. 2002). Nonetheless, the WHO did not reach its goal of eradicating polio world-wide by the year 2000, nor did they reach the new goal of a polio-free world by 2005. In light of these missed deadlines, analysis and critique of the PEI has become increasingly prevalent, as explained in the following section.

# 1.2 Analysis of the PEI

Analyzing the impact of the PEI is a complex process, with two opposing arguments at play. On the one hand, analysis by Bart et al. (1996) shows that from 2007 benefits from eradicating polio exceed the costs of eradication. With the number of polio cases worldwide having decreased from 400,000 in 1980 to just over 100,000 in 1993 (Lee n.d.), and to a mere 2000 in the year 2003 (Sangrujee et al. 2004), it is estimated that the PEI is responsible for preventing 855,000 deaths and 4 million cases of paralysis, as well as saving \$128 billion over the period 1970–2050 (Krym and McDonald 2004). By 2040 is it estimated that polio eradication efforts will result in an overall estimated savings of \$13 billion in terms of savings in direct costs for treatment and rehabilitation (Aylward et al. 2003).

The other side of the argument notes that cost per case eradicated is now increasing as four countries remain endemic and another dozen or so are experiencing frequent importations from other countries. In what is being seen as the "last push," even more international funding is pouring in to attempt to finally rid the world of this disease, and yet the number of polio cases is holding steady or in some places, like Nigeria, is even increasing from recent years when the number of cases reached all-time lows. Because increased financing is needed to eliminate the remaining cases, the cost per eradication increases. The

following section will examine how these high costs are justified by looking at the alleged benefit PEI confers on national health systems.

### **1.2.1 Development of National Health Systems?**

Some justify the high costs by pointing to the positive spillovers of the PEI onto national health systems. In the late 1980s the World Health Organization committed to pursuing polio eradication in a way which strengthened national health systems (Aylward et al. 2002), but the specific ways in which this would be done, and what part of the national health systems would be targeted, was never outlined. Furthermore, no ongoing evaluation of the impact of the PEI on national health systems was conducted.

Only in the late 1990s did researchers become interested in exploring the impact of the PEI on national health systems (Loevinsohn et al. 2002, Mogedal and Stenson 2000, World Health Organization 2000). Analysis has been extremely limited thus far; in 2000 the WHO pilot-tested a methodology for evaluating the impact of the PEI on national health systems (Mogedal and Stenson 2000), but to date has not published analyses of further countries using this methodology. In a 2003 study about global health, Aylward et al. note that more scientific evaluation of the impact of the PEI on national health systems "has been hampered by a lack of credible baseline data, the absence of control groups, and the concurrent implementation of major health-system reforms, such as decentralisation and sector-wide approaches" (p.911). One study on the impact of PEI on national health systems (Loevinsohn et al. 2002) further noted that "the available data are mostly qualitative and country specific, and the conclusions are not readily generalizable" (p.22). Of the dozen or so studies that look at the impact of the PEI on national health systems, the results are both extremely varied and overall inconclusive (Aylward et al. 2000, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002).

As such, to date mostly anecdotal recounts about the impact of the PEI on national health systems are available. Researchers and public health experts cite improved disease surveillance, better trained staff and management and strengthened physical infrastructure as positive spillovers from the PEI (Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Nsubuga et al. 2002). Despite these positive anecdotes, however, a study conducted by the World Health Organization (Mogedal and Stenson 2000) in Lao PDR, Nepal and Tanzania encountered "difficulty in detecting any unequivocal and significant impacts, whether positive or negative" (p.29).

In summary, this chapter has examined the history of the PEI, highlighting the WHA's initial effort to strengthen national health systems through the campaign with limited anecdotal evidence to confirm that national health systems have indeed been strengthened as a result of the PEI. The next chapter will attempt to draw more sound conclusions about the impact of the PEI on national health systems in six countries, and then use this data to determine the effect on overall public health.

# Chapter 2 – MEASURING THE IMPACT OF THE PEI ON NATIONAL HEALTH SYSTEMS

This chapter explains the research methodology used to measure the impact of the PEI on national health systems, highlighting country selection procedures as well as providing a brief background on each country. The chapter concludes by classifying each country in terms of the impact of the spillovers onto the national health system.

# 2.1 Research Methodology

In the following sections I will use existing country studies (which look at the impact of PEI on national health systems) to compare six countries. Two of these countries, Cambodia and Cote D'Ivoire, have exhibited positive spillovers from the PEI. Lao PDR and Nepal have exhibited mixed spillovers, and the remaining two countries, Benin and Niger, have shown no impact of the PEI on national health systems. The existing country studies measure the impact of the PEI on national health systems- personnel, infrastructure and services provided- but do not look to see how this impact influences overall public health.

# 2.2 Country Selection and Analysis: Impact of the PEI on National Health Systems

Evaluation studies of the PEI and its impact on national health systems are limited to fourteen countries; therefore, the selection of countries for this analysis was highly influenced by the amount of available literature, which covers the impact of the PEI on national health systems in fourteen countries. From these fourteen countries, countries with obvious factors that could lead to more or worsening health problems, such as overpopulation (e.g. India) and frequent natural disasters (e.g. Bangladesh), were eliminated. In addition, countries for which sufficient data was not available (e.g. Somalia, Afghanistan, Turkey, Democratic Republic of Congo, Philippines) were also eliminated. Countries which were found to not be comparable due to size (e.g. China) or extreme cultural differences (e.g. Morocco) were also eliminated. Countries in which major healthcare reforms were undertaken during the studied

years, which showed were shown to have an independent impact on the national health system and overall public health (e.g. Tanzania), were eliminated.

Although my initial inclination was to eliminate countries with the presence of conflict due to the potential significant impact of the violent conflict on health infrastructure and overall public health, existing literature indicates that even countries with conflict have the potential to benefit from the PEI by exhibiting positive spillovers. Based on these factors of elimination, Benin, Cambodia, Cote D'Ivoire, Lao PDR, Nepal and Niger remained. These remaining countries were analyzed for similarities which could allow for a most equal comparison. In this regard, a number of demographic, economic and health-related (both polio-specific and general) quantitative indicators were considered. Among others, population, population density and population below the poverty line, GDP/capita (PPP) and its growth rate, unemployment rate, various measurements of health expenditure, population with access to improved water source, life expectancy, maternal mortality rates, under 5 mortality rate and polio immunization costs and rates of vaccination were examined.

Data from many different sources was compiled and condensed for this analysis, and Benin, Cambodia, Cote D'Ivoire, Lao PDR, Nepal and Niger were found to be comparable in sufficiently many aspects (principally population, GDP/capita (PPP) and health expenditure)



References: Click and Learn n.d., Theodora Maps 2006. Maps used with permission.

that a sound analysis could be conducted. Figures 1 and 2 show the location of the analyzed countries in Africa and Asia, and Table 1 highlights their similarities

with regards to population,

#### Table 1: Quick Glance at Compared Countries

	Population in millions	Level of Human Development	GDP/capita (PPP)
	(2005)	(2004)	(2006 est.)
Benin	8.439	Low	\$1,100
Cambodia	14.071	Middle	\$2,600
Cote D'Ivoire	18.154	Low	\$1,600
Lao PDR	5.924	Middle	\$2,100
Nepal	27.133	Middle	\$1,500
Niger	13.957	Low	\$1,000

References: World Bank 2007, United Nations Development Programme 2006, CIA World Factbook 2007.

level of human development and GDP/capita (PPP).

The first part of the proceeding country analyses will provide a general overview profile of each country, highlighting in particular major political, economic and health developments which impact health systems. The second section of the analyses specifically examines the impact of the PEI on each country's national health system. As summarized in

Table 2: Summary of the Impact of the PEI onNational Health Systems

Country	Observed Impact
Benin	No change
Cambodia	Positive
Cote D'Ivoire	Positive
Lao PDR	Mostly positive, some negative
Nepal	Mostly positive, some neutral
Niger	No change

References: Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000.

Table 2, there is evidence from the

literature to support the notion that the

PEI has a positive impact on the national

health system (Cambodia and Cote

D'Ivoire), as well as evidence linking

the PEI to a neutral (Lao PDR and

Nepal) or negative (Benin and Niger)

impact on the national health system. The literature reviewed in this section reveals that the impact of the PEI on the national health system is partially dependent on the level of development of the health system, the management capacity of personnel, and the level of integration of the health infrastructure (Levin et al. 2002).

# 2.2.1 Benin

Benin is a country of 8.439 million people (World Bank 2007) located in Western Africa on the Gulf of Guinea. The country is classified as having a low level of human development, according to the Human Development Index (HDI) (United Nations Development Programme 2006), with an estimated 33% of the population living below the poverty line as of 2001 (CIA World Factbook 2007). In 2005 Benin had a higher than average population density of 75 persons per square kilometer<sup>1</sup> (United Nations Population Division 2006). The average GDP per capita in PPP was estimated to be \$1,100 in 2006, with a 4% annual GDP real growth rate (CIA World Factbook 2007).

Although Benin was plagued by political instability up until the early 1990s, and despite some recent political scandals involving fraudulent elections, the country has made significant political progress over the past decade and a half, and is currently considered a low political risk country (Encyclopedia of the Nations 2006, African Risk Insurance 2005). Economic policy reforms have also produced economic growth, another contributor to recent increased stability (African Risk Insurance 2005).

In the area of healthcare, Benin has recently made significant improvements, although the country is plagued by an HIV/AIDS epidemic. Benin has been positively impacted by the Bamako Initiative, a 1987 African-wide health reform initiative supported by the WHO and UNICEF, which introduced cost recovery (user fees for services<sup>2</sup>) and increases in routine immunization (WHO n.d.). For example, by 1998 death rates among infants and children under five were down by nearly 20%, immunization coverage was being sustained at around 80% of the population, and about 65% of women were using antenatal services (WHO n.d.).

<sup>&</sup>lt;sup>1</sup> The world average population density is 48 persons per square kilometer (United Nations Population Division 2006).

<sup>&</sup>lt;sup>2</sup> A cost recovery strategy replaces a government-funded health care system in which there are no out-of-pocket expense for users with a system of charging user fees doctor visits, prescription medicines and other services. User fees help control demand which in a "free" system may be artificially inflated (Arhin-Tenkorang 2000); consumers are less likely to abuse services when a cost is applied at the time of service, thus establishing a link between contribution and benefit (Bokros 2004).

During the period 1980-2004 under 5 mortality decreased from 214 to 152 deaths per 1,000 live births (WHO n.d.). However, life expectancy since 1980 has grown little, from 50 years in 1980 to 55 years in 2004 (Boston University 2007, The World Bank Group n.d., The World Bank Group 2001). Maternal mortality has decreased but remains high at 850 deaths per 100,000 live births as of 2000<sup>3</sup> (USAID-Benin n.d., The World Bank Group n.d.).

In 2003 the government reportedly spent 9.8% of total government expenditure on health, with health expenditure as a percentage of GDP at 4.4% (World Health Organization 2007). Health expenditure per capita from both private and public sources is \$9 per year as of 2003, the highest of the countries analyzed in this thesis, with 11.5% of total expenditure on health coming from external sources (World Health Organization 2007).

Recent health reforms as part of the government's National Health Policy and Strategy 2002-2006 include decentralization, improved planning and management, capacity building and an increased focus on dealing with major infectious diseases and other illnesses such as malaria (USAID-Benin n.d.). The government is also making an effort to involve private community partners and external donors in the overall health planning process, while specifically defining roles and responsibilities of each (USAID-Benin n.d.). USAID-Benin (n.d.) identifies weaknesses of the Ministry of Health infrastructures and personnel shortages at health facilities as the major challenges currently facing the health system.

Financing for health has varied in recent years; according to USAID-Benin and a SNIGS report from 1999 (n.d.), the percentage of Benin's national budget allocated to health has been up and down over the past several years, from 8.8% in 1987 to 3.2% in 1992, to 4.9% in 1996, 6.7% in 1998, and 5.1% in 1999. There is a high reliance on external donor funding; according to the SNIGS annual statistics report for 1999, donors supported 84% of

<sup>&</sup>lt;sup>3</sup> The world average maternal mortality ratio per 100,000 live births, as per modeled estimates in 2000, was 410 (The World Bank Group n.d.).

the health sector's overall budget, although due to government inefficiency only 30% of total external funding is spent (USAID-Benin n.d.).

A rapid appraisal of the PEI by UNICEF concluded that there was no relationship between the PEI and routine immunization coverage (Loevinsohn et al. 2002). Another UNICEF study concluded that potential for positive synergies had not been exploited, in that there was "insufficient use of community front line mobilisers, absence of integrated communication plans at all levels and low capacity building of staff in charge of communication activities in the whole health system" (2005). Because there was no detrimental impact of the PEI on routine immunization, but many missed opportunities for positive synergies between the PEI and the national health system, the PEI in Benin can be categorized as having no impact on the national health system.

# 2.2.2 Cambodia

Cambodia is a country of middle human development (United Nations Development Programme 2006) and is located in Southeast Asia. Cambodia has a population of 14.071 million people as of 2005 (World Bank 2007), with an estimated 40% living below the poverty line as of 2004 (CIA World Factbook 2007). Cambodia also has a higher than average population density at 78 persons per square kilometer (United Nations Population Division 2006). The estimated GDP per capita in PPP was \$2,600 in 2006 (CIA World Factbook 2007), with a real growth rate in 2006 of GDP of 5.8% (CIA World Factbook 2007).

Cambodia suffers from over thirty years of conflict (Walford 2000). The country was plagued by violence until 1991, and experienced political instability in the 1990s, including a coup in 1997. There are some fears of renewed instability. The past civil war has impacted demographics and had a significant, negative impact on the country's health system (Walford 2000). It is reported the country had only 50 doctors in 1979 (Walford 2000). Confidence in

available health services today is low; lack of staff training is a major problem, especially in rural areas (Walford 2000). The UK Department for International Development reports that the government's lack of strong management and planning in the area of health has resulted in a large number of specific projects such as disease eradication, funded primarily by external donors, with little integration into the national infrastructure (Walford 2000).

However, since the mid-1990s the government has been implementing health system reforms, in cooperation with international donors and partners, such as the World Bank, the Asian Development Bank, the UK Department for International Development, the World Health Organization and NORAD. The reforms include decentralization and devolution, new and improved physical infrastructure, increasing staff training and improving management and planning, as well as increasing government spending on health (Walford 2000). The Ministry of Health is also working towards improving performance and a broader sector approach to health sector support, including contracting out the provision of some services to the private sector and NGOs, although lack of a common strategic and financial framework hampers these efforts (Van Zant 2004, Walford 2000).

The government reportedly spent 11.8% of total government expenditure on health in 2003 (World Health Organization 2007). Health expenditure as a percentage of total GDP in 2003 was 10.9% (World Health Organization 2007). With the exception of government expenditure on health as a percentage of total government expenditure in Niger (12.4% in 2003), these figures are higher than in the other countries being examined. Health expenditure per capita is \$6 as of 2003, with 18.5% of total expenditure on health coming from external resources (World Health Organization 2007).

The UK Department for International Development reported in 2000 it was hard to judge the success of the reforms, given that available data is conflicting and the reforms are still playing out (Walford 2000). A report on the impact of health system reform on remote

health in Cambodia by Grundy (2001) noted that "recent health sector reforms have not as yet demonstrated tangible benefits for the health of remote populations" (p.1). However, maternal mortality rates were cut in half from 1990 to 2000 (Boston University 2007, Sprechmann et al. 1996, The World Bank Group n.d.), and while under 5 mortality fluctuated during the 1980s and 1990s, it is still down nearly 25% overall from 1980 (The World Bank Group n.d.). Life expectancy has also increased from 44 years in 1980 to 57 years as of 2004 (Boston University 2007, The World Bank Group n.d., The World Bank Group 2001).

Cambodia exhibits positive spillover effects of the PEI on national health system development (Melgaard et al. 1999). A 1999 study by Melgaard et al. found that the PEI planning process "provided a mechanism by which a recently revitalized Ministry of Health could demonstrate its capacity to conduct nationwide health initiatives while strengthening the weak lines of responsibility" (p. 2). In addition, the polio surveillance system was expanded to include other diseases as well and reached WHO standard status in 1996 (Melgaard et al. 1999, Partnerships for Health Reform n.d.), both significant improvements. Instead of conducting standard National Immunization Days (NIDs), Cambodia conducted twelve-day high-risk response immunization (HRRI) campaigns, in which more children were immunized and at a lower cost (Partnerships for Health Reform n.d.). In fact, the costeffectiveness of both polio-specific and routine immunization activities increased as a result of the disease surveillance system the PEI introduced (Partnerships for Health Reform n.d.). As such, the Partnerships for Health Reform project (n.d.) concluded that "countries that make strong efforts to improve their AFP surveillance will realize cost savings without lowering the effectiveness of their activities" (p.10).

# 2.2.3 Cote D'Ivoire

Although initially stable both politically and economically following independence from France in 1960, with whom the country retains close ties, this Western African country

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of 18.154 million people as of 2005 (World Bank 2007) has recently faced extreme political instability, reversing much progress (World Atlas n.d.). The effect of coups in 1999 and 2001, as well as a civil war since 2002, are reflected in demographics statistics. For example, life expectancy rates have decreased from 53 years in 1980 to 46 years in 2004 (Boston University 2007, The World Bank Group n.d., The World Bank Group 2001), while under 5 child mortality has increased from 172 in 1980 to 194 in 2004 (The World Bank Group 2007). The country's HDI ranking has also decreased, currently classified as low (United Nations Development Programme 2006) with 37% of the population living below the poverty line as of 1995 (CIA World Factbook 2007). Maternal mortality is the only measurement which has improved, from 810 deaths per 100,000 live births in 1990 to 690 in 2000 (Boston University 2007, The World Bank Group n.d.); both life expectancy and under 5 mortality rates have seen decreases (Boston University 2007, The World Bank Group n.d.); both life expectancy and under 5 mortality rates have seen decreases (Boston University 2007, The World Bank Group n.d.); both life as also GDP per capita in PPP, estimated at \$1,600 as of 2006), and a real growth rate of GDP of 1.2% (CIA World Factbook 2007).

The United States President's Plan for Emergency AIDS Relief (n.d.) notes the following about Cote D'Ivoire's public health system:

Cote D'Ivoire has a more developed public health... system in terms of human resources and infrastructure than many of its neighbors, but the overall health system is weak, and health and economic gains have been lost and reversed by the crisis. (p.5)

Government expenditure on health as a percentage of total government expenditure is the lowest of all countries examined in this thesis, registering at 5.0% in 2003 (World Health Organization 2007). Health expenditure as a percentage of GDP is also low (though slightly higher than Lao PDR's 3.2%) at 3.6% in 2003 (World Health Organization 2007). Health expenditure per capita, however, is \$8, with only 3.4% of total expenditure on health coming from external sources as of 2003 (World Health Organization 2007).

In addition to polio eradication rates suffering as a result of ongoing conflict, Cote D'Ivoire also suffers from polio importations from neighboring countries (Centers for Disease Control 2004). However, studies on the impact of the PEI on the development of the national health system in Cote D'Ivoire conclude that the spillovers from the PEI onto the national health system have been positive (Levin et al. 2002, Loevinsohn et al. 2002). A study by Levin et al. (2002) found that for the period 1996-1998, expenditures on the PEI, routine immunization, and the health sector overall increased. In some instances there was an increase in funding for routine immunization from both external sources and the government (Levin et al. 2002, Loevinsohn et al. 2002). The government also increased expenditure on the PEI by 22-27% (Levin et al. 2002, Loevinsohn et al. 2002). The PEI surveillance resources have also been used for other diseases, and the country has seen massive improvements in infrastructure, capacity building and provision of personnel (Levin et al. 2002).

# 2.2.4 Lao PDR

The Lao People's Democratic Republic is a communist nation located in Asia, which is recovering from years of conflict and a de-habilitating refugee situation which ended in 2001 (U.S. Department of State 2006). The country has a population of 5.924 million people as of 2005 (World Bank 2007) and boasts a middle level of human development (United Nations Development Programme 2006). Population density is below average at 25 persons per square kilometer (United Nations Population Division 2006). Despite the conflict, Lao PDR has seen increases in life expectancy, from 45 years in 1980 to 55 years in 2004 (Boston University 2007, The World Bank Group n.d., The World Bank Group 2001).

In the 1990s, Lao PDR experienced rapid economic growth (Mogedal and Stenson 2000). In 2006 Lao PDR had a GDP per capita in PPP of \$2,100 and a real growth rate of GDP of 7.2% (CIA World Factbook 2007).

Until the mid-1980s, healthcare was linked to the cooperative farming system in Lao PDR (Lytleton 2004). After the breakdown of this system and introduction of the New Economic Mechanism (NEM), decentralization of health services was introduced in 1987 (Lytleton 2004, Phommasack et al. 2005). However, decentralization was later replaced by recentralization when decentralization-related management and financial problems emerged (Phommasack et al. 2005). Although reforms are hampered by organizational dysfunction, especially poor planning and unprofessionalism (Lytleton 2004), long-term health reforms aimed at reducing the infant mortality rate, under-five mortality rate, maternal mortality rate and malnutrition have begun to take effect. Significant improvements have already been made in some areas, such as decreasing under 5 mortality by more than 50% over the past twenty-four years, from 200 in 1980 to 83 in 2004 (WHO n.d.). Maternal mortality has also decreased from approximately 650 deaths per 100,000 live births in 1990 to 405 in 2005 (Boston University 2007, National Statistics Centre of the Lao PDR 2005, The World Bank Group n.d., The World Bank Group 2001). Some challenges include staffing shortages and a lack of training of existing staff (Phommasack et al. 2005).

The 1990s saw an increase in foreign funding for health projects (Lytleton 2004). Indeed, as of 2003, 30% of total expenditure on health came from external sources (World Health Organization 2007). Lao PDR is plagued by funding shortages in general, for which reliance on foreign financing (45% in 1995-1996, 25% in 1996-1997 and 68% in 1997-1998) is necessary (Mogedal and Stenson 2000). As of 2003 government expenditure on health as a percentage of total government expenditure was 6.2%, with health expenditure as a percentage of GDP listed at 3.2% (World Health Organization 2007).

A report by the World Health Organization on the impact of disease eradication on health systems found that the "positive broad health system impacts stand out in the Lao PDR where PE has established a basis for services that did not exist before" (Mogedal and Stenson

2000 p.ix). Indeed, Mogedal and Stenson (2000) report that the PEI strategy was intentionally crafted as a way to "spearhead re-establishment of a functioning immunization service and basic care approach in Lao PDR, where there were only rudimentary services available" (p.13). Mogedal and Stenson (2000) report that the PEI has helped promote better health service delivery strategies, although Loevinsohn et al. (2002) note that some missed opportunities regarding carrying over positive PEI management practices into the regular health sector existed. Nonetheless, the PEI is responsible for improvements in programs and services related to the PEI (Mogedal and Stenson 2000), such as capacity building and provision of personnel, increased and broadened training for this personnel (Mogedal and Stenson 2000). The PEI is also noted to have resulted in an influx of public health resources (Loevinsohn et al. 2002, Mogedal and Stenson 2000).

A WHO-commissioned study found that no financial trade-off between the PEI and routine immunization or other health services existed (Loevinsohn et al. 2002). In addition, increases in routine immunization coverage post-PEI were also observed (Loevinsohn et al. 2002). Improvements in the cold chain (temperature-controlled supply chain for vaccinations) as a result of the PEI were especially important in this regard (Mogedal and Stenson 2000). It was found that the PEI surveillance resources were used for other diseases, and that other physical health infrastructure improvements also occurred (Loevinsohn et al. 2002, Mogedal and Stenson 2000).

Other important positive spillovers include a positive policy context and increased political cooperation while reducing bureaucracy (Mogedal and Stenson 2000). In addition, the PEI helped induce the development of disease prevention strategies and promoted general positive organization capacity, as well as interagency coordination (Loevinsohn et al. 2002, Mogedal and Stenson 2000). During the PEI Lao PDR also showed increased societal

mobilization (Mogedal and Stenson 2002) and effective use of external funds (Mogedal and Stenson 2002).

There is no conclusive evidence regarding service delivery, since only minor, not serious, disruptions were noted (Mogedal and Stenson 2000).

2.2.5 Nepal

The Asian nation of Nepal made a major transformation in 1991 when the country transitioned from an absolute monarchy to a democracy (Pearson 1999), although some recent political instability has hampered democratic progress and overall stability (U.S. Department of State 2007a). Nepal is classified as having a middle level of human development (United Nations Development Programme 2006) and has a population of 27.133 million people as of 2005 (World Bank 2007). Population density and unemployment are both high, at 184 persons per square kilometer and 42% as of 2004, respectively (CIA World Factbook 2007, United Nations Population Division 2006). As of 2006, GDP per capita in PPP was \$1,500 with a real growth rate of 5% (CIA World Factbook 2007).

In 1991, a new health policy was introduced and set goals for reducing mortality and fertility (Pant 1996, Pearson 1999). A long-term health plan for 1997-2017 focuses on integrating health systems (Pearson 1999). Although much of the country's old health infrastructure needs to be replaced, investment in the 1990s in health infrastructure, as well as increased investment in new equipment as a result of the PEI, has resulted in improvements (Pearson 1999). However, the PEI has led to higher depreciation rates as well due to increased usage of the systems, with maintenance on existing equipment a major problem (Mogedal and Stenson 2000). Mogedal and Stenson (2000) report that health reforms and reorganizations of routine immunization work have had a greater impact on improved immunization coverage rates than the PEI.

Pearson (1999) reports that the health system is still highly centralized, despite talks of decentralization. A major focus on reforms is to improve health services in rural areas by strengthening the primary healthcare system (Mogedal and Stenson 2000, Pearson 1999). In recent years a high number of new public health workers have been trained and deployed, although high turnover and lack of continuity in senior posts in public administration continues to be a problem (Mogedal and Stenson 2000).

The government reportedly spends 7.9% of total expenditure on health, and health expenditure as a percentage of GDP is 5.3% (World Health Organization 2007). Only 9.9% of total expenditure on health comes from external resources (World Health Organization 2007). Health expenditure per capita is the lowest of the countries being examined, at a mere \$3 as of 2003 (World Health Organization 2007). Life expectancy has grown from 48 years in 1980 to 62 in 2004 (Boston University 2007, The World Bank Group n.d., The World Bank Group 2001), while significant progress has also been made in reducing under 5 mortality from 195 in 1980 to 76 in 2004 (The World Bank Group n.d.). Maternal mortality rates also saw similar decreases of more than 50% over the period 1990 to 2000 (Boston University 2007, West Jr. et al. 1999, The World Bank Group n.d.), largely due to vitamin A supplementations distributed as part of the PEI (West Jr. et al. 1999).

Loevinsohn et al. (2002) report that two different studies showed some positive spillovers from the PEI to health systems in Nepal; Mogedal and Stenson (2000) also find mostly positive spillover effects, although negative effects and many missed opportunities also exist (Levin et al. 2002, Mogedal and Stenson 2000).

While some studies found that staff were diverted from their regular duties to work on the PEI, and that some activities (such as sterilization camps) were "somewhat hampered," and there was possibly a weakening of TB therapy activities, there were found to be no negative impacts on maternal and child health data as a consequence (Loevinsohn et al. 2002

p.21). There was also no financial trade-off between the PEI and routine immunization and other health programs (Loevinsohn et al. 2002).

In Nepal, highly positive spillovers from the PEI onto the national health system exist in the areas of financial allocation and management (Loevinsohn et al. 2002, Mogedal and Stenson 2000). PEI planning and management strengthened and had a clear positive impact on overall organizational capacity for other health programs as well (Mogedal and Stenson 2000). In addition, the study determined the PEI was responsible for strengthening teamwork and improving the training capacity of public health workers (Mogedal and Stenson 2000).

One study by the All India Institute of Medical Sciences (AIIMS) found that the PEI improved primary health care services (Loevinsohn et al. 2002). Routine immunization coverage during the PEI was found to be acceptable (Mogedal and Stenson 2000), and increases in routine immunization coverage post-PEI can be seen (Loevinsohn et al. 2002), although Mogedal and Stenson (2000) find the levels of routine immunization to be less than satisfactory. No conclusive evidence exists regarding general service delivery (Mogedal and Stenson 2000). Nepal's cold chain was improved as a result of the PEI, although the reorganization of the Ministry of Health caused some disruptions (Mogedal and Stenson 2000). Technical assistance for the surveillance of other diseases has also improved, although there are many missed opportunities regarding using PEI surveillance systems for other diseases (Mogedal and Stenson 2000)

While many positive spillovers have been noted, in the case of Nepal there were also many missed opportunities, particularly regarding the possibility for additional vitamin A supplementation, and the use of managerial skills, such as supervision, for other programs (Levin et al. 2002, Loevinsohn et al. 2002, Mogedeal and Stenson 2000, West Jr. et al. 1999). Although the PEI was able to overcome political divisions, the new linkages and partnerships formed as a result of the PEI between government and NGOs, as well as increased

coordination between all parties and heightened societal mobilization, have not been exploited for other diseases as of yet (Mogedal and Stenson 2000). This could be due to the fact that the PEI was conducted independent of regular immunization programs (Loevinsohn et al. 2002), with no special efforts made to exploit any positive synergies (Mogedal and Stenson 2000). Better planning would have lessened the delays and disruptions produced by the PEI, in the area of training as an example (Mogedal and Stenson 2000).

# 2.2.6 Niger

Niger is a West African country of 13.957 million people (World Bank 2007) and low human development (United Nations Development Programme 2006), with 63% of the population estimated to live below the poverty line as of the most recent estimates in 1993 (CIA World Factbook 2007). During the 1990s Niger suffered from severe political instability; the country's transition to democracy, which started in 1999 with the re-writing of the constitution, continues today (U.S. Department of State 2007). Economically, Niger is said to be among the world's poorest countries, and thus relies heavily on foreign financial assistance (U.S. Department of State 2007). GDP per capita in PPP is the lowest of the group of countries being examined in this thesis, at \$1,000 as of 2006 (CIA World Factbook 2007). Real growth rate of GDP is also low at 3.5% annually as of 2006 (CIA World Factbook 2007).

Health-wise, Niger's biggest challenges are poor quality services and limited access to health services: according to the WHO, more than 50% of the population does not have access to primary health care (2005a). While the country suffers from both a high fertility rate of 7.8% (U.S. Department of State 2007), Niger is also plagued by one of highest infant mortality rates in the world, at 123 deaths per 1,000 live births (Save the Children 2005), as well as a high under 5 mortality rate of 259 deaths per 1,000 live births as of 2004 (World Health Organization 2006). Maternal mortality is also extremely high at approximately 1,600

deaths per 100,000 live births in 2000 (World Health Organization 2006), a significant increase from only ten years earlier (Boston University 2007, The World Bank Group n.d., The World Bank Group 2001). Life expectancy in Niger has grown only slightly in recent years, from 39 years in 1980 to 45 years in 2004 (Boston University 2007, The World Bank Group n.d., The World Bank Group 2001). In 2005 a food shortage threatened nearly one million children under 5, with the WHO noting that under such conditions risk of disease is increased (WHO 2005). Niger also suffers from polio importations from Nigeria, and also transmits polio to its neighbors (Barger and Fol 2006, Centers for Disease Control and Prevention 2004).

Despite these challenges, or perhaps as a result of them, Niger spends the highest percentage of total government expenditure on health (12.4% in 2003, World Health Organization 2007) of the countries being examined. Health expenditure as a percentage of GDP is much lower at 4.7% (2003), and nearly one third (32.8% in 2003) of resources for health come from abroad (World Health Organization 2007). Total health expenditure per capita was \$5 in 2003 (World Health Organization 2007).

A rapid appraisal by UNICEF of PEI activities concluded that the poor performance of routine services did not improve as a result of the PEI (Loevinsohn et al. 2002). For the purpose of this analysis, therefore, Niger will be included with Benin as countries in which the PEI has no spillover (positive or negative) onto the national health systems. However, it should be noted that a recent international project integrating malaria control (began in late 2005) and the PEI in Niger is being called successful at this stage, although because this program is so recent, it is impossible at this point in time to determine the long-term impact of the PEI on the national health system. The data being used in this thesis to measure the impact of the PEI on national health systems and overall public health is from 2004 and before, thus the impact of this 2005 program would not show up in the data. The

sustainability of positive spillovers from this program is addressed in the policy recommendations section of this thesis.

### 2.3 Wide Spectrum of Impacts

The above analysis of the impact of the PEI on national health systems in six countries reveals a wide spectrum of impacts. While Cambodia and Cote D'Ivoire exhibited positive spillovers from the PEI on the development of their national health systems (Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999), results were mixed in Lao PDR and Nepal (Levin et al. 2002, Loevinsohn et al. 2002, Mogedal and Stenson 2000). Benin and Niger showed no change (Loevinsohn et al. 2002).

This section concludes that positive synergies from the PEI can result even in the midst of conflict, polio importations from neighboring countries and other major challenges. Positive synergies exist because of direct and purposeful planning (Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, Partnerships for Health n.d.). Positive spillovers from the PEI included increased funding for both polio and other diseases, the use of the polio surveillance systems for other diseases, joint immunization campaigns encompassing both polio and other diseases, increased cost-effectiveness, infrastructure improvements, capacity building, improved staffing, better health service delivery (Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, Partnerships for Health n.d.). The literature overwhelmingly concludes that with proper planning, most negative spillovers can be minimized (Aylward et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002).

The next chapter will attempt to determine if there is any relationship between the level of impact of the PEI on national health systems, outlined above, and overall public health.

# Chapter 3 – RELATIONSHIP BETWEEN THE PEI AND OVERALL PUBLIC HEALTH

This section builds on the analysis from the previous chapter and examines changes in overall public health in the countries in this study. The premise of this analysis is that if the PEI has had a significant effect on the national health system, these improvements should be accompanied by improvements in overall public health as well.

# 3.1 Disease Eradication as a Public Health Strategy?

There has been a recent trend in the literature to cite disease eradication programs like the PEI as public health strategies in and of themselves (Aylward et al. 2000, Centers for Disease Control and Prevention 1997, Centers for Disease Control and Prevention 1999, Garrett 2007, Melgaard et al. 1999, Olive et al. 1997). This trend is highly problematic given the inconclusive evidence supporting the link between the PEI and strengthening of national health systems, and the previously inexistent research on whether overall public health improves as a result of such disease eradication programs.<sup>4</sup>

This is a first attempt to jointly analyze the PEI, national health systems and overall public health. This analysis will look at changes in life expectancy, under 5 mortality rates and maternal mortality rates in the six countries studied, to detect any health trends that could be partially attributable to the PEI.<sup>5</sup> Additionally, other quantifiable factors which could impact the existence of positive spillovers and the quality of overall public health will be analyzed, including polio immunization rate and total confirmed cases, level of development according to the HDI, GDP/capita (PPP), access to an improved water source, percentage of

<sup>&</sup>lt;sup>4</sup> The current research looks only at the vitamin A supplementation aspect of the PEI, noting that vitamin A supplements delivered with the polio vaccinations have led to reducing mortality from all causes by 23% (Goodman et al. 2000, p.307), averting an estimated 400,000 childhood deaths in 1998-1999 alone (Aylward et al. 2003). Loevinsohn et al. (2002) note that "one analysis showed that 40 countries had used national immunization days to deliver vitamin A to more than 60 million children. Because these countries represented 34% of the 118 countries where vitamin A deficiency is a public health problem, and given the impact of supplementation (a 23% reduction in overall mortality among children aged 6 to 59 months), this constituted a significant contribution of polio eradication to child survival" (p.22).

<sup>&</sup>lt;sup>5</sup> Some scholars warn that it will take at least a full generation to see improvements in overall public health (Garrett 2007); this analysis includes data from twenty-five years in an attempt to satisfy this requirement. It is recognized that this thesis would be enhanced by incorporating GDP/capita (PPP) and Human Development Index data from the period 1980-2004; due to unavailability of data, this information is excluded.

population living below the poverty line, government expenditure on health as a percentage of total government expenditure and external resources for health as a percentage of total expenditure on health.<sup>6</sup>

At this point is it appropriate to note that even taking into consideration other quantifiable factors which could impact the existence of positive spillovers and the quality of overall public health, it is recognized that this paper offers only a limited view of the relationship between the PEI and overall public health. Via the country selection process and the country analyses section, I have attempted to highlight the similarities between the six countries being compared, and from this common basis make my analysis. However, data availability also constrained this analysis, and as such, this paper cannot extensively cover all individual factors which may impact public health, nor can this paper use regression analysis to identify trends. However, this paper does attempt to use the available data to point out trends which *could* be at least *partially* attributable to the PEI.

# **3.1.1 Public Health Indicators**

To better identify the relationship between the PEI and overall public health, I will compare quantifiable public health statistics such as maternal mortality rate, under 5 child mortality rate and life expectancy. I chose these three indicators because they provide an insight into the quality of overall public health. Garrett (2007) argues the following:

Instead of setting a hodgepodge of targets aimed at fighting single diseases, the world health community should focus on achieving two basic goals: increased maternal survival and increased overall life expectancy. Why? Because if these two markers rise, it means a population's other health problems are also improving. And if these two markers do not rise, improvements in disease-specific areas will ultimately mean little for a population's general health and well-being. (p.7)

<sup>&</sup>lt;sup>6</sup> As per the World Health Organization (2007), health expenditure as a percentage of GDP includes both private and public funding for health, whereas total government expenditure on health as a percentage of GDP is limited to public funding only. External resources for health as a percentage of total expenditure for health would include external funding that went to both public and private health projects.

Life expectancy data measures the average number of years a person is expected to live at their time of birth (WHO 2000b). It is a good measure of not only the overall health of a nation's people (Fang 2007, The World Bank Group 2001), but also what Garrett (2007) calls "essential public health services" (p.7). Because life expectancy figures are sensitive to reductions in death rates of children (Wattenberg 2000), changes in the availability and quality of care, which particularly impact child survival, should roughly correspond with life expectancy figures (Garrett 2007).

With specific regards to child survival, I have included the under 5 child mortality rate in this analysis. Under five child mortality is the probability of dying between birth and exactly five years of age per 1,000 live births (considering the current age-specific mortality rates), and is generally derived from vital registration systems, censuses and household surveys (UNICEF 2001, The World Bank Group 2004). This measurement is used by the WHO and others as prime indicators of overall development because it is particularly sensitive to overall welfare (Younger 2001). A study by Perry et al. (2006) notes that a "well-developed system of primary health care... can make a strong contribution to reducing infant and child mortality in severely impoverished settings" (p.217). Additionally, Perry et al. (2006) cite increasing population coverage of immunizations as a key factor in reducing under 5 mortality.

Maternal mortality<sup>7</sup> is another measure which reflects the quality of infrastructure, staff training and national health systems (The World Bank Group 2004a). Maternal mortality data measures the number of women who die during childbirth, per every 100,000 live births (The World Bank Group 2004a). In addition to measuring the quality of health services available to mothers in childbirth, UNICEF (2006) also reports that "the foundations

<sup>&</sup>lt;sup>7</sup> While figures on life expectancy and under 5 child mortality are widespread and easily accessible, the maternal mortality data used in this study is only available for a limited number of years. The WHO noted in 2000(a) that "because measuring maternal mortality is difficult and complex, reliable estimates of the dimensions of the problem are not generally available and assessing progress towards the goal is difficult" (p.1).

for maternal risk are often laid in girlhood," indicating that improvements in this maternal mortality rates would also reflect improvements in health services during childhood and adolescence.

An analysis of life expectancy, under 5 mortality and maternal mortality rate changes during the PEI shows that the countries with the so-called positive spillovers do not necessarily exhibit the largest or greatest changes in these indicators, as seen in Table 3.

Table 3: Summary of the Relationship Between the PEI and Overall Public Health: Health Indicators

	Observed Impact of the PEI on National Health System	Change in Life Expectancy (1980-2004)	Change in Maternal Mortality Rate (1992-	Change in Under 5 Mortality Rate (1980-2004)	Overall Change in Public Health Indicators
Benin	No change	+10.0%	-14.1%	-29.0%	Positive
Cambodia	Positive	+29.5%	Approx50%	-25.8%	Positive to
					highly positive
Cote D'Ivoire	Positive	-13.2%	-14.8%	+12.8%	Mixed
Lao PDR	Mixed	+22.2%	-37.7%	-58.5%	Highly positive
Nepal	Mixed	+29.2%	-50.7%	-61.0%	Highly positive
Niger	No change	+15.4%	+33.3%	-19.1%	Mixed

Note: some changes in maternal mortality rates are calculated using end year 2000, others using end year 2005, based on availability of data. The change in the maternal mortality rate in Cambodia is noted as an approximation due to a discrepancy in data, and as such, the overall change in public health indicators is noted as positive to highly positive. References: Aylward et al. 2000, Boston University 2007, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al.

References: Aylward et al. 2000, Boston University 2007, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, USAID-Benin n.d., WHO n.d., The World Bank Group n.d., The World Bank Group 2001.

Outliers are shown in bold italics for easier viewing. For example, with regards to life expectancy data over the period 1980-2004, Cambodia, where positive synergies were observed, and Lao PDR and Nepal, where mixed synergies (both positive and negative) were observed, showed the greatest increases in life expectancy in terms of percentage (increases of 29.5%, 22.2% and 29.2%, respectively). These countries also exhibited the biggest real GDP growth rates (to be discussed further below). However, in Cote D'Ivoire, although researchers have indicated that positive synergies exist from the PEI onto national health systems (Levin et al. 2002, Loevinsohn et al. 2002), the data shows that life expectancy initially increased between 1980 and 1985, but has been falling since. This trend could be

partially attributable to the negative impact of political unrest and civil war on living conditions and life expectancy (especially in recent years), although the presence of conflict in all countries studied should mitigate this effect.

In terms of under 5 mortality, five of the six countries studied have experienced decreases in the under 5 mortality rate (the exception again being Cote D'Ivoire). The largest decreases in under 5 mortality are observed in Nepal and Lao PDR, where the PEI has had mostly positive/some neutral and positive/negative impacts on the national health systems, and not in Cambodia and Cote D'Ivoire, the countries experiencing positive spillovers from the PEI onto national health systems, as might be expected.<sup>8</sup>

With regards to maternal mortality, the data loosely corresponds to the pattern seen before: the largest decreases in maternal mortality rates are in Cambodia and Nepal, where we saw positive and mostly positive/some neutral impacts of the PEI on national health system development, respectively. Lao PDR, where the PEI had both positive and negative impacts on the national health system, also shows a significant decrease in maternal mortality. Cote D'Ivoire (positive) and Benin (no change) experienced similar drops of 14.8 and 14.1% in maternal mortality. Niger is the only country to exhibit an increase in maternal mortality. However, it should be noted that this analysis of maternal mortality is partly constrained by the fact that percent changes were calculated using varied end years (2000-2005), based on availability of data, and the change in the maternal mortality rate in Cambodia could only be noted as an approximation due to a discrepancy in data.

The overall change in public health indicators is summarized in the right-most column of Table 3. Countries that exhibited one or more counter-trends (e.g. a decrease in life expectancy) are identified as experiencing mixed health results. Lao PDR and Nepal exhibited the largest changes in the three indicators, and thus are tagged as countries in which

<sup>&</sup>lt;sup>8</sup> Similar to the reasons for a decreasing life expectancy in Cote D'Ivoire, an increasing under 5 mortality rate is a result of both the ongoing conflict as well as a malaria crisis. According to UNICEF (2007), malaria is the number one cause of death in children under the age of five.

the relationship between the PEI and public health is highly positive. Benin and Cambodia show a positive or positive to highly positive relationship between the PEI and overall public health because the increase in life expectancy and decreases in under 5 mortality and maternal mortality rates were significant, although not as high as in Lao PDR and Nepal.

## **3.1.2 Development Indicators**

These three health indicators show that in some cases, but not all, the supposedly positive spillovers from the PEI onto national health systems translate into corresponding changes in overall public health. As such, it is necessary to examine other data that could help explain the relationship between the PEI, national health systems and overall public health. Improvements in health have been tied to measurable development indicators such as food, water and sanitation, described by Mamdani (2006) as "material conditions for good health"

4 looks at Observed Impact of Level of Human Access to an the PEI on National Development Improved Water Health System (2004)Source (2004) the impact Benin No change Low 67% Cambodia Positive Middle 41% the level of Cote D'Ivoire Positive Low 84% Lao PDR Mixed Middle 51% human Nepal Mixed Middle 90% Niger No change Low 46%

to an Improved Water Source

developmen

(p.2). Table

t has on the References: Aylward et al. 2000, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, Nsubuga et al. 2002, United Nations Development Programme 2006, The World Bank Group n.d.

Table 4: Relationship Between Spillovers, Level of Human Development and Access

existence of

spillovers. With the exception of Cote D'Ivoire, Table 4 shows that countries classified as having a middle level of human development experienced positive or mixed spillovers, while low development countries saw no change in health systems as a result of the PEI. This suggests that the potential for positive spillovers might be constrained by the level of development of a country. However, measurements which contribute to the level of human development, such as access to an improved water source, are again problematic, as countries which recorded positive spillovers fall on both ends of the spectrum as far as access to an improved water source (for example, Cambodia 41% and Cote D'Ivoire 84%, both in 2004). Although development appears to be important factor which influences the possibility for positive spillovers, it is impossible to confirm the role hygiene might play in this process, since figures about access to an improved water source do not correspond with either level of human development or the observed impact of the PEI on national health systems.

#### 3.1.3 Economic Indicators

Since an analysis of health and development indicators has not overwhelmingly explained the relationship between the PEI, its impact on national health systems and its relationship to overall public health, it is necessary to analyze other possible factors which could define and explain this relationship. Mamdani (2006) notes that there is a clear relationship between economic and health indicators. As such, examining the economic measurements available for these six countries is perhaps more useful in helping to understand the relationship between the PEI, national health systems and overall public health. This relationship is outlined in Table 5.

	Observed Impact of the PEI on National Health System	GDP/Capita (PPP) (2006 est.)	GDP Real Growth Rate (2006 est.)	Government Expenditure on Health as a Percentage of Total Government Expenditure (2003)	Health Expenditure as a Percentage of GDP (2003)
Benin	No change	\$1,000	4.0%	9.8%	4.4%
Cambodia	Positive	\$2,600	5.8%	11.8%	10.9%
Cote D'Ivoire	Positive	\$1,600	1.2%	5.0%	3.6%
Lao PDR	Mixed \$2,100	\$2,100	7.2%	6.2%	3.2%
Nepal	Mixed	\$1,500	5.0%	7.9%	5.3%
Niger	No change	\$1,000	3.5%	12.4%	4.7%

**Table 5: Relationship Between Spillovers and Economic Indicators** 

Note: Due to availability of data, GDP/capita (PPP) and GDP Real Growth Rate data are both from 2006, while Government Expenditure on Health as a Percentage of Total Government Expenditure and Health Expenditure as a Percentage of GDP are measured as of 2003. It is recognized that the use of different baseline years may limit this analysis.

References: Aylward et al. 2000, CIA World Factbook 2007, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, Nsubuga et al. 2002, World Health Organization 2007.

For example, countries with the lowest GDP per capita (Benin and Niger) experienced no change in health systems. With the exception of Cote D'Ivoire, my analysis showed that countries exhibiting positive or mixed spillovers had a GDP of greater than or equal to \$1,500. These same countries experienced the largest changes in life expectancy and maternal mortality. Again with the exception of Cote D'Ivoire, countries with a GDP real growth rate of at least 5.0% exhibited positive and mixed spillovers from the PEI onto their national health systems.

Looking at government expenditure on health as a percentage of total government expenditure is problematic, since countries experiencing positive spillovers spend both the second highest and the very lowest on health as a percentage of total government expenditure. However, there seems to be a relationship between government expenditure on health as a percentage of total government expenditure and health expenditure as a percentage of GDP. In both Cambodia and Cote D'Ivoire, where positive spillovers from the PEI onto national health systems were recorded, the difference between government expenditure on health as a percentage of total government expenditure and health expenditure as a percentage of GDP is the smallest. In Cambodia, the government spent 11.8% on health as a percentage of total government expenditure and health expenditure as a percentage of GDP was 10.9%, a difference of 0.9%. In Cote D'Ivoire, the government spent 5.0% on health as a percentage of total government expenditure and health expenditure as a percentage of GDP was 3.6, a difference of 1.4%. In the four other countries, the difference between government expenditure on health as a percentage of total government expenditure and health expenditure as a percentage of GDP ranged from 2.6% to 7.7%. Countries experiencing "no change" with regard to spillovers recorded the highest and third highest government expenditure on health as percentage of total government expenditure, suggesting

that it is not so much the quantity of funding but rather other factors which influence what impact disease eradication funding has on national health systems.

Another example is found examining external resources for health as a percentage of total expenditure on health. Again, these examples suggest the amount of external assistance

is far less important

than previously

thought. Table 6 suggests that perhaps it is hard to integrate funding from external sources into the existing health infrastructure, which could explain why a

# Table 6: The Relationship between Spillovers, External Funding and Health Expenditure as a Percentage of GDP

	Observed Impact of the PEI on National Health System	External Resources for Health as a Percentage of Total Expenditure on Health (2003)	Health Expenditure as a Percentage of GDP (2003)
Benin	No change	11.5%	4.4%
Cambodia	Positive	18.5%	10.9%
Cote D'Ivoire	Positive	3.4%	3.6%
Lao PDR	Mixed	30.0%	3.2%
Nepal	Mixed	9.9%	5.3%
Niger	No change	32.8%	4.7%

References: Aylward et al. 2000, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, Nsubuga et al. 2002, World Health Organization 2007.

country like Niger with the highest level of external resources of the six countries studied experienced no spillovers from the PEI onto its national health system, which Cote D'Ivoire recorded the lowest level of external resources for health (part of which would fund the PEI) as a percentage of total expenditure on health and yet experienced positive spillovers.

# **3.1.4 Polio Immunization and Incidence Rates**

In a study about the relationship between the PEI and overall public health, it is necessary to also examine the relationship between spillovers and polio immunization and incidence rates. For example, the number of confirmed polio cases does not appear to be directly related to polio immunization rates, nor do these measurements directly correspond to the existence of positive spillovers, as seen in Table 7. In a country like Cambodia where positive spillovers have been observed, in 2004 zero confirmed polio cases were reported and

the country achieved a polio immunization rate of 86%. On the other end of the spectrum,

Observed Impact

of the PEI on

National Health

System

No change

Positive

Positive

Mixed

Benin

Cambodia

Cote D'Ivoire

Lao PDR

Benin, where

no change was seen as a result

of the PEI,

there were six

confirmed

polio cases in

2004 and yet

they achieved

Table 7: Relationship Between Spillovers and Polio Immunization and Incidence Rates

**Polio** Immunization

Rates

(2004)

89%

86%

50%

46%

80%

Number of

Confirmed Polio

Cases (2004)

6

0

17

1

0

Nepal Mixed 25 Niger No change 62% Note: Cote D'Ivoire and Niger reported the greatest number of confirmed polio cases in 2004; both countries suffer from importations from neighboring countries (Barger and fol 2006, Centers for Disease Control and Prevention 2004). References: Aylward et al. 2000, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, Nsubuga et al. 2002, The World Bank Group n.d., World Health Organization 2006a.

an immunization rate of 89%. In Nepal, a country with mixed spillovers, an immunization rate of 80% corresponded to zero confirmed cases of polio in 2004, whereas in Lao PDR, also with mixed spillovers, one confirmed case was found and yet immunization was only at 46% (The World Bank Group n.d., World Health Organization 2006a). As such, the relationship between polio immunization rates and the existence of spillovers is impossible to define. With the exception of Cote D'Ivoire, the relationship between number of confirmed cases and existence of spillovers is much stronger, with countries exhibiting positive and mixed spillovers reporting zero or one confirmed case(s) of polio in 2004.

# 3.2 The Relationship Between the PEI and Overall Public Health

This analysis has revealed some encouraging trends with regards to the relationship between the PEI and overall public health. Health indicators showed that, with the exception of Cote D'Ivoire, countries in which positive and mixed spillovers from the PEI onto national health systems were reported generally exhibited the largest percentage improvements in life expectancy, under five mortality and maternal mortality rates (summarized as a "highly positive" observed change in health indicators). Again with the exception of Cote D'Ivoire,

countries classified as having a middle level of human development experienced positive or mixed spillovers, suggesting that a certain level of development is needed to create the possibility for positive spillovers. These trends are highlighted in Table 8.

	Observed Impact of the PEI on National Health System	Observed Change in Public Health Indicators	Level of Human Development (2004)	GDP/Capita (PPP) (2006 est.)	GDP Real Growth Rate (2006 est.)
Benin	No change	Positive	Low	\$1,000	4.0%
Cambodia	Positive	Positive to	Middle	\$2,600	5.8%
		highly positive			
Cote D'Ivoire	Positive	Highly mixed	Low	\$1,600	1.2%
Lao PDR	Mixed	Highly	Middle	\$2,100	7.2%
		positive			
Nepal	Mixed	Highly	Middle	\$1,500	5.0%
		positive			
Niger	No change	Mixed	Low	\$1,000	3.5%

 Table 8: Relationship Between the PEI and Overall Public Health

Note: "Highly positive" change in public health indicators refers to a significant increase in life expectancy and significant decreases in both under 5 and maternal mortality rates. A "positive" change in public health indicators refers to increased in life expectancy and decreases in both under 5 and maternal mortality rates. An observed change in public health indicators of "mixed" refers to an increase in life expectancy, a decrease in under 5 mortality and a significant increase in maternal mortality rates. A "highly mixed" change in public health indicators refers to a decrease in maternal mortality rates. A "highly mixed" change in public health indicators refers to a decrease in maternal mortality rates.

Note: Due to availability of data, Level of Human Development is measured as of 2004, while GDP/Capita (PPP) and GDP Real Growth Rate figures are from 2006. It is recognized that the use of different baseline years may limit this analysis.

References: Aylward et al. 2000, Boston University 2007, CIA World Factbook 2007, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal et al. 2000, Nsubuga et al. 2002, USAID-Benin n.d., WHO n.d., The World Bank Group n.d., The World Bank Group 2001, World Health Organization 2007.

Economic indicators confirm the results from our analysis of level of development:

countries with the lowest GDP per capita (Benin and Niger) experienced no change in health

systems. Once again with the exception of Cote D'Ivoire, my analysis showed, as

highlighted in Table 8, that a GDP of greater than or equal to \$1,500 and a GDP real growth

rate of at least 5.0% is necessary to see positive or mixed spillovers (both onto national health

systems and overall public health), as well as the largest changes in life expectancy and

maternal mortality.

Some unexpected findings emerged from this analysis as well. For example, an

analysis of government expenditure on health as a percentage of total government

expenditure and health expenditure as a percentage of GDP revealed that in both Cambodia and Cote D'Ivoire, where positive spillovers from the PEI onto national health systems were recorded, the difference between these two measurements is the smallest. An analysis of external funding revealed that high external funding does not translate into positive spillovers. Looking at polio immunization and incidence rates, although countries exhibiting positive and mixed spillovers reported the fewest number of confirmed cases in 2004, these countries' immunization rates ranged from 46%-86%, highly counter-intuitive to the idea that higher immunization rates results in fewer confirmed cases.

# 3.2.1 The PEI and Overall Public Health

Given this data, Table 9 will help us further understand the relationship between the PEI and overall public health. In both Lao PDR and Nepal, countries with mixed spillovers from the PEI onto the national health systems, highly positive improvements in overall public health were recorded. Although the PEI had no impact on the national health systems in

Benin and Niger, this

analysis has shown that

Benin still exhibits

significant

improvements in overall

public health. And in

Cambodia and Cote

D'Ivoire, although

positive spillovers from

the PEI onto the

national health systems

Table 9: Relationship between the PEI, National Health Systems and
Overall Public Health

1		Relations	hip between 1	the PEI and F	Public Health
	Observed Impact of the PEI on National Health System	Highly positive	Positive	Mixed	Highly mixed
Ī	Positive	Camb	odia		Cote D'Ivoire
	Mixed	Lao PDR, Nepal			
ľ	No change		Benin	Niger	

References: Aylward et al. 2000, Boston University 2007, CIA World Factbook 2007, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, National Statistics Centre of the Lao PDR 2006, Nsubuga et al. 2002, Sprechmann et al. 1996, United Nations Development Programme 2006, West Jr. et al. 1999, The World Bank Group n.d., The World Bank Group 2001, World Health Organization n.d., World Health Organization 2007. were observed, the relationship between the PEI and overall public health ranged from highly positive or positive in Cambodia to highly mixed in Cote D'Ivoire.

The next chapter will attempt to further explain the wide spectrum of outcomes by reconsidering commonly accepted policy recommendations, including the use of disease eradication as a public health strategy, and proposing a new policy approach appropriate to modern disease eradication.

# **Chapter 4 – POLICY IMPLICATIONS**

This chapter begins by using the findings from chapter 3 to determine whether the practice of using disease eradication campaigns as public health strategies is a sound public policy. I conclude by critiquing the existing policy recommendations with regards to using the PEI to strengthen national health systems and suggesting a new policy approach which can be applied to the PEI and other disease eradication campaigns.

# 4.1 Disease Eradication as a Public Health Strategy?

Although some scholars have justified disease eradication as a public health strategy due to the potential spillovers as well as the global savings in public health costs (Melgaard et al. 1999), this analysis has now shown that the PEI does not always result in positive spillovers onto national health systems, nor is it always accompanied by improvements in overall public health.

As such, this thesis concludes that using the PEI as a public health strategy cannot be a one-strategy-fits-all approach. In both Benin and Niger, for example, it appears low GDP/capita was one factor at play which may have prevented the PEI from resulting in positive spillovers onto the national health system and subsequent positive improvements in overall public health. In such conditions, long-term benefits from vaccination can be overshadowed by the poor surrounding health environment; hence, disease eradication campaigns like the PEI may result in short-term successes but do little to impact long-term conditions in the country.

# 4.2 A New Policy Approach to Disease Eradication

With the conclusion that the PEI cannot be considered a valid public health strategy in all cases, it is appropriate to critique the existing policy recommendations and develop a new policy approach. But first, it is useful to examine the countries that were successful in mobilizing the PEI for improvements in national health systems and overall public health:

what characteristics do these countries share that might help explain their success? What policy steps did they take which contributed to their success?

# 4.2.1 Success Stories

While not all countries in this analysis exhibited positive spillovers or improved public health, some were able to effectively use the PEI as a public health strategy. What did these countries do right? What lessons can be learned and applied to other countries?

Table 10 outlines the profile of the successful countries, those that exhibited positive and mixed spillovers as well as positive changes in indicators which measure public health.<sup>9</sup>

Table 10	: Profile	of Successful	l Countries
----------	-----------	---------------	-------------

					Government		
				GDP	Expenditure	Health	
	Observed			Real	on Health as	Expenditure	
	Impact of	Level of	GDP/Capita	Growth	a Percentage	as a	Total
	the PEI on	Human	(PPP)	Rate	of Total	Percentage	Confirmed
	National	Development	(2006 est.)	(2006	Government	of GDP	Polio Cases
	Health	(2004)		est.)	Expenditure	(2003)	(1996/2006)
	System				(2003)		
Cambodia	Positive	Middle	\$2,600	5.8%	11.8%	10.9%	84/1
Lao PDR	Mixed	Middle	\$2,100	7.2%	6.2%	3.2%	21/0
Nepal	Mixed	Middle	\$1,500	5.0%	7.9%	5.3%	9/4

Note: It is recognized that the use of varying baseline years may limit this analysis. References: Aylward et al. 2000, CIA World Factbook 2007, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, Nsubuga et al. 2002, United Nations Development Programme 2006, World Health Organization 2006a, World Health Organization 2007.

Cambodia, Lao PDR and Nepal are all of a middle level of human development, reflected not only in the official United Nations Development Programme (2006) score but also in a life expectancy of 55 years and above in all three countries as of 2004 (Boston University 2007, The World Bank Group n.d., The World Bank Group 2001) and under 5 mortality rates of 141 and fewer deaths per live births as of 2004 (The World Bank Group n.d., World Health Organization n.d., World Health Organization 2006).

<sup>&</sup>lt;sup>9</sup> Cote D'Ivoire is not included as a "successful" country; although identified by scholars as exhibiting positive spillovers from the PEI onto the country's national health system, Cote D'Ivoire did not experience the same positive improvements in public health as the other countries labeled as "successful."

Economically, successful countries have a GDP/capita in PPP (2006 est.) of \$1,500 and above (CIA World Factbook 2007).<sup>10</sup> Successful countries did not necessarily spend the highest amount on health as a percentage of total government expenditure or GDP in general (for example, Niger and Benin spent 12.4 and 9.8%, respectively, of their government budgets on health as a percentage of total government expenditure, World Health Organization 2007), but interestingly the percentages spent on each were nearly equal, differing by no more than 3%.

Referring back to the country profiles from Chapter 2, we can attempt to build a policy profile of successful countries. We see that despite past violence and political instability, all three nations launched massive health-related reforms in the late 1980s and early 1990s, which also corresponded with the launch of official polio eradication programs.<sup>11</sup> Some of the results attributed to the reforms and the PEI are improved infrastructure, an increased number of better trained staff and increased spending for health (both from internal and external sources). There is also better teamwork and coordination between local health officials, private parties and external health organizations and donors. In addition, the PEI especially is credited for improving health management and planning. Routine immunization has increased, and many polio surveillance systems are used for other diseases. The PEI has also served as a basis for services which did not exist previously- and as a result, has improved basic care.

Cambodia, Lao PDR and Nepal all significantly decreased the number of confirmed polio cases during the period 1996-2006. Although Benin and Cote D'Ivoire also reported 0 confirmed polio cases in 2004, it is still worth noting that countries exhibiting positive and mixed spillovers reported 4 or fewer confirmed cases (WHO 2006a).

<sup>&</sup>lt;sup>10</sup> The world average GDP growth rate in 2006 was estimated at 5.1% (CIA World Factbook 2007); this indicates that successful countries achieve almost average and above real growth of GDP.

<sup>&</sup>lt;sup>11</sup> Although Benin did not exhibit positive spillovers, this country also launched health reforms in 1987 and 2002 (WHO n.d., USAID-Benin n.d.). As such, it should be noted that the presence of health reforms is only one element in the success of Cambodia, Lao PDR and Nepal.

Table 11 shows the result of the PEI on national health systems and overall public

health in our three

success stories:

Cambodia, Lao PDR and

Nepal. In all three cases, a significant increase in life expectancy during the period 1980-2004 was observed, as well as significant decreases in both maternal mortality and under 5 mortality rates.

	Observed Impact of the PEI on National Health System	Change in Life Expectancy (1980-2004)	Change in Maternal Mortality Rate (1992- 2000/2005)	Change in Under 5 Mortality Rate (1980- 2004)
Cambodia	Positive	+29.5%	Approx 50%	-25.8%
Lao PDR	Mixed	+22.2%	-37.7%	-58.5%
Nepal	Mixed	+29.2%	-50.7%	-61.0%

Table 11: Summary of the Impact of the PEI on National Health Systems and Its Relationship to Overall Public Health in Successful Countries

References: Aylward et al. 2000, Boston University 2007, CIA World Factbook 2007, Levin et al. 2000, Levin et al. 2002, Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000, National Statistics Centre of the Lao PDR 2006, Nsubuga et al. 2002, Sprechmann et al. 1996, United Nations Development Programme 2006, West Jr. et al. 1999, The World Bank Group n.d., The World Bank Group 2001, World Health Organization n.d., World Health Organization 2007.

### **4.2.2 Existing Recommendations**

With this successful profile in mind, it is appropriate to reconsider commonly accepted policy recommendations, including the use of disease eradication as a public health strategy, and formulate a new policy approach appropriate to modern disease eradication and public health development.

Following the World Health Assembly's lead, in theory if not in practice, of implementing the PEI in a way which produces positive synergies for the national health systems (infrastructure and other immunization campaigns), existing literature addresses a number of ways in which the PEI can be better implemented and positive synergies extracted. A consolidation of the existing literature on this topic results in five broad recommendations. First, and perhaps most obvious, many scholars, including Melgaard et al. (1999), note that eradication campaigns must be *intentionally* designed in a way to provide maximum benefit

to national health systems. While this analysis did not show that all positive spillovers were a result of intentional planning, it showed that negative impacts could have been avoided in nearly all the countries analyzed with better planning. As such, it should be the responsibility of the WHO to adhere to its 1980s proclamation that eradication campaigns must be pursued in ways that strengthen national health systems, and

insist that policy makers enact them as such, especially since positive spillovers can translate into improvements in overall public health.

The second recommendation is that eradication campaigns must be pursued within, and integrated into, existing health infrastructure (Melgaard et al. 1999). The polio vaccination should be part of routine immunization schedules, and vitamin A distribution should happen not just with polio but with other routine immunizations as well (Loevinsohn et al. 2002, Mogedal and Stenson 2000). As such, stronger linkages with other health partners, especially local health partners, are needed (Loevinsohn et al. 2002). The 2005 international project integrating malaria control and the PEI in Niger is a perfect example of such coordination.

# Summary of Existing Policy Recommendations (from pgs. 38-41)

- Eradication campaigns must be intentionally designed to result in positive spillovers onto the national health system
- Eradication campaigns must be pursued within, and integrated into, existing health infrastructure.
- Proper planning is required to avoid negative impacts of disease eradication onto national health systems and to increase the chance of positive spillovers.
- External funding should not be solely for eradication campaigns but used for other health system investments as well.
- Eradication campaigns must be carefully monitored using baseline data in order to detect impacts on the national health system

References: Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000.

Involving international partners, as well as a high level of internal management, the PEI was used as a platform to reach not only children vulnerable to poliomyelitis but also mothers and children who could be impacted by malaria (International Federation of the Red Cross and Red Crescent Societies 2005). The third recommendation goes along with the first two: proper planning is required to intentionally design disease eradication campaigns like the PEI in ways which integrate the program into existing health infrastructure. This planning is necessary to avoid negative impacts and increase the possibility for positive spillovers (Loevinsohn et al. 2002, Mogedal and Stenson 2000). Mogedal and Stenson (2000) note that "partners in the eradication effort should first of all give due attention to how planning and implementing eradication can give higher benefits to system development without compromising efficiency" (p.38). Among the areas to highlight: campaigns should be planned ahead of time and not interfere with other major health interventions (Mogedal and Stenson 2000), training should be coordinated and integrated with other training programs (Melgaard et al. 1999) and equipment and personnel available for the PEI, such as surveillance equipment, should be made available for other health programs and functions as well (Loevinsohn et al. 2002, Melgaard et al. 1999, Mogedal and Stenson 2000).

Returning to the Niger example, a recent program report noted that "this operation proved that similar large scale interventions are feasible, even in large and land-locked countries in Africa with fragile infrastructures" (International Federation of the Red Cross and Red Crescent Societies 2005 p.3) The approach was heralded by Jeffrey Sachs and is being duplicated in other countries, not only for its tangible results, but for its potential to increase staff training and stimulate societal mobilization (International Federation of the Red Cross and Red Crescent Societies 2005). This project in Niger is therefore an example that "integrating public health interventions is possible and is a cost savings approach to addressing several public health problems at the same time" (International Federation of the Red Cross and Red Crescent Societies 2005 p.25) with proper and careful advance planning, as well as immense external funding (International Federation of the Red Cross and Red Crescent Societies 2005).

The fourth recommendation addresses funding: external funding should not be solely for eradication campaigns but used for other health system investments as well (Melgaard et al. 1999). This analysis has shown that in the lowest GDP countries of Benin and Niger, external funding may have had an impact on polio incidence but did little for strengthening overall public health. In the lowest GDP countries, therefore, it seems that disease eradication is not a viable public health strategy, and that a general public health improvement strategy which funds health system investments specifically is needed.

The final recommendation, heralded by Loevinsohn et al. (2002) and Mogedal and Stenson (2000), is that disease eradication campaigns must include indicators and baseline data for monitoring the campaign's effects on the overall health system. Currently, very few indicators are available, which made it impossible for scholars and researchers to know how the PEI was impacting national health systems. This analysis has shown that the impacts of the PEI on national health systems are not always positive, and more importantly, that these impacts do not automatically translate into improved public health. Monitoring is necessary to track these trends and develop policies that will maximize the impact of the PEI on national health systems and subsequent changes in overall public health.

# 4.2.3 A New Policy Approach

This thesis does not conclude that the previous, existing policy recommendations with regards to the PEI are no longer valid. However, the analysis contained in this thesis has shown that the existing recommendations do not go far enough. The new policy recommendations build on the recommendations by other scholars and experts, which focus primarily on the PEI as a simple disease eradication campaign. These new recommendations attempt to take into consideration what was learned in this analysis, and maximize all possible benefits from the PEI by examining disease eradication in its larger context of strengthening national health systems and improving overall public health.

To begin, a one-size-fits-all approach to disease eradication is not appropriate, and campaigns must be individually crafted with the conditions of the country forefront in any

# A New Policy Approach (from pgs. 32-33)

- A one-size-fits-all approach to disease eradication is not appropriate.
- Disease eradication campaigns like the PEI can possibly be used as public health strategies in medium and high development countries.
- To serve as valid public health strategies, disease eradication campaigns must be purposefully crafted to result in positive spillovers, as well as integrated into existing infrastructure.
- Where possible, vaccinations should be delivered together to minimize fixed costs from vaccination campaigns and exploit synergies.
- Disease eradication as a public health strategy should result not only in positive spillovers onto the national health system, but also in improvements in overall public health.
- To achieve maximum benefit, low development countries below a certain GDP/capita or level of human development should abandon health-related campaigns which solely focus on a single disease and instead invest in improving the health infrastructure needed to fight all diseases.

analysis. The country profiles outlined in Chapter 2 show just how very different the six countries in this study were. The same eradication campaign did not produce the same results in all six countries.

Even given the vast differences from country to country, this thesis has shown that it is possible to improve public health as a result of disease eradication programs such as the PEI, and it is hoped that from here out that will be the focus of the campaigns. However, to serve as valid public health strategies, disease eradication campaigns must be purposefully crafted to result in positive spillovers, as well as integrated into existing infrastructure. On that note, when possible to deliver other vaccinations with the polio vaccination, such as vitamin A, these opportunities must be taken advantage of to minimize fixed costs and exploit synergies.

Furthermore, this thesis has shown that it is possible for the PEI to result not only in positive

spillovers onto the national health system, but also improvements in overall public health. However, not all countries will be able to benefit from using the PEI as a public health strategy. Countries which do not fit the profile discovered in this analysis should seriously reconsider the use of the PEI as a public health strategy, as this analysis has shown that general funding for health infrastructure may be more beneficial than disease-specific funding.

In conclusion, I will address the larger implications of these findings.

# CONCLUSION

This thesis has questioned the validity of using disease eradication campaigns as valid public health strategies by examining the impact of the PEI on national health systems and how this impact influences public health in Benin, Cambodia, Cote D'Ivoire, Lao PDR, Nepal and Niger. The major contribution of this work has been to show that the existence of positive spillovers from the PEI onto national health systems does not automatically translate into improvements in public health. In the previous pages I have argued that in order to use disease eradication campaigns like the PEI as public health strategies, the presence of both positive spillovers and improvements in public health must be observed. In higher income countries, this analysis has shown that there is a possibility for positive spillovers from the PEI onto the national health systems, but only if these spillovers are intentionally crafted and the campaign is integrated into the existing infrastructure and with other health programs, as was the case with vitamin A supplementation in Nepal (West Jr. et al. 1999).

While successful in certain countries, this thesis has shown that in the lowest income countries, the PEI did not work as a public health strategy. Although further research is needed, low income countries should consider general health improvement campaigns in light of disease-specific eradication programs, if the end goal is to improve overall public health. This thesis has shown in the six countries studied that a "minimum threshold" was required to achieve maximum benefit from the PEI and maximum improvements in overall public health. In the six countries studied in this analysis, this minimum threshold was medium development, life expectancy of 55 years and above and under 5 mortality of 141 or fewer deaths per 1,000 live births.

We must follow the example of the World Bank (WB) and International Monetary Fund (IMF), who recently realized that a one-size-fits-all approach to development simply does not work (The International Bank for Reconstruction and Development/The World Bank

2004, Rajan 2005), and identify the countries in which health infrastructure improvements may be more beneficial than disease eradication campaigns, in terms of both spillovers onto health systems and overall public health. In countries which do not meet this minimum criteria, Garrett (2001) argues that investments in public health are vastly cheaper and more effective than specific disease eradication campaigns and other after-the-fact medical interventions. Further, in the words of former U.S. President Bill Clinton:

If you first develop the health infrastructure throughout the whole country, particularly in Africa, to deal with AIDS... you will increase the infrastructure of dealing with maternal and child health, malaria, and TB. Then I think you have to look at nutrition, water, and sanitation. All these things, when you build it up, you'll be helping to promote economic development and alleviate poverty. (Garrett 2007 p.4)

While only four countries in the world remain polio endemic as of 2007 (World

Health Organization 2006c), the implications of this study reach far beyond the PEI.

Questioning the validity of using the PEI as a public health strategy is of particular

importance because polio is not the only disease for which massive aid money is pouring in

from the international community. Malaria, TB, HIV/AIDS and others also attract

international funds. Mogedal and Stenson (2000) note the following:

It is obvious that the last phase of an eradication effort – such as now for PE – does not lend itself well to a policy change in the direction of broader efforts to strengthen the health system. Even for a strong health systems advocate it would be eminently justifiable for the focus of the very last effort to eradicate polio to be strongly on just that and nothing else. The main pay-off of PE for all health systems comes with the eradication of the last wild virus. Hence the above recommendations are more relevant to future eradication initiatives as well as to other specific technical interventions than to any last minute effort for PE to engage in health systems development. (p.40)

We must learn from the PEI: instead of applying a one-size-fits-all strategy, each

country must be analyzed, much as was done in this thesis, to identify factors which could contribute to, or impede, the success of the funding in not only targeting the disease but supporting the surrounding infrastructure as well. In low development countries, policy makers must question the use of disease eradication campaigns, and carefully consider pursuing overall health system improvements instead, which may have a wider impact on overall public health.

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