Budget Support in Zambia: Health

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Preface

Chris Elbers and Jan Willem Gunning are the authors of chapters 1, 5-7. Marije Groot Bruinderink provided superb research assistance for this part. Julien Schrijver, Remko van Leeuwen and Leander Buisman are the authors of chapters 2-4, Annexes 1, 2 and 3, and have also contributed to the discussion of malaria in chapter 7. They are very grateful to Nadine Collet for her comments on the first draft and Tamara O'Reilly for her editorial work.

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Source: United Nations, 2004

Abbreviations and Acronyms

AIDS	-	Acquired Immune Deficiency Syndrome
ARI	-	Acute Respiratory Infections
CBoH	-	Central Boards of Health
CP	-	Cooperating partners
DHB	-	District Health Boards
DHS	-	Demographic and Health Surveys
DRC	-	Democratic Republic of Congo
DTP3	-	Diphtheria Tetanus Pertussis
EPI	-	Extended Programme of Immunization
GDP	-	Gross Domestic Product
GFATM	-	Global Fund to fight AIDS, Tuberculosis and Malaria
GHI	-	Global HIV/AIDS initiatives
GNI	-	Gross National Income
GRZ	-	Government of the Republic of Zambia
HALE	-	Healthy life expectancy
HepB3	-	Hepatitis B
HFA	-	Health for All
HIPC	-	Highly Indebted Poor Country
HIV	-	Human Immunodeficiency Virus
HMB	-	Hospital Management Boards
HR	-	Human resources
HSR	-	Healthcare Sector Reform
IMR	-	Infant mortality rate
IRS	-	Indoor residual spraying
ITN's	-	Insecticide treated mosquito nets
MAP	-	Multi Country AIDS Program
MDGs	-	Millennium Development Goals
MDRI	-	Multi-donor Debt Reduction Initiative
MoH	-	Ministry of Health
MMR	-	Maternal mortality rate
NAC	-	National HIV/AIDS/STI/TB Council
NGO	-	Non-governmental organization
NHA	-	National Health Accounts
NHSP	-	National health Strategic Plan
NMSP	-	National Malaria Strategic Plan
NTP	-	National Tuberculosis Program
ODI	-	Overseas Development Institute
ORT	-	Oral Rehydration Therapy
RBM	-	Roll Back Malaria

RBoH	-	Regional Boards of Health
RHC	-	Rural Healthcare Centres
PEPFAR	-	US President’s Emergency Plan for AIDS Relief
PHC	-	Primary Health Care
PPP	-	Purchasing Power Parity
SWAp	-	Sector-wide approach
TB	-	Tuberculosis
THE	-	Total health expenditure
U5-MR	-	Under-5 mortality rate
UHC	-	Urban Healthcare Centres
UNDP	-	United Nations Human Development Index
UNICEF	-	United Nations Children's Fund
WHO	-	World Health Organization
WHS	-	World Health Statistics

Chapter 1 Introduction

Many donors provide an increasing share of their development aid in the form of sector or general budget support. How such aid is to be evaluated has long been discussed. A first attempt was the *Evaluation of General Budget Support* (IDD and Associates, 2006, 2007). Since that time evaluation experts have debated whether statistical methods developed for project evaluation can be amended and used for the evaluation of budget support. In project evaluation rigorous measures of project effectiveness can be obtained through random assignment across treatment and control groups. Being able to assess the effectiveness of budget support in a similarly rigorous way is obviously desirable. Regression techniques have been proposed in several studies. In the form advocated by Elbers *et al.* (2009) this requires panel data for a sample of beneficiaries, at the level of households or communities. Such data are often not available and collecting them specifically for an evaluation is sometimes considered too costly. In this evaluation we investigate whether it is feasible to evaluate budget support using only data that are already available, at least to the government.

Budget support allows a government to expand the scale of its operations. It may also change the nature of these operations to the extent that conditionality is effective in changing government policies. The issue of whether (through policy dialogue) donors were able to change the nature of government operations is dealt with in other parts of this evaluation. Here we take changes in government policies as given, irrespective of whether or not they were the result of budget support. The counterfactual is therefore the situation where policies would have remained unchanged both in terms of level and content.

The evaluation describes policies and outcomes in the health sector in Zambia. It addresses four evaluation questions:

- *What are the main developments in health?*
- *Who benefited from the (improved) serviced delivery?*
- *What is the impact of budget support on public health spending and on health service delivery?*
- *What was the impact of the improved service delivery on the life of people?*

A large part of the report (chapters 2-4) is devoted to the first question. There is no attempt here to duplicate the many existing, comprehensive reports. Rather, the chapters focus on highlighting the health policies of the Government of Zambia, changes in the key indicators such as child mortality and a comparison of Zambia's performance with that of its neighbors.

The remaining evaluation questions are addressed in chapters 5-7. The data sources used are discussed in chapter 5. Chapters 6 and 7 discuss impact evaluation, using administrative data or household surveys. Chapter 8 concludes.

Chapter 2 Health Sector Indicators

Health and development are directly connected. Without a healthy population socio-economic development cannot be effectively pursued. Without a certain level of development though, increasing a nation's health is almost impossible. Many developing countries struggle with this catch-22 situation.

Zambia is one of the poorest countries in the world. It is a low-income country with a gross national income per capita of US$950 (World Bank, 2010-b). 64% of the population lives on less than $1 a day (WHO, 2009, p. 2). As a result, Zambia ranks 164th out of 181 countries in the United Nations Human Development Index (UNDP, 2009, p. 198). It is also a country with large inequalities, with 72% of the rural population living in poverty in 2002 while 'only' 28% of the urban population were living in poverty at that same time (GRZ, 2005, p. 19).

Until 2005, a large external debt had put a considerable burden on government expenses, but since the country qualified for debt cancellation under the Highly Indebted Poor Country (HIPC) and Multi-donor Debt Reduction Initiative (MDRI) in 2005 and 2006 respectively, $6.7 billion of debt has been written off (World Bank, 2010; ODI, 2009, p. 3). Where the external debt as a percentage of gross domestic product (GDP) in 2002 was 178.7%, in 2006 it had been reduced to 8.8% (World Bank, 2008, p. 17). Over the past years Zambia has had a strong macro-economic performance with an average growth rate of its GDP of 5.4% between 2001 and 2009 (ibid). However, this average GDP-growth rate is insufficient to attain middle-income status by 2030 as described in Zambia's national Vision 2030. In fact, Zambia would need an average growth rate of 6% in the first five years from 2005 to 2010 and from then onwards would need to increase its GDP growth rate up to 10% in the period 2025-2030 (GRZ, 2006, p. 7; p. 12). Part of Vision 2030 is that the national poverty head count should drop below 20 per cent, the Gini-index should drop from 50 to 40 and there should be 'equitable access to quality healthcare by all' (ibid., p.6; p. 38).

The Republic of Zambia, 2008	
Population	12.6 million
GDP (PPP)	$ 17.155 billion
GDP per capita (PPP)	$ 1,460.63
HIV infection rate (15-49 yrs)	15.2% (2007)

Sources: World Bank (2010) Data Profile Zambia, on: http://data.worldbank.org/country/zambia; IMF (2010) World Economic Overview 2010, on: http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/index.aspx

The Millennium Development Goals (MDGs) play an important role in Zambia's policy-making process. Therefore, this report focuses in particular on performance indicators that measure Zambia's progress towards achieving the MDGs; in particular the three MDGs focusing directly on health. Zambia is likely to reach its target for gender equality (MDG3) and possibly also attaining universal primary education (World Bank, 2008, p. 15). Targets on poverty and hunger, child mortality, maternal mortality and fighting malaria and other major diseases can potentially be met by 2015, but this is still highly uncertain (World Bank, 2008, p. 15; ODI, 2009, p. 4). Zambia is likely to succeed in achieving the MDG of having halted and begun to reverse the spread of HIV/AIDS (UNDP, 2009, p. 3).

The health sector's performance is clearly one of the country's greatest challenges. To increase the sector's effectiveness, organisational changes have been implemented under the Public Service Reform Programme, the National Decentralisation Policy, the National Health Services Act of 1995 and the repeal of the latter in 2004. Although there have been improvements in the sector and its outcomes, they have not been significant enough to solve the complex mix of health problems the country still faces.

The challenges regarding the population's health and the health sector's performance will be discussed in this report. Chapter two will start with an outline of the health sector's key indicators. This is done on three levels on which the sector's performance can be measured: health outcomes, healthcare coverage, or output, and the input the sector gets from government and other sources. In chapter 3 these indicators will be compared with Zambia's neighbouring countries to provide an overview of Zambia's relative performance. Chapter 4 focuses on the healthcare policies Zambia has devised, historically and currently, to address its health crisis. A discussion is added on the various aspects of the policies. Chapter five will briefly summarise, conclude and discuss the limitations of the used data and possibilities for further research.

In this chapter the key performance indicators provide an overview of Zambia's current performance in terms of health outcomes, outputs and inputs. Consistent and comparable summary indicators for mortality levels and burden of disease are important for understanding the variations in health and mortality risks across countries and for assessing health progress and priorities. WHO and World Bank prepare annual life tables for all member states based on available information and using standard methods. We have chosen data from these two institutes as they are reliable and they have been assembled using standard methods. In cases where comparability is not directly an issue, figures from other data sources are also used.

2.1 Health Outcomes

This section discusses the indicators as seen in Annex I, table 1. These are used to assess how effectively the Zambian health sector is dealing with morbidity and mortality in the country.

Life expectancy In 2008, the average Zambian had a life expectancy of 45 years. Although this was an improvement compared to 2000 when the average life expectancy was 42, it is still less than the average life expectancy of 51 years in 1990. The decline in the country's life expectancy is mainly attributable to the HIV/AIDS epidemic (Picazo and Zhao, 2009, p. 10). Over the years women have fared slightly better than men. In 2008, 2000 and 1990 respectively average male life expectancy was 45, 41 and 49. For women this was 46, 43 and 53 in the same years. The average life expectancy is rising, but is still not at the same level as it was in 1990.

Child mortality The infant mortality rate (IMR) for both sexes, probability of dying by age 1 per 1,000 live births, was 92 in 2008. This was down from 104 in 2000 and 105 in 1990. Female infants have a slightly better chance of living past their first year than their male counterparts (female: 82, 93, 93 in 2008, 2000 and 1990 respectively; male: 102, 116, and 117 in 2008, 2000 and 1990

respectively).

A medical explanation for this difference is unlikely, but skewed sex ratios for child mortality have been reported elsewhere. There are several possible explanations. Misclassification of girls as boys affects sex-specific mortality rates, but it does not affect overall mortality rates if the total number of children is correct. Anecdotal evidence suggests that households that have more girls than boys may intentionally misclassify girls as boys, if there is stigma attached to having only girls. Underreporting of girls could indicate that dead girls are not being counted in the total number of births. Conservative households may intentionally underreport the number of living girls in the household to keep strangers from knowing about the presence of females. Also, many households refuse to divulge the names of females in the household, and some may refuse to report the presence of living females. Underreporting of girls would introduce error into overall estimates of mortality.[1]

Under-five mortality (U5-MR), the number of children who die before reaching age 5 per 1000 live births, was 148 in 2008 for both sexes. This indicator showed an improvement since 1990 and 2000 where it stood at 172 and 169 respectively. Again, girls had a better chance of survival than boys. Although making progress, Zambia still has a long way to go before it reaches the MDG-targets for these two indicators. The target level set by the government for IMR is 36 per 1,000 live births. For under-5 mortality the country should reach 63 per 1,000 by 2015.

Zambia's poor record on this indicator can be partly explained by the continuing high rates of malnutrition among children as well as low coverage of child health interventions (Picazo and Zhao, 2009:12). According to the WHO 14.9% of children under 5 were underweight in 2007. In this age group 45% of deaths were caused by three conditions – diarrhoea (15%), malaria (15%) and pneumonia (15%). HIV/AIDS is also a big killer accounting for 12% of deaths of under-5-year-olds (WHO, 2010-a:69).

The trend of women outperforming men on this indicator remains throughout their lives.

Adult mortality, the number of people who die between 15 and 60 years per 1,000 population, in 2008 was 515 for both sexes, 498 for females and 538 for males. The country's adult mortality rate shows the same trend as most of the other indicators with it being much more favourable in 1990, but having been improved since 2000. In 1990 for both sexes the indicator scored 352 per 1,000, but in 2000 this had increased to 632.

Maternal mortality In every 100,000 live births in 2007, 591 Zambian women died during pregnancy, while giving birth or shortly after (WHO, 2010-a). In a report on the Zambian health sector this figure is put at 449 as per September 2008 (ODI, 2009, p. 7). MMR has seen a steady decline over the past decade compared to its 1996 level (649). Direct causes for maternal death that were preventable include postpartum haemorrhage, sepsis, obstructed labour, post-abortion complications, and eclampsia. Malaria, anaemia, HIV/AIDS and delays in accessing health facilities have been identified as indirect causes for Zambia's high MMR (Picazo and Zhao, 2009, p. 7).

[1] http://www.who.int/bulletin/volumes/88/8/09-068957/en/index.html

2.1.2 Burden of Disease

HIV/AIDS – Prevalence of HIV among adults aged 15-49 was 15.2% in 2007 (7th highest globally). This figure was down from the 16% in 2002 and the 19.7% recorded in 1999 (ODI, 2009, p. 7). The epidemic does not affect everyone equally. According to the WHO (2005, p. 1), AIDS cases peak among women 20 to 29 years old and among men 30 to 39 years old. This suggests 'significant transmission from older men to younger women' (ibid.). Women are significantly harder hit by the HIV/AIDS epidemic (18%) than men (13%) and urban populations have a much higher prevalence rate (25%–35%) than the rural population (8–16%). Countrywide the virus killed 470 people per 100,000 population in 2007.

Tuberculosis In 2000, of the total Zambian population 350 people per 100,000 were living with tuberculosis (TB). In 2008 this figure was down to an estimated 260 per 100,000. The estimated incidence of TB, per 100,000 population per year, also fell in that same period. This went from 600 cases per 100,000 in 2000 to 470 per 100,000 in 2008. The mortality rate, per 100,000, for TB among HIV-negative people was estimated at 18 for 2008.

Malaria Zambia's malaria incidence was 244 per 1,000 in 2008 (WHO, 2010-a). This is a considerable improvement compared to 2005 when it was 373. In 2004 and 2002 it was 383 and 388 respectively (GRZ, 2005, p. 14). In 2006 the disease caused 212 deaths per 100,000 population (WHO, 2010-a). Malaria is one of the leading causes of morbidity and mortality in the country with especially children under five and women most at risk. The government's policy toward controlling malaria will be discussed in chapter 5.

2.2 Healthcare Service Delivery

Health service coverage is measured here using ten main indicators. This data can also be found in Annex I, table 2.

Immunisation coverage among 1-year-olds is divided into four sub-measures, being measles, DTP3, HelB3 and Hib3. 85% of one-year-olds had received immunisation against measles in 2008, the same level as in 2000. In 1990 immunisation against measles had reached 90% of one-year-olds (WHO, 2010-a, p. 94). The coverage of DTP3 immunisation had reached 1%-point more one-year-olds in 1990, 91%, but then decreased to 78% in 2000, and rose slightly to 80% in 2008. Immunisation coverage for HepB3 and Hib3 were both 80% in 2008 with no earlier data available.

Antenatal care coverage (MDG5 sub-target) was 94% in 2002 where at least one visit had taken place. In the same year, 72% of the time at least four visits had taken place. Also an indicator for MDG5, births attended by skilled health personnel, had coverage of 47% in 2007. This was the same between 1990 and 1999 (WHO, 2010-a:94). Of all births between 2000 and 2008, 2.1% were done by caesarean section.

There are no data on how many children aged 6-59 months received vitamin A supplementation.

Of children younger than five years old 41% were sleeping under insecticide-treated nets (ITN) and 43% were given antimalarial treatment when they had a fever. 68.2% of children younger

than five that had ARI (acute respiratory infections) symptoms were taken to a health facility and 66.8% of under-fives with diarrhoea received ORT (oral rehydration therapy) (WHO, 2010-a, p. 95).

The level of children under five who were stunted was 45.8% in 2007, who were underweight was 14.9% and overweight 8.4% (WHO, 2010-a, p. 108).

Contraceptive prevalence between 2000 and 2008 was 40.8% (WHO, 2010-a, p. 95). Antiretroviral therapy among HIV-infected pregnant women was estimated at 59% in 2008. Antiretroviral therapy (ART) coverage among people with advanced HIV-infection was 46% in 2007. Zambia has 19 hospital beds per 10,000 people in 2008.

2.3 Human Resource Crisis

The Zambian health sector workforce counts a total of 649 physicians which accounts for about 1 per 10,000 people. Nursing and midwifery personnel are more numerous with 8,369 of them working in the sector (7 per 10,000 people). The density of dentistry personnel is significantly less with 56 of them countrywide, amounting to less than 0.5 per 10,000 people. There are 108 people in Zambia qualified as pharmaceutical personnel and 803 as public and environmental health workers. No data is given on the number of community health workers. WHO(2010) adds to this bleak picture by showing some rather implausible changes between 2004 and 2006, see Table 2.1.

Table 2.1 Human resources for health in Zambia, absolute numbers

	2004	**2006**
Nursing personnel	16,990	6,096
Midwifery personnel	5,020	2,273
Pharmaceutical technicians/assistants	332	84
Laboratory technicians/assistants	1,163	392
Medical assistants	2,122	1,161
Pharmacists	707	24
Dental technicians/assistants	222	40
Radiographers	252	139
Other health workers	1,208	471
Laboratory scientists	…	25
Physicians	…	1,264
Environmental and public health workers	…	1,027
Dentists	269	16
Health management and support workers	…	10,853

Source: WHO (2010) Human Resources for Health, online database

Such extreme trends could not be confirmed on the basis of Zambia's Health Management Information System (see Chapter 6 on data sets used for this study). For instance, the absolute number

of staff personnel in health centers hardly changed between 2000 and 2008 (which is bad enough given the low initial density and population growth during that period).

Table 2.2 gives an indication of the staffing requirements in three parts of the health sector. There is a clear difference between rural healthcare centres and urban ones with the situation in RHC being twice as bad as in UHC. Overall the staffing level of the health sector was only 47% in 2005.

Table 2.2 Staffing issues at health facilities, by cadre, 2006

	RHC			**UHC**			**Hospital**		
	No. Estab Posts	No. Of Vacant Posts	% of Posts Vacant	No. Estab Posts	No. Of Vacant Posts	% of Posts Vacant	No. Estab Posts	No. Of Vacant Posts	% of Posts Vacant
Doctors	11	10	91	58	22	38	85	50	59
Clinical Officers	110	64	58	136	59	43	111	59	53
Medical licentiates	15	13	87	12	5	42	24	18	75
Midwives	109	55	50	282	90	32	179	63	35
Nurses	215	92	43	577	131	23	695	344	49
Envir. health officers	76	30	39	37	9	24	14	6	43
Pharmaceutical staff	18	12	67	34	7	21	37	17	46
Dentistry staff	13	13	100	44	9	20	23	9	39
Lab, x-ray tech, etc.	15	12	80	48	13	27	76	37	49
Physio, etc.	8	8	100	15	3	20	47	34	72
Administrative staff	48	24	50	280	24	9	215	79	37
Other staff	292	55	19	485	62	13	594	152	26
Total	**930**	**388**	**42**	**2,008**	**434**	**22**	**2,100**	**868**	**41**

Source: World Bank (2009) World Bank Country Study: Zambia

The Zambian government is well aware of the situation, as illustrated by the following: 'The extent of the crisis is such that many Rural Health Centres have no staff or are staffed by untrained personnel and new facilities have been opened without additional staff to run them. Hospital wards are grossly understaffed with dozens of patients attended to by one nurse' (GRZ, 2005, p. 24). The government (ibid.) has identified several factors that have created this crisis and that continue to contribute to its existence:

- Poor and unattractive conditions of service;
- Emergence of a competitive local, regional and international market for health staff;
- Growing reluctance of qualified medical staff to serve in rural locations;
- Increased absence from work and high staff deaths attributable to the HIV/AIDS epidemic;
- Increasing demands on health staff due to increases in the numbers of HIV/AIDS patients;

- Restrictions on new staff recruitments arising from the HIPC completion conditionalities.

The human resources crisis in Zambia's health sector has been noted by many (*e.g.* Fastone, 2008, and Schatz, 2008) and is being acknowledged by the Zambian government. Eastone (2008) summarizes (p. 53) the main strategies of the *Human Resources for Health Strategic Plan* (2007-2010) of the Ministry of Health:

1. A coordinated approach to planning across the sector
2. Increase the number of trained and equitably distributed staff
3. Improve the productivity and performance of health workers
4. Strengthen human resource planning, management and development systems at all levels of the health system.

To date, there is no evidence that this policy has been successful. Indeed, some authors argue that the human resources crisis is related to a shift in financing which has led to increased reliance on external funds. (See also section 2.5 below.) Picazo and Kagulura (2008): "increased funding for health tends to go together with a) perverse staffing patterns, b) an increasing proportion of MoH resources that is going to administration rather than service delivery and c) a relative high vacancy rate for rural areas." Similary, the World Bank has identified factors complicating the human resource situation. According to them it is the inability of the basket funds and vertical financing to formally finance personal emoluments that causes the paradoxical situation of an HR shortage in a sector flooded with donor funds (Picazo and Zhao, 2009, p. 63).

The brain drain is often referred to as one of the main contributors to the shortage of staff in Zambian health facilities (Lusale, 2007, Schatz, 2008). The outflow of skilled health workers to countries like Botswana, South Africa and the UK, has negative effects on the provision of health care. This, for example, is the case of reproductive and sexual health of the people in the source country, especially those who rely on public medical services in rural areas. 'Shortage and uneven distribution of healthcare workers, aggravated by the brain drain, has contributed to the high rate of maternal and newborn mortality and morbidity in the source countries' (Serour, 2009, p. 175). Improving maternal health is often referred to as the heart of the MDGs, as progress on this goal is critical to achieving the other MDGs (Serour, 2009, p. 175).

Quantifying Zambia's brain drain has been attempted, but has relied on mostly anecdotal evidence and rough indicators. Definite figures are unavailable. What is clear though is that the brain drain exists and that the negative effects of it are typically larger when the country has limited human capital in combination with a limited capacity to train professionals. Both of these are valid for Zambia's health sector (Amin and Mattoo, 2007, p. 2).

Government expenditure on education was only 2% of GDP in Zambia at the beginning of the century, among the lowest in Africa and well below the 3.4% average level for least developed countries. The problem of low expenditure is compounded by how Zambia allocates it. Students in health and welfare constitute about 3% of all students at the tertiary level in Zambia – only 7 countries in the world had a lower percentage in 2007. Thus, restricting the outflow of skilled health workers will help address the existing shortages in Zambia only to a limited extent (Amin and Mattoo, 2007, p. 3).

Zambia's educational infrastructure for healthcare, in 2007, had only one medical school, three nursing schools, and three technical colleges graduating doctors, nurses, and laboratory technicians,

and pharmacists respectively. In 2004, these schools produced only 49 doctors, 540 nurses, 20 pharmacists and 38 laboratory technicians, which sum to 693 healthcare professionals (Amin and Mattoo, 2007, p. 17). 'These graduation rates are not only low by international standards, but also inadequate to sustain acceptable standards of healthcare. For example, to meet the basic WHO recommendations on staff-population ratios (1:5,000 for doctors and 1:700 for nurses) Zambia would require an additional 1,654 and 10,636 nurses which equal about 34 and 20 times the respective annual graduation rates (Amin and Mattoo, 2007, p. 16).

The above shows that the main reason for the human resource shortages in Zambia is the country's low capacity to produce skilled professionals although migration of the skilled tends to aggravate the problem (Amin and Mattoo, 2007, p. 17).

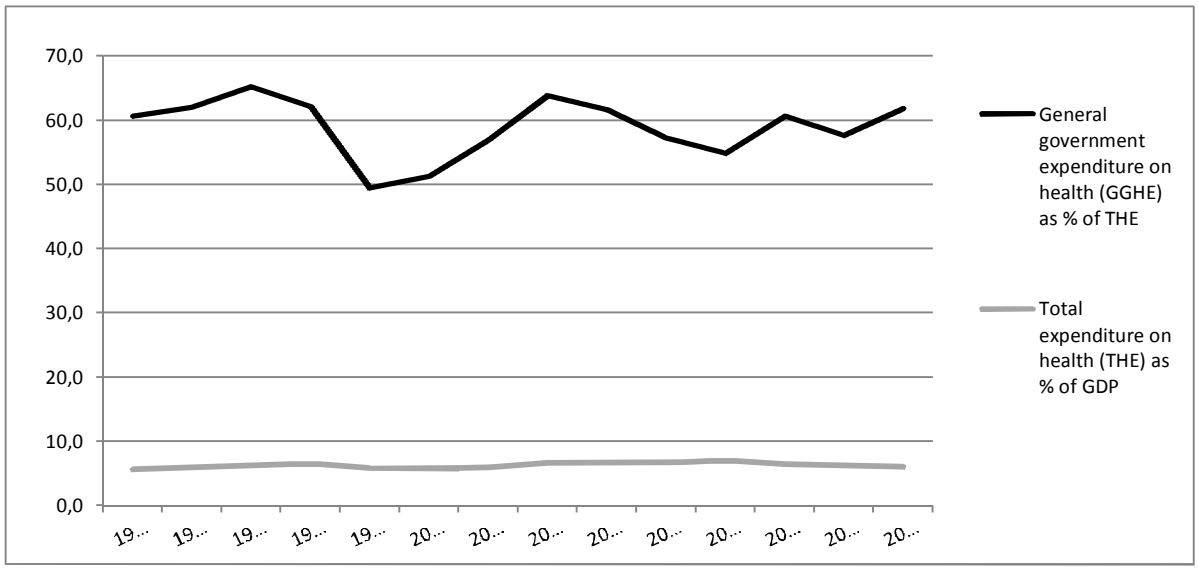
The Zambian government has several initiatives in place to counter the human resource crisis. One of the national level measures is the exemption of the health sector from the public sector employment freeze. Also, the Ministry of Health (MoH) has allocated K32 billion on top of the normal personal emolument budget for recruitment and retention of staff under the so-called Zambia Health Worker Retention Scheme. This was introduced in 2003 primarily to address the shortage of health workers in rural areas. It aims to decrease attrition rates in rural districts by providing a monthly stipend (hardship allowance), housing rehabilitation, vehicle loans and facility incentives. In return, the health worker is required to give three years of service in a rural area. One study found that the scheme up to 2007 had not succeeded in increasing in numbers the available staff (GHIN, 2010, p. 3).

2.4 Health Inputs

The Zambian government spent K947 billion a year on the health budget in 2008, which was K415 billion in 2004 (ODI, 2009, p. 9).[2] There are no standard definitions of what constitutes 'government health spending' which has often led to confusion when making comparisons (Picazo and Zhao, 2009, p. 19). The figures reported are from the WHO as part of the National Health Account data for Zambia. They include externally obtained resources, or so-called 'rest of world funds' (see Annex III).

[2] US$ 1 = ZMK 4,845, on 23 September 2010

Figure 2.1 Public expenditure on health in Zambia, 1995-2008



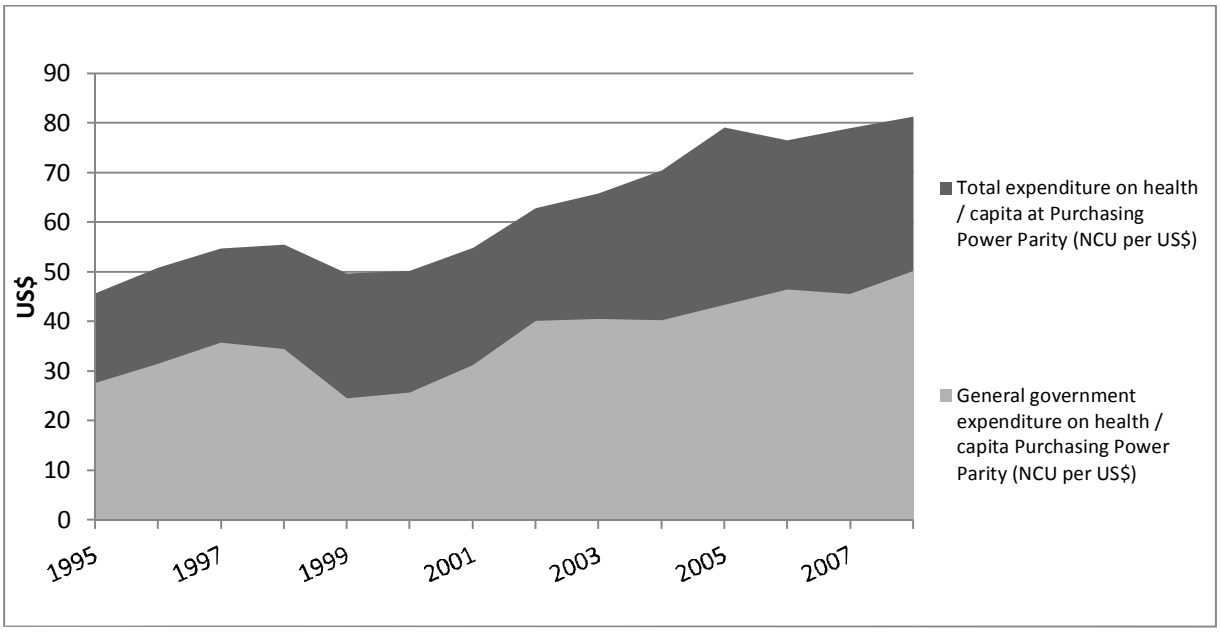
Source: WHO, 2010-b

The total health expenditure (THE) in Zambia amounted to 6.0% of GDP in 2008, which was down from 7.0% of GDP in 2005, but up from 5.7% in 2000 (WHO, 2010-b). The evolution of THE as a share of GDP can be seen in figure 2.1 above and its underlying data can be found in Annex II, table 6. In 2008 61.8% of the THE were government's discretionary funds. This amounted to 15.2% of its total government expenditures through which it has successfully lived up to its pledge to spend at least 15% of its budget on health (GRZ, 2005, p. 18). 32.1% of THE came from external sources which are part of government's share. Not included in the government's share is the 38.2% gained from private expenditures made by the Zambian people. In 2000, 51.3% of THE came from the Zambian government (17.8% of THE came from external sources that year) and 48.7% of THE came from private sources. Out-of-pocket private expenditure, one of the three components of private expenditure, made up 74.5% of private expenditure and 28.5% of THE in 2008 (WHO, 2010-b).

Per capita THE (at average exchange rate) was US$57 in 2007, up from US$18 in 2000 (WHO, 2010-a, p. 137). Per capita THE adjusted for power purchasing parity was $81 in 2008 and $79 in 2007, up from $50 in 2000. Per capita government expenditure on health (PPP) was $50 in 2008, $46 in 2007 and $26 in 2000. Furthermore, per capita government expenditures on health were estimated to be US$33 in 2007 and US$42 in 2008. The WHO estimated that a country such as Zambia needs a per capita expenditure on health of US$33 for it to deliver its Basic Health Care Package' (GRZ, 2005, p. 18). These estimates mean that Zambia performs well regarding its level of health spending.

During the period 1996 to 2002 Zambia's total spending on health fluctuated within a range of $18-26 (at market exchange rates) but increased to $34 in 2004. This was attributable mainly to an increasing share of donor funding (Goldsbrough and Cheelo, 2007, p. 3). Disease-specific vertical funds are the main driver behind the increase, of which PEPFAR (US President's Emergency Plan for AIDS Relief) is the most notable contributor (ibid., p. 4). The sharp rise in health spending in dollar terms has also been caused by appreciation of the Kwacha (ibid., p. 29). Figure 2.2 shows the per capita THE (PPP) and the per capita Zambian government's share (PPP) on health.

Figure 2.2 Per capita THE and government share, PPP average exchange rate, 1995-2008



Source: WHO, 2010-b

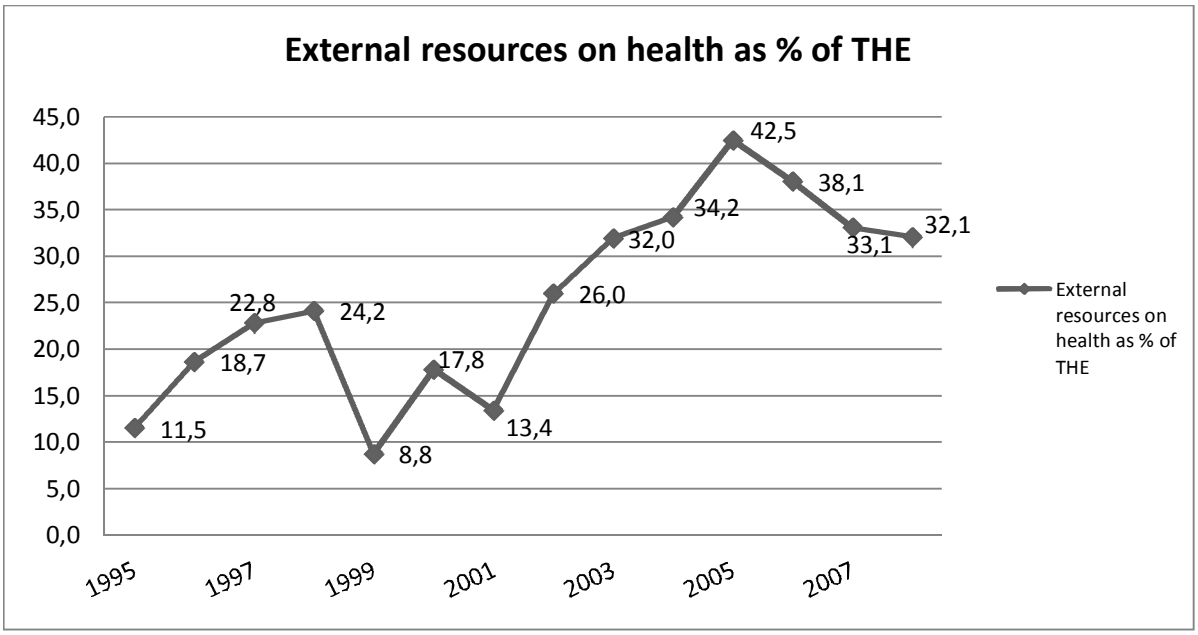
Health expenditure in Zambia is increasingly being devoted to administration. Disaggregating health accounting data into health service provision and administration reveals the increasing bureaucratization of health services. Since 2001, the percentage of MoH health expenditures going to service provision has decreased, while the percentage going to administration has risen sharply. Expenditures on administration have jumped from 14.8% of THE in 2001 to 30.8% of THE in 2004. By 2004, administrative expenditures accounted for 37.6% of total MoH expenditures. Among administrative costs, general administration at MoH consistently expanded since 2001, rising from 63.4% to 93.6% of total administration in 2004. The creation of two separate entities (MoH and CBoH) during this period largely accounts for this administrative intensity (Picazo and Zhao, 2009, p. 26, 27). The fragmentation of financing and service delivery following these reforms appears to have increased administrative costs. Administrative costs of donor-supported vertical projects incurred 50 percent of total administrative costs in the sector (ibid., p. 26).Thus, about a third of all health expenditure in Zambia is being used for activities not directly related to health service provision and the demands attached to donor funding are compounding this problem. The GRZ's share of total spending has been going down, but its discretion over health sector resources has been increasing due largely to donor support (Picazo and Zhao, 2009, p. 19). This subject is addressed below.

2.5 Cooperating Partners in Zambian Health Sector

External donors, called cooperating partners (CP) in Zambia, have come to play an increasingly important role in the Zambian health sector. Since the late 1990's their share in THE has risen sharply till about 2005, after which it settled, to rise again slightly in 2008 (see figure 2.3 below). External resources have increased 4-fold in real terms between 1995 and 2008. In that same period

government and private expenditure on health increased by a factor of only 1.5 (WHO, 2010-b). The contribution of external funds to total health expenditure as a percentage is shown in figure 2.5. Here one can see that in 2005 when external funds slacked its share of THE decreased sharply.

Figure 2.3 External resources for health in Zambia as percentage of total health Expenditure

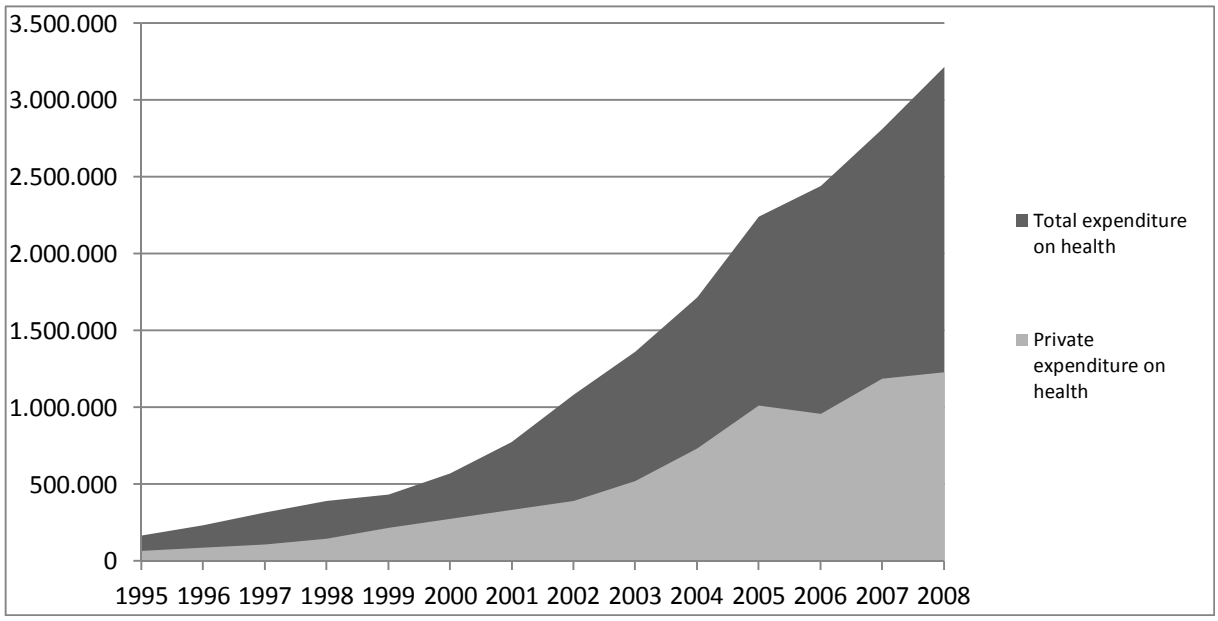


Source: WHO, 2010-b

2.6 Private Expenditure

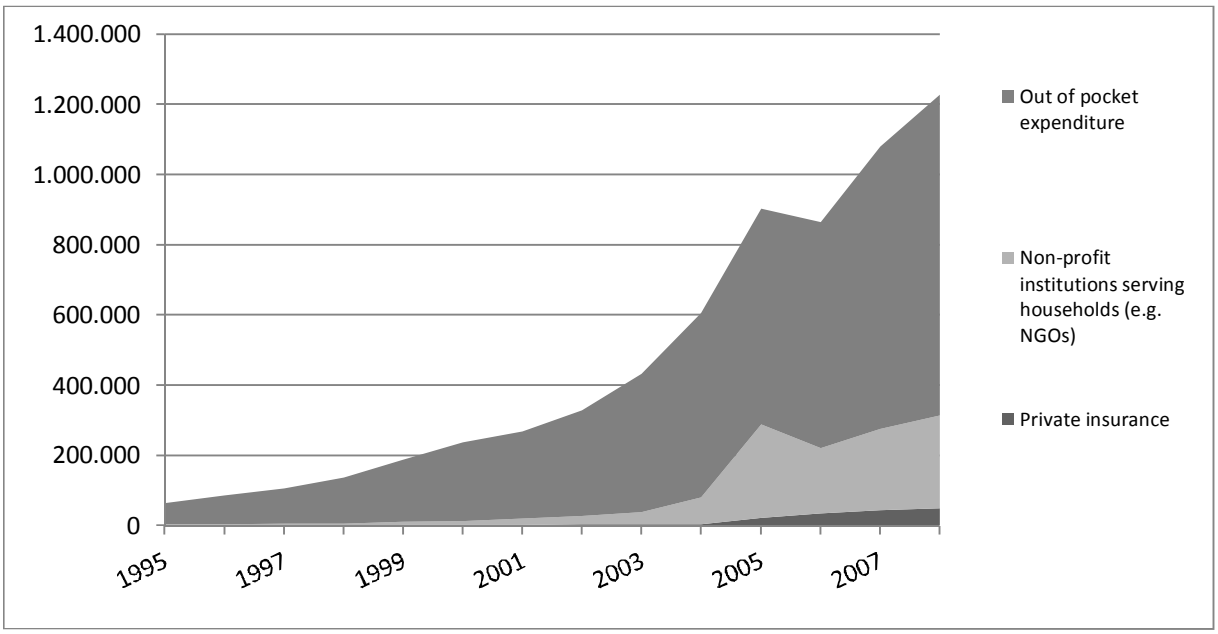
Another interesting development in health funding has been the rise of out-of-pocket expenditure as part of THE. Also the increasing share of non-profit institutions as part of the private expenditure is worth noting. As a share of THE private expenditure on health was the same in 2008 as it was in 1995. In nominal terms though, private expenditure has grown considerably over the years (see figure 2.4 below). Figure 2.5 also shows a sharp increase of non-profit institutions' share in private expenditure. These institutions, like NGO's for instance, have seen a 5-fold increase in real terms, whereas out-of-pocket's increase was only 1.3 times in the period 1995-2008, also in real terms.

Figure 2.4 Private expenditure as share of total health expenditure, 1995-2008



Source: WHO, 2010-b

Figure 2.5 Private health expenditure over time, 1995-2008



Source: WHO, 2010-b

2.7 Conclusion

Health indicators in Zambia are generally poor when ranked on a global scale. In comparison to its peers, that face similar health challenges, Zambia is performing reasonably well. The most striking phenomenon looking at its health indicators is the reverse in earlier improvements in life expectancy and mortality towards the millennium and the gradual improvement in the past decade. The main reason for this trend is the devastating HIV/AIDS epidemic, coinciding with a TB epidemic. During the last two decades, adult health has indeed been seriously affected by the HIV and tuberculosis co-

epidemic. The other major health problems facing Zambia include diarrheal diseases, malaria, acute respiratory infections, tuberculosis and malnutrition. With regard to some important health statistics, the following observations are described. The MMR has improved compared to 1990, but is still high. The IMR is at a high level. It is almost at the same level as in 1970.The U5-MR is also high and has not decreased over time. The life expectancy has dropped with more than ten years compared to 1980.

The health sector is seriously hampered by a human resource crisis which is partly to blame for high levels of maternal and child mortality. The main reason for staff shortages in Zambia is the country's low capacity to produce skilled professionals and the brain drain has contributed to this problem. Rural areas are more heavily affected by the human resource crisis than urban areas. Zambia's heavy reliance on external funding is problematic in this situation as donor funding is typically not directed at personnel emoluments or training facilities.

Zambia's health expenditure is just below the average level of itsl eight neighbouring countries (discussed in further detail in chapter 3). It is well in line though with, and in the past years has been above, the estimated per capita expenditure on health (US$33) needed according to the WHO to deliver a Basic Health Care Package. Nevertheless, these funds need to be applied to alleviate significant health challenges. Additionally, increases in Zambia's health expenditure are largely donor driven, which provides a complete new set of challenges in terms of securing sustainable funding of health care. The latter will be addressed in more detail in chapter 4.

Chapter 3 Zambian Indicators Compared

To get an idea of the performance of Zambia's health sector it is informative to compare the country's key health sector indicators to those of other countries in the region.

Zambia has borders neighbouring eight countries. Of these eight, three are middle-income countries, namely Angola, Botswana and Namibia, and the other four (Democratic Republic of Congo, Malawi, Mozambique, Tanzania and Zimbabwe) are, like Zambia, low-income countries (World Bank, 2010-b). A quick overview of the countries' main demographic and economic indicators is given below in table 3.1.

Table 3.1 Selected indicators of Zambia and neighbouring countries

	Population (million) 2007	**Urban population (%) 2010**	**GDP (billions of US$) 2007**	**GDP per capita (US$) 2007**	**Gini-index**
Angola	17.6	58.8	61.4	3,623	58.6
Botswana	1.9	61.1	12.3	6,544	61.0
Congo, Democratic Republic of	3.6	62.1	9.0	143	44.4
Malawi	14.4	19.8	3.6	256	39.0
Mozambique	21.9	38.4	7.8	364	47.1
Namibia	2.1	38.0	7.0	3,372	74.3
Tanzania	41.3	26.4	16.2	400	34.6
Zambia	12.3*	35.7	11.4	939	50.7
Zimbabwe	12.4	38.3	3.4	261	50.1

Source: UNDP, 2009 ; *This number diverges from the World Bank (2010)

The data discussed in the remainder of this chapter can also be found in annex I and II. Data are sourced from the WHO unless stated otherwise.

3.1 Health Sector Input

As discussed in the previous chapter, the total expenditure on health in Zambia constitutes 6.2% of the country's GDP. This is just under the average level of all eight neighbouring countries, which is 6.3%. As can be seen in annex I, table 3, Angola's total health expenditure relative to GDP at 2.5% is the smallest of the nine countries mentioned. Malawi's THE is at the other extreme making up 9.9% of this country's GDP. Namibian and Zimbabwean THE is also a relatively larger share of their respective GDP.

These figures are only a very general indicator because of the highly aggregate nature of both indicators. Angola's GDP for instance is relatively high compared to the other countries, but it has the same size population as Zambia. Even though Angola spends almost twice as much per capita on healthcare, THE as a percentage of GDP is still very low.

Government expenditure on health as a percentage of total government expenditure is more indicative in this sense. Zambia spends 14.5% of its total budget on health bettered only by Tanzania who spends 18.4% of its total expenditure on health. Both countries are well above the continent's average of 9.6% as well as the average of Zambia and its neighbours which is 11.3%. Namibia and Malawi are about average for Zambia's peer group at 11.1% and 11.9% respectively, whereas Mozambique allocates one percent point above the peer group's average, 12.6%. Botswana, Zambia's third biggest neighbouring economy on a GDP PPP basis, has a 13% government share in the country's total health spending.

Having controlled for size of budget and GDP it is important to also do this for population size. Zambia's per capita total health expenditure adjusted for purchasing power in international dollars ($81 in 2008) makes for not just an interesting indicator, but also a good basis for a country comparison. Per capita THE differs quite substantially among Zambia's neighbouring countries. Botswana and Namibia top the list with $762 and $467 respectively. Most of the $762 comes from the government of Botswana (74.6%), the remainder is privately sourced. Namibia's government is less of a big spender on health with only 42.1% of per capita THE coming from the government's coffers. The largest part of Namibian per capita THE comes from private sources (57.9%). The other middle-income country, Angola, lags far behind these two with $131 spent per capita per year on health.

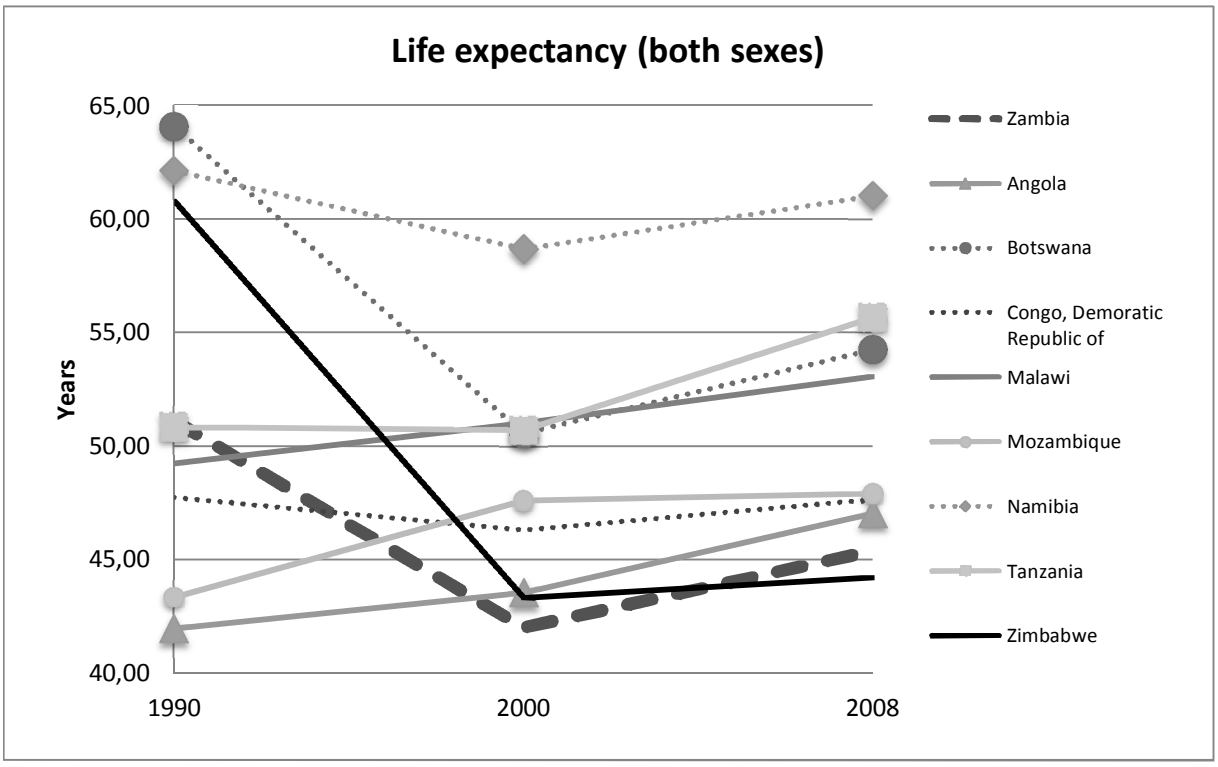
The remainder of Zambia's neighbours have a per capita expenditure that matches their low-income status. The DRC is by far the smallest spender on health of this group. Per capita total expenditure on health in the DRC is $17 per person per year. The Congolese government's share in this is only $4. In Zimbabwe the government spends $9 of the $20 per capita total health expenditure. Malawi spends 59.7% of per capita THE, which amounts to $30 of the total $60 per capita THE in the country. In Tanzania considerably more is spent per capita on health, with a total of $63 per head. Of this the country's government takes care of 65.8%. Mozambique spends less than Malawi and Tanzania, but almost doubles that of Zimbabwe. The $39 spend per head in Mozambique is mostly money coming from the government with the government share accounting for 71.8% of per capita THE.

One would expect that when a country spends more on health this will be evident in improved health service delivery and subsequently better health outcomes. Again, this is a rough indication which is subject to many other factors, but this can give a first glance at Zambia's performance. The following establishes if this is the case for Zambia in comparison to its neighbouring countries.

The biggest spender on health in the group, Botswana, scores better on most health outcome indicators except those for HIV/AIDS and tuberculosis. Influencing the HIV/AIDS and TB epidemic is a much more difficult task than fighting other diseases. The smallest spender in per capita PPP, the DRC, also does worse overall on the health outcomes than most other countries.

Zambia's life expectancy of 45 is in the lower ranges. Only Zimbabwe (44) has lower life expectancy than Zambia, whereas Angola has 47, and the DRC and Mozambique have 48. The other neighbouring states all have considerably higher life expectancies. The average Tanzanian, Batswana and Malawian lives respectively till 56, 54 and 53. In Namibia people are expected to live longest at their birth, up to 61 years.

Figure 3.1 Life expectancy over time in selected countries



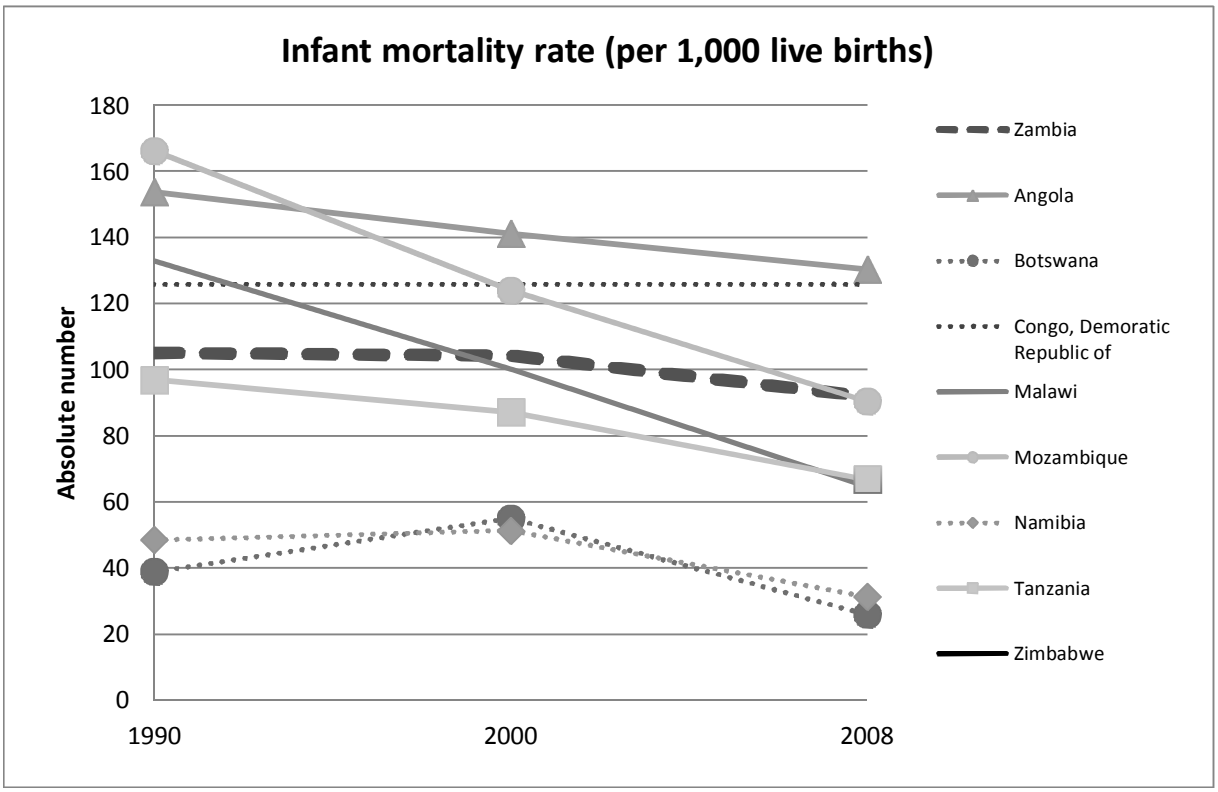
For data see Annex II, table 1 - Source: World Bank, 2010-b

Looking at healthy life expectancy (HALE, both sexes), Zambia performs even worse. Its HALE of 40 is just one year more than Zimbabwe's 39. Mozambicans have a HALE of 42, Malawians of 44, and Angolans, Tanzanians and Congolese all of 45. Again, Botswana and Namibia perform considerably better with a HALE of 49 and 52 respectively.

Zambia's infant mortality rate of 92 is only better than Angola (130) where a long civil war ended only eight years ago and the DRC (126) which is currently in an unstable security situation despite the 20,000 strong UN peacekeeping force stationed in the country.[3] Mozambique's IMR is almost the same as Zambia's at 90 deaths per 1,000 live births. Zimbabwe, Tanzania and Malawi have IMR ratios of 62, 67 and 65 respectively. Namibia (31) and Botswana (26) again perform best of the group. This is also the case with the under-5 mortality rate (U5-MR) and MMR. Zambia with a U5-MR of 148 per 1,000 only out-performs Angola and the DRC, with the other low-income neighbouring countries doing rather better. Zambia has though seen an improvement in its U5-MR in the past decade (see figure 3.3).

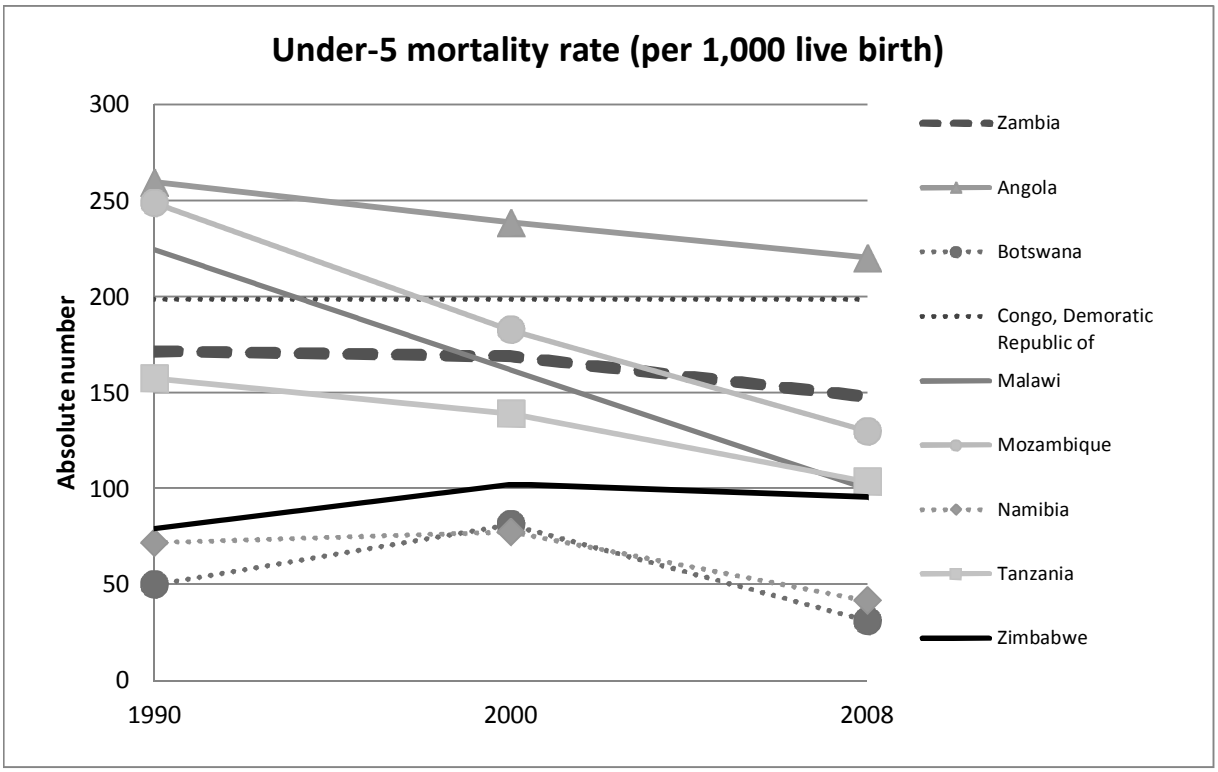
[3] http://www.un.org/en/peacekeeping/missions/monuc/facts.shtml

Figure 3.2 Infant mortality rate over time in selected countries



For data see Annex II, table 2 - Source: World Bank, 2010-b

Figure 3.3 Under-5 morality rate over time in selected countries



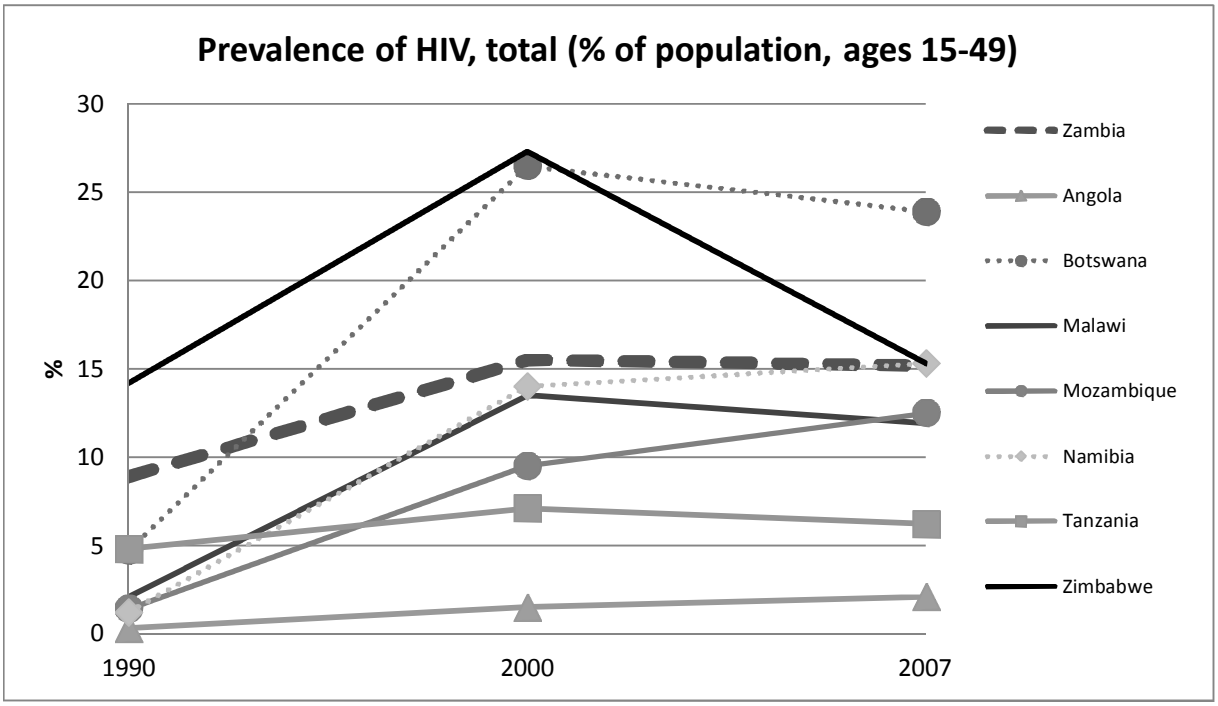
For data see Annex II, table 3 - Source: World Bank, 2010-b

One area in which Zambia is doing well is its MMR. It out-performs most neighbouring countries. The 591 women per 100,000 who die during or just after pregnancy are less than Angola's 1,400, the DRC's and Malawi's 1,100, Tanzania's 950 and Zimbabwe's 880. Mozambique does slightly better with 520 per 100,000.

Zambia does even better on the prevalence of underweight children (under 5 years). The level of 10.1% of Zambian children is lower than that of all other countries considered. The DRC scores highest here at 28.2%, closely followed by Angola with 27.5%. Mozambique has a high prevalence as well with 21.2%. Namibia and Malawi do better with 17.5% and 15.5% respectively. Botswana does just not as good as Zambia with 10.7%. For Tanzania there was no data on this indicator in the set.

The Southern African region is hit hard by the HIV/AIDS epidemic which is reflected in the prevalence figures of the countries discussed. Zambia has a prevalence rate of 15.2%. Namibia and Zimbabwe have almost identical prevalence rates of 15.3% in both countries. Botswana is hardest hit with a prevalence rate of 23.9%. Angola and the DRC have the lowest prevalence rates of HIV/AIDS with 2.1% and about 4% respectively.

Figure 3.4 Prevalence of HIV over time in selected countries



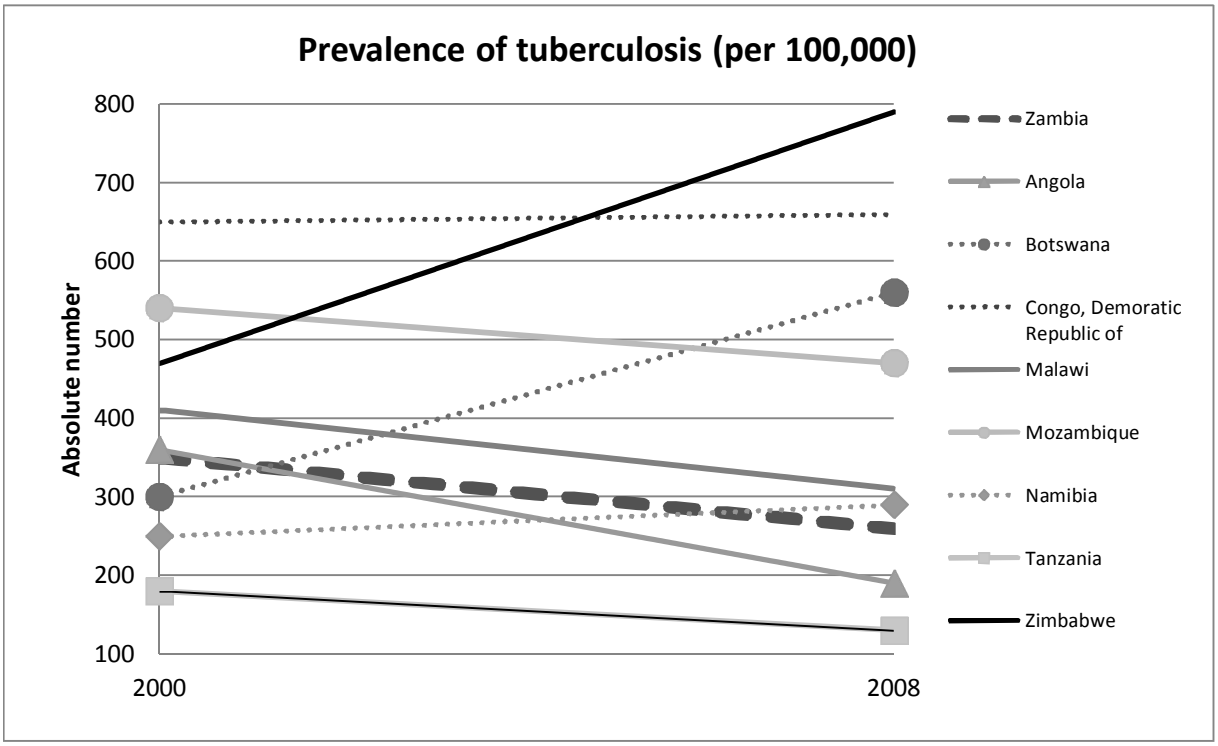
For data see Annex II, table 4 - Source: World Bank, 2010-b

Zambia is also troubled by a high incidence of endemic malaria. 244 people per 1,000 population were affected by malaria in 2008 (see table 6, annex I). Only Malawi had a higher incidence rate at 335.9 per 1,000. In the other countries, malaria was less widespread. Mozambique's incidence was still rather high at 215.9, as was Angola's at 190. The DRC (83.6) and Zimbabwe (80.5) were better off, as was Namibia with 56.2. In Botswana only 9.3 cases of malaria per 1,000 population were reported. In Tanzania it was a mere 0.2 cases per 1,000.

Zambia has improved its prevalence rate of TB in the period 2000-2008, as have several other countries in the region. This trend is difficult to explain, first because some neighbouring countries see

an increase in TB prevalence (Namibia and Botswana), and second, because one would expect that with stable or increasing HIV/AIDS prevalence rates TB-rates would show similar trends. A declining TB-prevalence could be the effect of health measures or it could also be related to under-diagnosis of the disease, for example due to insufficient laboratory facilities.

Figure 3.5 Prevalence of TB over time in selected countries



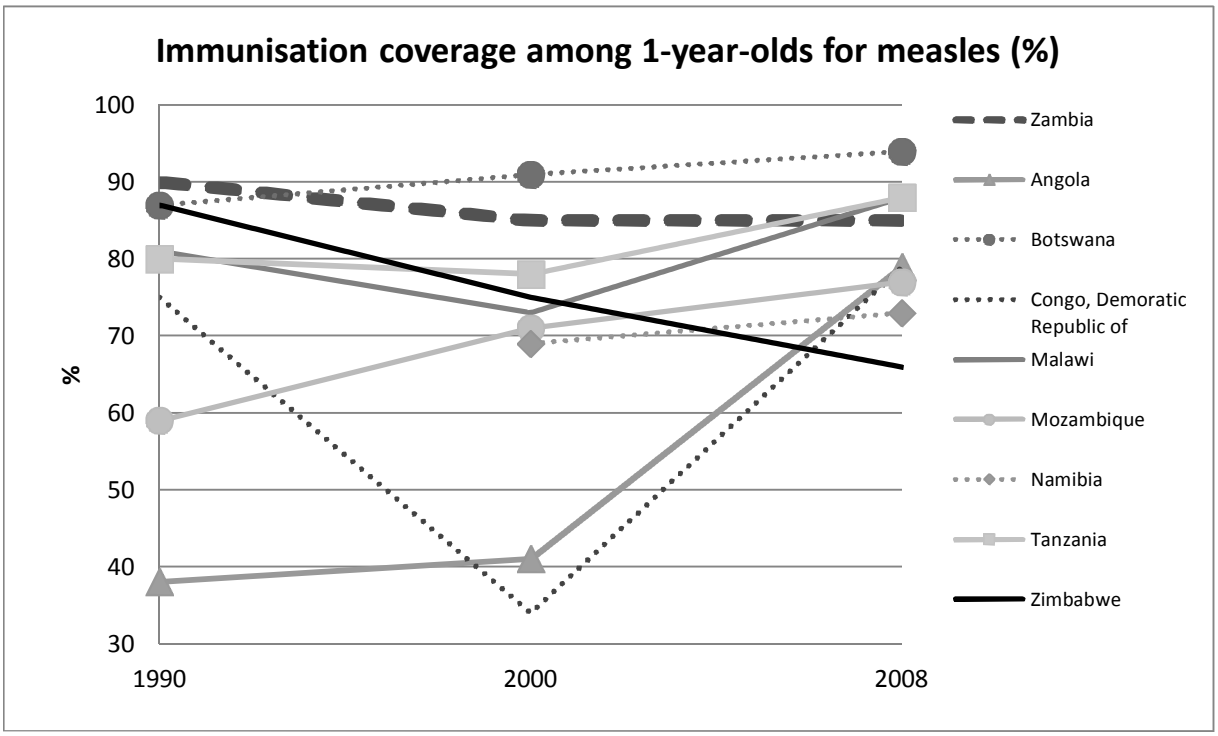
For data see Annex II, table 5 - Source: World Bank, 2010-b

3.2 Health Coverage

Table 2, Annex I, shows different health service coverage indicators which reflect the extent to which people in need actually receive the specific healthcare associated with the indicators in Zambia and the eight neighbouring countries. The selected health service coverage indicators are (1) the immunisation coverage among 1-year-olds for MDG 4 measles in 1990, 2000 and 2008, (2) the antenatal care coverage for at least 1 and at least 4 visits, (3) the percentage of births attended by skilled medical personnel, (4) the contraceptive prevalence rate, (5) the percentage of children under 5 sleeping under insecticide-treated nets, (6) the percentage of children under 5 with ARI symptoms taken to facility, (7) the percentage of children under 5 with diarrhoea receiving ORT, (8) the percentage of children under 5 with fever who received treatment with any antimalarial, and (9) the percentage of births by caesarean section.

First, the immunisation coverage in Zambia among 1 year-olds for measles (MDG 4) is among the best in the region. The indicator does however show a slight downward trend for Zambia in the period 1990 to 2008 (90% to 85%). Only three of its neighbours have a higher coverage of which two do only slightly better.

Figure 3.6 Immunisation coverage among 1-year-olds for Measles in selected countries



For data see Annex II, table 6 - Source: World Bank, 2010-b

Second, the antenatal care coverage in Zambia for at least 1 visit (94%) as well for at least 4 visits (72%) is among the highest compared to the eight other countries. Only Botswana has higher antenatal care coverage for at least 1 visit (97%) and at least 4 visits (97%). On the other hand, Tanzania has the lowest coverage for at least 1 visit (76%), while the lowest coverage for at least 4 visits is in the DRC.

Third, 47% of the births in Zambia are attended by skilled medical personnel. This percentage is low compared to the majority of the eight countries. For instance, the percentage in Botswana is twice as high, and in Namibia 1.7 times higher than in Zambia. In contrast, the births in Angola, Mozambique and Tanzania are as often attended by skilled medical personnel as in Zambia.

Fourth, the contraceptive prevalence rate in Zambia is 40.8%, which is 6 percent point higher than the average contraceptive prevalence rate of the nine countries. There are huge differences between the countries. For example, the contraceptive prevalence rate in Angola is 6.2%, while the rates for Zimbabwe and Namibia are respectively 60.2% and 55.1%.

Fifth, the percentage of children under 5 that sleep under an insecticide-treated net is 41% in Zambia. This number is relatively high compared to Angola, Botswana, Congo, Malawi, Mozambique and Tanzania[4].

Sixth, 68.2% of the children under 5 with acute respiratory infection (ARI) symptoms are taken to a facility in Zambia. The percentage for Namibian children under 5 is slightly higher (71.5%), while Zimbabwean children under 5 with ARI symptoms are taken to facilities in 26.3% of the cases.

[4] Data for Botswana and Namibia are missing.

Seventh, the number of children under 5 with diarrhoea that receive ORT is relatively similar to the number of children under 5 with ARI symptoms that are taken to a facility in Zambia (66.8%), Malawi, Mozambique, Namibia and Tanzania. In contrast, in Zimbabwe, children under 5 with diarrhoea receive ORT, in 61.6% of the cases, while ARI symptoms are treated in 26.3% of the cases, as mentioned above.

Eighth, the percentage of children under 5 with fever who received treatment with any antimalarial (43%) is above average in Zambia compared to the other countries considered. The use is only relatively higher in Tanzania (58%). On the other hand, the percentage of use when needed is only 5% in Zimbabwe, while the use when needed ranges between 23% and 30% in Angola, Congo, Malawi, Mozambique and Namibia.

Ninth, the percentage of births by caesarean section is 2.1% in Zambia, which, together with Mozambique (1.9%), is the lowest compared to the other countries. Again, Botswana and Namibia show to have divergent percentages from the rest, respectively 7.7% and 12.7%.

3.3 Staffing Levels Compared

Table 4 (see Annex I) shows the number and density per 10,000 inhabitants of (1) physicians (2) nurses and midwifes, (3) dentistry personnel, (4) pharmaceutical personnel, (5) public and environmental health workers, (6) community health workers, and (7) hospital beds in Zambia and eight neighbouring countries.

For each of the nine countries nurses and midwifes form the largest subgroup of the healthcare sector workforce. But we observed significant differences between the countries. For instance, in Zambia and Zimbabwe, there are 7 nurses and midwifes per 10,000 inhabitants, while the density of nurses and midwifes is considerably lower in Malawi, Mozambique and Tanzania, while significantly higher in Botswana and Namibia.

A similar pattern is found with regards to the number of physicians, although the absolute number of physicians is lower than the number of nurses and midwifes. Remarkably, Malawi, Mozambique and Tanzania have an extremely low density of physicians, less than 0.5 per 100,000, without showing unfavourable health statistics per se.

Finally, the number of hospital beds per 10,000 inhabitants is found to be the highest in Zimbabwe (30). Almost double that of Zambia (19). The number of hospital beds per 10,000 inhabitants is the lowest (8) in the following countries: Angola, Congo and Mozambique.

3.4 Conclusion

Zambia is out-performed by its richer neighbours, Namibia and Botswana, on most of the discussed indicators. But the other neighbouring countries have a similar level of healthcare spending at PPP or even less at average exchange rates. Nonetheless, these countries perform on a roughly similar level looking at the health indicators. We have described some differences with regard to specific indicators, from these rough measures it follows that Zambia has a remarkably low life expectancy, high

prevalence of HIV/AIDS and relatively high child mortality. The country does well in terms of maternal mortality and measles immunisation as well as TB and malaria incidence.

Finally, when looking at the ensemble of figures in this chapter one is struck by the striking similarity of trends across countries in terms of many indicators. This suggests that indicator differences between 1990, 2000, and 2007/8 are not just reflecting random fluctuation over time, but that there is a time pattern, common to many countries in the region. In terms of health, and perhaps driven by the HIV/Aids epidemic, the 1990s do appear to be a 'lost decade' for many countries in Sub-Sahara Africa.

Chapter 4 Health Policy

This chapter provides a description of Zambia's health policy and also an analysis of how this policy tries to address the dire state of the population's health highlighted in previous chapters. First, the background of Zambia's health sector policy will be given. This is followed by the current structure of the Zambian healthcare system which will be divided into the delivery structure and its management structure. Following this is the policy focus of the Ministry of Health and an example from a leading cause of death in Zambia, HIV/AIDS.

4.1 Background

The 'Health for All' (HFA) policy and the 'Primary Health Care' (PHC) strategy formulated by the World Health Organisation (WHO) in 1978 during the conference in Alma Ata, is considered the first global attempt to organise health services in low income countries to provide equity of access to quality care that addresses the basic health needs of all people. The PHC strategy aimed at replacing the thus far mainly hospital based and curative oriented health services as well as disease specific special programs, by preventive and promotive services as close as possible to the community (Bosman, no date).

However, in Zambia and many other low-income countries in sub-Saharan Africa the reform attempts were severely hampered by economic recession, debt crisis, structural adjustment programs and shrinking donor support. The overall health situation in these countries was then further worsened, in particular by the HIV-pandemic, increasing demographic pressure and urbanisation as well as the general continuation of poverty.

The story of Zambia in this regard is no exception. Falling copper prices and the worldwide energy crisis of the mid-1970's led to a massive decline in government revenues. Due to extensive borrowing, an overvalued exchange rate and subsidies on consumer goods, an external debt of about US$7 billion was created by the end of the 1980's (ibid.).

The new government elected in 1991 was faced with a multitude of problems in the health sector: a rundown physical health infrastructure, epidemics of cholera, tuberculosis, HIV/AIDS and endemic malaria as well as a chronic shortage of drugs and medical supplies, demoralised health workers, uncontrolled population growth and an antiquated health management structure unresponsive to the prevailing health needs (ibid.).

In 1991 the Movement for Multiparty Democracy formulated new National Health Policies and Strategies which were to address these problems. The Corporate Plan for Implementing National Health Policies and Strategies and the National Health Policies and Strategies, both published in 1992 provide the blueprint for the Health Sector Reform in Zambia. In 1995, Zambia's parliament adopted the National Health Services Act paving the way for a radical reform of the country's health services. Through this act the responsibility for the implementation of health services was delegated to autonomous national, district and hospital boards. The boards are financed from a national 'basket' in which funds of the government and donor countries are pooled.

Bosman describes in his white paper for the Stop TB initiate how poor implementation of the Health Care Reforms (HSR) in Zambia affected the National Tuberculosis Program (NTP) that was funded since 1988 under a bilateral agreement between the Governments of Zambia and the

Netherlands, which completely collapsed under the Health Care Reforms. The report outlines that the HSR concept developed in Zambia offered theoretical opportunities for TB control, though also having a number of inherent risks. In practice, however the HSR had disastrous effects on the NTP and the control of TB. With the expiry of the bilateral agreement on 31 December 1997, the external funding of the NTP ended. Since the 'basket' did not fund special programs, de facto the NTP ceased to exist on 1 January 1998. Furthermore, as the Government of Zambia failed to secure the procurement of anti-TB drugs in time in 1997, the country ran out of anti-TB drugs at the end of the second half of 1998.

This adverse outcome of the HSR in the 1990's can be attributed to a list of different factors. The blueprint of the HSR was mainly developed by a small group of policymakers and (external) technical advisers. Additionally, the blueprint was based on a number of principles, which in practice were non-negotiable. Furthermore, a crucial factor was that the HSR was heavily dependent on external funding, while the Government of Zambia could not commit itself sufficiently due to the adverse economic situation.

The management structures of the above-mentioned reforms were mostly undone. In 2006, government decided that the structure was too labour intensive and the CBoH duplicated many functions already performed at the MoH. Subsequently, it put the management and control of the country's health facilities and services back with the MoH through its control of the Provincial Health Offices (Picazo and Zhao, 2009:6). The functions, staff and assets of the Central Board of Health were put back under the MoH. The public participation in the management of health services, which the CBoH had to facilitate, is now the responsibility of newly devised advisory councils (GRZ, 2005, p. 10). These developments follow a long period of reforms, of which the collapse of TB control is illustrative.

4.2 Current structure of the Zambian Healthcare System

4.2.1 Delivery structure of the healthcare system

The MoH, through the Provincial Health Offices, has three facility types through which it delivers health services to the Zambian people. Health posts are intended to service some 3,500 people in rural areas and 7,000 people in urban areas, or at least within 5 kilometres radius in sparsely populated areas. The target is to have 3,000 of these health posts, but currently only 171 exist (GRZ, 2005, p. 11; GRZ, 2009, p. 11).

Health centres are divided into two subgroups, Urban Health Centres (UHC) and Rural Health Centres (RHC). The UHC are intended to serve some 30,000 to 50,000 people and RHC a catchment area of 29 kilometre radius or a population of 10,000. For these centres the target is to have 1,385, but currently there are 1,294 (1,029 RHC and 265 UHC) (GRZ, 2009, p. 11).

The third type of facility is the hospitals. Subdivided into three levels, there are first level referral hospitals, second level general hospitals and third level central hospitals. First level referral hospitals serve populations 'between 80,000 and 200,000 with medical, surgical, obstetric and diagnostic services, including all clinical services to support referrals from health centres' (Picazo and Zhao, 2009, p. 6). Zambia has 72 of these hospitals, which are found in most of the country's 72 districts (GRZ, 2009, p. 10-12).

Second level general hospitals are meant to cater for 200,000 to 800,000 people and operate at the provincial level. They provide services in internal medicine, gynaecology, dental, psychiatry and intensive care services as well as general surgery, paediatrics and obstetrics (GRZ, 2005, p. 11). The 21 second level hospitals in the country are meant to function as referral centres for the first level hospitals. The 21 hospitals are not evenly distributed over the country though as Southern and Copperbelt provinces have 3 and 9 of this level hospital respectively (GRZ, 2009, p. 11).

The central hospitals are the third level and are for catchment areas of 800,000 and above. They have sub-specialisations in for instance internal medicine, surgery, training and research. In 2008 there were 6 third level hospitals of which three are in Copperbelt Province and three in Lusaka Province (GRZ, 2009, p. 11,12). Table 4.1 summarizes.

Additional facilities are provided by private and mission parties. Of the total 1,564 health facilities recorded in Zambia in 2008, 1,355 were government owned, 92 privately owned and 117 were owned by missions (GRZ, 2008, p. 12). The facilities that are government-owned fall under three different ministries: MoH, Ministry of Defence and Home Affairs (ODI, 2009, p. 8).

Table 4.1 Healthcare facilities on different levels

Level	Population served	Institution	Number of facilities
Village	3,500-7,000	Health Post	171
Health Area	30-50,000 about 10,000	Urban Health Centre Rural Health Centre	1294
District	80-200,000	Referral Hospital	72
Province	200-800,000	General Hospital	21
Nation	> 800,000	Central Hostpital	6

Source: See text.

4.2.2 Management structure of the healthcare system

The goal of the Zambian health sector is 'to provide equity of access to assured quality, cost-effective and affordable health services as close to the family as possible' (GRZ, 2005, p. I). To attain this, the country relies on a network of clinics and hospitals throughout the country. The National Health Services Act of 1995 provided for 'popular' and 'technical' management structures. The popular structures included Boards of Health at the Central, District and Hospital level, as well as local committees at the community level. Technical management was in the hands of Management Teams at the national, district, and hospital levels. This dual system was abolished in 2006, officially to avoid duplicating functions and responsibilities, also considering the lack of human resources in the health sector. Currently, responsibility for hospitals is with the District Health Management Teams and management and control of all public health facilities and services falls directly under the Ministry of Health, through the Provincial Health Offices.

4.3 Policy Focus

In 2006 the Zambian government published its Vision 2030. The Vision 2030 forms the latest overarching plan for Zambia's development. The health sector is an integral part of this. Generally, poor levels of health as shown by indicators as IMR, MMR and life expectancy are recognised as obstacles to the country developing towards a middle-income country by 2030 (GRZ, 2006, p. 24). High prevalence of HIV/AIDS is seen as the main contributor to the steadily declining life expectancy (ibid.). Fighting the burden of disease and improving healthcare services are thus seen as essential to socio-economic development. This is done through striving towards the MDGs, increased access to health facilities and availability of health workers (WHO, 2009, p. 10).

The implementation of Zambia's sector reform policy and Vision 2030's developmental goals are guided by the National Health Strategic Plan (NHSP) of which the fourth is currently in place covering the period 2006 to 2010 (GRZ, 2005, p. 9).

The NHSP's goal is to 'further improve health service delivery in order to significantly contribute to the attainment of the health Millennium Development Goals (MDGs) and national health priorities' (GRZ, 2005, p. 21). Out of the eight MDGs, goal 4, 5, 6 are directly related to the performance of the health sector. Apart from the MDG on child mortality, maternal health, and HIV/AIDS, malaria and other diseases the Zambian government focuses on ten priorities. These are grouped in four categories: Human Resource Crisis, Public Health Priority Interventions, Clinical Care and Diagnostic Services Priorities (GRZ, 2005, p. 22). The ten corresponding priorities can be found in table 4.2.

As one can see from the table, the government's priorities include a broad range of issues that cover many aspects of the health sector. Taking into account the limited amount of resources and the size of the country's health challenges, it is important that a more detailed working programme and matching budget is brought into place. We would advise additional research into these matters in order to get a better impression of the needs and challenges to reach the objectives set out below in the table.

Table 4.2 GRZ Priority areas for 2006-2010		
I	**Human Resource Crisis**	
	1.Human resources	To train, recruit and retain appropriate and adequate staff at all levels
II	**Health Service Delivery Priority Interventions**	
	1. Basic healthcare package	
	2.Public Health Priority Interventions	
	2.1-Child health and nutrition	To reduce the child mortality rate under five years old.
	2.2-Integrated reproductive health	To reduce the maternal mortality rate (MMR)
	2.3-HIV/AIDS, TB and STI's	To halt and begin to reduce the spread of HIV, TB and STI's through effective interventions
	2.4-Malaria	To reduce the incidence and mortality due to malaria
	2.5-Epidemics & Public health	To improve public health surveillance and control of epidemics
	2.6-Environmental health and food safety	To promote and implement appropriate interventions aimed at improving hygiene, access to basic sanitation, safe water and safe food.
III	Clinical care and diagnostic services priority interventions	
	3.1-Essential drug and medical supplies	To ensure availability of essential drugs and medical supplies at all levels
	3.2-Infrastructure and equipment	To ensure availability of appropriate infrastructure and equipment at all the levels, including the availability of basic services such as water, electricity and telecommunication at all health facilities
IV	Priority integrated support systems	
	1. Health research and development	
	2. Systems strengthening and health sector governance	To strengthen existing integrated operational systems, financing mechanisms and governance arrangements for effective policy implementation and delivery of health services
Source: GRZ (2005) National Health Strategic Plan 2006-2010, p. 22		

Below a discussion is added on the HIV/Aids crisis in Zambia. It serves as an illustration of how Zambia's health policy is implemented and what its effects are. Another priority area in Zambia's health policy is malaria. Malaria policy has been fairly successful, as will be discussed in more detail in Section 7.1.

4.5 HIV/AIDS

Zambia has made significant efforts in responding to the HIV/AIDS epidemic that has severely hit the country. The country has developed policies and guidelines for both testing and treatment of HIV/AIDS. The HIV testing policy requires full pre-test counselling. It also requires that diagnostic testing and counselling be offered to people living with HIV/AIDS as part of a comprehensive HIV/AIDS care package. As early as 1987, an emergency plan on safe blood supply was launched by the government. All district, provincial and central referral hospitals have blood transfusion facilities. All blood products used here are required to be screened for HIV (WHO, 2005-b). In December 2002, the National HIV/AIDS/STI/TB Council (NAC) was established to coordinate the national multisectoral response. The NAC is made up of representatives from government, nongovernmental organizations, mass media, youth and the private sector, as well as religious and traditional leaders, and integrates the participation of multilateral and bilateral agencies. The National HIV/AIDS/STI/TB Intervention Strategic Plan 2002–2005 was developed with the following priority interventions: promoting behaviour change, reducing mother-to-child transmission, ensuring safe blood transfusion, providing care, treatment and support to people living and affected by HIV/AIDS, improving care and support for orphans and vulnerable children and strengthening multisectoral coordination of interventions (WHO, 2005-b). As a way of increasing access to health care and in particular to HIV/AIDS related services, in April 2006, the government of Zambia abolished user fees for primary health care in rural areas (GHIN, 2008, p. 10). A high-level Cabinet Committee on HIV/AIDS has also been established to provide policy direction and regularly report to the Cabinet on HIV/AIDS issues (WHO, 2005-b).

Key initiatives in the past decade have included involvement from civil society organizations of people living with the disease and a coordinated multisectoral approach by Zambia's donors involved in bilateral, multilateral and global HIV/AIDS initiatives (GHIN, 2008, p. 9). Three global HIV/AIDS initiatives have contributed the largest direct external funding to scaling up HIV/AIDS prevention, treatment and care in Zambia since the introduction of, initially domestically funded, ART in 2002: the US President's Emergency Plan for AIDS Relief (PEPFAR), the Global Fund to Fight AIDS, TB and Malaria (GFATM), and the World Bank Multi Country AIDS Program (MAP) (GHIN, 2008, p. 7). The MoH initiated pilot, public sector ART programs at the country's 2 largest hospitals. These programs filled to capacity almost immediately, which made evident to Zambian decision makers that the sheer magnitude of the nation's AIDS epidemic would far outstrip not only the number of available physicians but also the ability of the existing hospital system to cope.

The Global HIV/AIDS initiatives (GHI) provided resources to this end. They included actual financial resources to purchase the antiretrovirals, support for upgrading clinics and hospitals as well as a variety of technical support functions (Hanefeld, 2009, p. 5). About 70% to 80% of ART provision in Zambia is, directly or indirectly, being supported by external donors (Hanefeld, 2009, p. 8).

Findings show that significant scale-up of HIV/AIDS services has occurred between 2004 and 2006, which have stretched Zambia's health system's capacity including human resources and district coordination of services (GHIN, 2008, p. 7).

Zambia's room to manoeuvre in reaction to these findings is very limited since it has little influence on policy formation regarding the HIV/AIDS epidemic. This is because the country relies so heavily on the GHI resources for its national treatment programmes. National treatment targets for

Zambia are developed based on discussions with the GHI's and are led by their own targets and priorities. This demonstrates close coordination, but also how the country's national policy process regarding ART has been shaped by GHI's' (Hanefeld, 2010, p. 97).

The WHO reports that 'the high prevalence of HIV-related illness in Zambia has seriously overburdened the health care system at all levels, accentuating the burden on a thinly stretched workforce whose numbers are also diminishing due to HIV/AIDS' (WHO, 2005-b). GHI's, 2010, p. 98). The situation is further exacerbated by the emigration of skilled health workers to other countries as discussed in chapter 2. Health infrastructure is particularly constrained in rural, remote areas. Apart from addressing these constraints the WHO also advises that systems for drug procurement and supply management be strengthened (WHO, 2005-b).

4.6 Conclusion

Zambia has seen fundamental changes in its health sector in the past decades. This chapter has endeavoured to provide a description of the Zambian healthcare policies, and tries to establish links with the findings on health statistics provided in Chapters 2-3. Many of our findings should be placed in the context of a period of health sector reform from the mid 1990s. The HSR-plan was prepared at a time when the country and, in particular, the health sector, was facing significant changes and challenges, including: high disease burden, compounded by the HIV/AIDS epidemic; critical shortages of health personnel; deteriorating health infrastructure; significant legal reforms; on-going restructuring of the health sector; a weak economy; and inadequate funding of the health sector. All these factors have significant implications on the organization and management of the health sector. Despite its challenges the sector has seen successes. Malaria is a good example of this.

The country's fight against HIV/AIDS is illustrative of the mixed blessing donor support is to a country. Without the GHI's Zambia would not be able to provide the same coverage of ART, but in turn it would not have its health workforce stretched as much either and it would have more autonomy in policy-making. Healthcare insurance schemes may provide a nation in the long run with a higher quality of services, a higher willingness to pay for insurance and a higher capacity to pay. This will result in a better and more sustainable health infrastructure to the benefit of people with low income, contributing to a healthier and more productive population.

Today's funding constraints in the global economic crisis are real and acute, and Zambia will not be able to escape them. Many people now see the possibility of achieving universal access to antiretrovirals by 2015 as an unrealistic dream. Too many donor governments have withdrawn or capped their financing of the Global Fund, which is one the largest international financing mechanisms for HIV/AIDS work. Zambia's dependency on donor support is a risky situation, and budget shortfalls are limiting the reach of life-saving programs. In our view Zambia should focus on sustainable financing and accountable delivery of healthcare services, while ensuring that the demand for and supply of healthcare develop hand in hand.

Chapter 5 Data Sources for Impact Evaluation

In chapters 6 and 7 two data sources are used, sometimes in linked form: administrative health data and household survey data. These sources make it possible to consider sector-wide impacts, unlike other data sources which are limited in space (e.g. a particular village) or scope (e.g. a single health policy). The statistical methodology relies on linking local differences in outcomes to local differences in policy. This makes aggregate data inappropriate. Instead we will use data at the level of individuals, households or (at most) districts.

The Ministry of Health maintains a health management information system (HMIS). This contains data at the level of health facilities (health posts, clinics, hospitals) for the period 2000-2009. The Ministry has kindly given us access to these data at the level of district aggregates. Since Zambia has 72 districts this constitutes in principle a very useful set of panel data, especially since the districts enjoy a certain degree of autonomy. The HMIS reports three types of variables. First, the human resources used at the various facilities: doctors, trained midwives, traditional birth assistants etc. The HMIS also records in some detail the material resources, notably the stocks of various medicines. Secondly, there are financial data on income and expenditure. Finally, there is a record of the nature of diseases (diagnoses), the treatment given and the mortality of patients at the facility.

The HMIS is in principle an invaluable data source for any analysis of health services in Zambia. The system forms the basis for the aggregate information (at the national and provincial level) reported in the *Annual Health Statistics.* There is also much scope for using the data at a much lower level, for example to analyse differences in human resources or drugs availability at the level of health facilities. It is our impression that this potential is not yet fully exploited. We would like to encourage the Government of Zambia (at all levels) to make more use of this data base. More intensive use of the HMIS requires some investment in improving the data base. We discovered some errors in the HMIS but these could be avoided with fairly simple data checking methods. This need not be costly.

We have made extensive use of the HMIS but this *caveat* should be kept in mind: our conclusions are partly based on data which are imperfect. There also is a fundamental problem involved in the use of data collected at a health facility. Inevitably, the data record information for a special subgroup of the population: those who came to a heath facility to seek treatment or advice. Clearly, this group is not representative. This presents a major problem, in statistical jargon: a selection effect. For example, if the HMIS data show an increase in the number of children with diarrhea there are two, radically different, explanations. Prevalence of diarrhea may have increased in the population. Alternatively, prevalence may have stagnated or fallen but the number of mothers who take a child suffering from diarrhea for treatment has risen, because the distance to a facility is reduced, because it is better staffed or reported to be better equipped. Obviously, if one relies exclusively on the HMIS data one may consider a policy that was successful as a failure and vice versa. This does not mean that this data source cannot be used. In principle the HMIS can be extremely useful. We illustrate in chapter 7

how it can be used while dealing in a rather simplistic way with the selection effect. In chapter 8 we revisit this issue and deal with selectivity in an alternative way.

The second source of data is the Demographic and Health Surveys (DHS). These are available for 2001/2 and 2007. (We have not used the Living Conditions Measurement Surveys (LCMS) since they are less informative on health issues.) The DHS is based on a (stratified clustered) random sample among households. The collected health data therefore do not suffer from a selection bias. While this is a great advantage compared to the HMIS, there also is a drawback: the health data are self-reported. The questionnaire asks questions about symptoms which can be observed by a lay person: fever, rapid breathing, coughing with blood etc. Since the respondents have no medical training this is appropriate but it implies that the DHS data provide a noisy measure of, for example, malaria prevalence. A second drawback is that the DHS samples differ from one survey to another: this is not a panel dataset (not even at the level of districts). We show in chapter 8 that there still is scope for using the DHS data, by linking them to the HMIS data at the district level. This is feasible since the location of households is recorded in the 2007 survey in terms of GPS coordinates.

Chapter 6 Analysis of District Health Data

In this chapter we first analyse the trends in health expenditure at the district level. These are then linked to changes in outcomes. For example, are differences in expenditure driven by differences in diseases burden? Is an increase in district level expenditure (possibly as a result of budget support) reflected in improved service levels: more vaccinations, higher stocks of antibiotics etc.?

The analysis is based on information in the HMIS data base. It demonstrates how conclusions on the impact of public health policy can be drawn from administrative data using statistical techniques of inference. We use the HMIS at the district level. That amounts to a panel data set of 72 districts with data covering the period 2000-2010: for each district there is a time series of each item present in the HMIS, although there can be missing years for some items. Such a panel allows one to study the correlation between, say, district-level health expenditure and health outcomes.

Although valuable in itself, correlation does not immediately reveal the direction of causality: one might hope to find that increases in health expenditure lead to better health outcomes, but it could be that district health expenditure is mostly driven by long-run differences in disease prevalence between districts. It is therefore important to disentangle such different determinants of the relationship between health expenditure and health outcomes. The statistical technique of "difference in difference" estimation allows this: instead of looking at the correlation between health expenditure and outcomes directly, one analyses the relationship between *changes* in expenditure and *changes* in outcomes. This relationship allows interpreting correlations found in the data as causal under relatively mild conditions. In principle the HMIS is therefore an ideal basis for analyzing public health issues in Zambia without having to resort to costly collection of survey data, provided that the selection problem (discussed in chapter 5) can be properly addressed. In this study we exploit this potential by using HMIS data at the level of districts, but one can also use the data for individual health facilities.

6.1 Expenditure

The HMIS contains data on total expenditure at the district level. Despite decentralisation the real value of that expenditure has not increased over the last decade in per capita terms. Table 6.1 summarizes the data. The first column in the Table gives real per capita health expenditure in districts. Note that the HMIS does not contain data for 2009 and 2010 so that the recent increase in spending is not reflected in the Table. There are big differences between districts in the levels of expenditure. Therefore the second column controls for district fixed effects. However, this does not change the general pattern of the findings: an increase until 2003-2005, and from then on a strong decline.

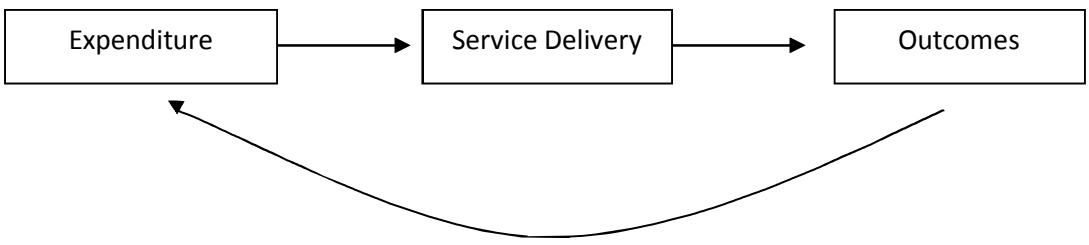
Table 6.1 Trends in District Health Expenditure

year	real per capita expenditure (population weighted)	real per capita expenditure controlling for district differences (population weighted)
2000	34.0	36.0
2001	51.0	51.4
2002	55.0	56.4
2003	53.6	54.6
2004	49.8	50.9
2005	55.2	51.9
2006	35.0	35.3
2007	40.9	41.3
2008	37.2	31.3

Source: HMIS. Price level 2000.

The rather large changes beg the question what determines those changes in the allocation of funds across districts. (Note that the differences are in per capita terms so that population growth cannot drive the allocation.) This is considered in other parts of the evaluation. Here we focus on two sub-questions: whether expenditure affects service delivery and whether outcomes are sensitive (as one would hope) to service delivery. Figure 6.1 illustrates the nature of the argument. Changes in expenditure may induce changes in service deliveries and thereby in outcomes. There may also be reverse causality, as illustrated by the arrow from outcomes to expenditure: the level and allocation of expenditure may be adjusted in response to observed changes in outcomes.

Figure 6.1



For the first sub-question, we use the data to investigate whether changes in expenditures explain (in a statistical sense) changes in service delivery. We have investigated this in a large number of ways. This reveals that district level expenditure for drugs are very weakly correlated with total expenditure (r = 0.27). For expenditure for emergency drugs this correlation is however quite high (r = 0.82). We interpret this as health facilities being able to respond to urgent needs. We have also linked the number of deliveries assisted by trained traditional birth assistants and the number of antenatal visits (both per capita) to total expenditure. In both cases there is a positive effect.

Table 6.2 shows a regression for assisted deliveries. The effect of total expenditure is quite strong: considering the mean of 52.0 total expenditure accounts for about half of assisted deliveries. There also is an effect on antenatal visits which responds to both total expenditure and the number of average staff at the facility which itself is strongly related to total expenditure. This provides a link from budgets to service delivery. Recall, however, from Table 6.1 that expenditure declined in real terms per capita. The evidence suggests that this has had a substantial adverse effect on the number of assisted deliveries in an adverse way, approximately offsetting the positive effect of the positive trend (the coefficient 0.017 in Table 6.2).

Table 6.2: Assisted Deliveries and Total Expenditure

Source: HMIS

Dependent variable: number of deliveries assisted by trained traditional birth assistants divided by the number of under-1 in the population

	coefficient	t-score
Real total health expenditure per capita	0.001	6.13
year (2000 = 0)	0.017	10.26
constant	0.126	10.04
R-squared		0.15
Number of observations		441

Districts fixed effects regression; district dummies not reported

While immunization levels are high we find that vaccinations are not correlated with total (health) expenditure. The most likely explanation is that vaccinations are to a large extent funded off budget through NGOs and UNICEF.

A notable example of reverse causality is the positive effect of malnutrition on expenditure. This effect is quite strong: an increase of one standard deviation in the number of underweight children (scaled by the total population) induces a 40% increase in total expenditure per capita (in the district). Remarkably, total expenditure does not react in a similar way to various other plausible outcome measures such as under-5 mortality. It should be noted that there is no evidence of an effect of expenditure on malnutrition. Since malnutrition is strongly correlated with under-5 mortality it appears that it is used as an "early warning" signal although this is not discussed in the literature in those terms.

6.2 Evidence on Child and Maternal Mortality

The district health data contain information on two important impact variables: child mortality and maternal perinatal mortality. As indicated before (chapter 5) these cannot be used without adjustment, since the district health data refer to a subgroup of the population, those seeking treatment. Ideally, one would deal with the resulting endogeneity by instrumenting. However, there is no suitable instrumental variable available. Instead we have dealt with the selection effect in a fairly crude way by scaling the impact variables (child or maternal mortality) by the number of patients. We then relate scaled mortality to measures of service delivery and the number of patients.

This procedure ensures that improvements in service delivery are deemed effective (in terms of reducing mortality) only if they reduce the mortality/patients ratio while controlling for the number of patients. The regression results are reported in Table 6.3. They show that availability of DPT vaccines, deliveries supervised by trained Traditional Birth Assistants (tTBAs) are negatively related to child mortality. However, these results cannot be directly interpreted as causal relationships. Instead, DPT stocks and supervised deliveries are likely to be a general quality indicator for district health centers, perhaps also showing a focus on children. The effect is quite strong: one standard deviation more DPT stocks per capita is associated with a 17% decline in child mortality (per patient). The impact of supervised deliveries is even higher, with a decline of 25%. The significant coefficients for the number of patients per capita shows that outreach of health centers matter: an increase in the use of health centers as measured by the number of patients per capita is associated with a decline in child mortality per treated patient. This could reflect scale effects or that health centres are more easily accessible. Somewhat surprisingly, stocks of antibiotics do not seem to affect child mortality significantly (but see the next chapter on this).

Table 6.3: Child Mortality and Health Services

Source: HMIS

Dependent variable: under-5 child deaths registered at health center divided by number of patients (mean value is 0.006)

	mean	coefficient	t-score	
Benzylpen (antibiotics) stocks per capita	0.00015	3.866	0.94	
DPT vaccine stocks per capita	0.0012	-1.586	-2.18	
Deliveries by tTBAs per capita	0.237	-0.010	-5.29	
Patients per capita	1.43	-0.003	-4.71	
R-squared				0.023
Number of observations				453

Districts fixed effects regression; district dummies not reported; robust standard errors used to calculate t-scores.

A similar picture emerges when looking at maternal death. Table 6.4 shows the regression results. In this regression stocks of antibiotics have a strong negative effect on maternal death: a standard deviation more of stocks per capita reduces mortality by 50%. Again, this should not be taken as a causal relationship because of the weak data base on which the result is based and the many other factors that cannot be accounted for in the regression. Note also that maternal death responds to assisted deliveries as expected, but the coefficient is not significant.[5]

[5] Although registered maternal deaths have been scaled by the number of patients visiting the health centres, using standard regression techniques for a relatively rare phenomenon is perhaps inappropriate. To check robustness of the result in Table 6.4 we have repeated the regression in levels, using Poisson regression, which is more appropriate for count data. In this alternative regression in levels, the antibiotics effect remains very strong and significant, the number of assisted deliveries remains insignificant, while (obviously – because of scale) the number of patients is highly significant as well.

Table 6.4: Maternal Death and Health Services

Source: HMIS

Dependent variable: maternal death registered at health center divided by number of patients (mean value is 0.00005)

	mean	coefficient	t-score	
Benzylpen (antibiotics) stocks per capita	0.00015	-0.209	-2.53	
Deliveries by tTBAs per capita	0.237	-0.00005	-1.03	
Patients per capita	1.43	-0.000006	-0.73	
R-squared				0.022
Number of observations				453

Districts fixed effects regression; district dummies not reported; robust standard errors used to calculate t-scores.

6.3 Conclusion

Our first conclusion concerns methodology. District level panel data can in principle be used to address many public health and impact evaluation questions. We have noted that there are some problems with the HMIS but these can be overcome with relatively simple procedures for data checking. Irrespective of data quality the analysis should deal with the selection effect: good facilities attract many patients. Obviously that should not be interpreted as a high prevalence rate in the catchment area. We have proposed to scale the variables to correct for the selection effect.

The second conclusion is that a number of outcomes and service delivery indicators are partly determined by expenditure levels. This suggests that it makes sense to focus on budget levels as a way of influencing outcome and impact variables.

Chapter 7 Three Killer Diseases: Impact and Incidence of Health Policies

In this chapter we attempt to link health policies to three killer diseases: malaria, diarrhea and acute respiratory infections (ARI). For each of these diseases we consider two issues: the *impact* of policies and their *incidence* (in terms of wealth classes).

> Recall from chapter 1 that we take changes in the size and nature of government activities as given. We try to measure the impact of these changes but do not attempt to explain the changes themselves as partially the result of donor involvement. In the case of malaria we can go slightly further. The Roll Back Malaria campaign, involving massive distribution of bed nets, was very much initiated by donors. Subsequently it was adopted by and executed through the Government of Zambia. This is an example of the possible effectiveness of policy dialogue and donor coordination.

While in the previous chapter we used the administrative health data (HMIS), in this chapter we use the DHS data. (In the ARI case we show how the DHS data can be linked to the HMIS data.)

7.1 Malaria

Malaria is one of the main causes of death in Zambia. Therefore the government's approach towards it is suitable an example of its concrete policies for the health sector. The disease is responsible for 15% of deaths of children aged under 5 and 9% of deaths from all ages. In 2008 there were 244 cases of malaria per 1,000 population (WHO, 2010-a, p. 68). The WHO, UNICEF, UNDP and the World Bank launched the Roll Back Malaria (RBM) Partnership in 1998, in an effort to provide a coordinated global response. RBM principles were integrated with sub-national level planning cycles and budgeting through which it could also draw upon common basket resources for the health sector under the sector-wide approach (SWAp) (Steketee, 2008, p. 46). The Zambian government set up a National Malaria Control Centre in 1997 to coordinate the efforts of the partners trying to control the disease. The initial goal was to 'achieve 60% coverage with preventive interventions among those at risk of malaria and 60% coverage with prompt and effective treatment among those suffering from malaria' (Chizema-Kawesha et al., 2010, p. 480). The government's 2006-2010 National Malaria Strategic Plan (NMSP), a renewed version of the one covering the period 2000-2005, aims to cut malaria incidence by 75 % and significantly reduce malaria-related mortality by 2010 through a national scale up of malaria interventions, including insecticide treated mosquito nets; indoor residual spraying (IRS); and prompt effective antimalarial treatment, especially to vulnerable populations such as children and pregnant women.[6]

The combined efforts of the government and supporting donors such as the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM), the U.S. Agency for International Development and other bilateral and multilateral sources, have proven remarkably effective. New and increased funding attracted by the national malaria strategies have led to markedly expanded malaria prevention and diagnostic services. The government and its partners distributed some 5.9 million ITN's between 2003

[6] http://www.nmcc.org.zm/about_nmcc.htm

and 2008 with a wide coverage, reaching rural and previously poorly served areas (Chizema-Kawesha et al., 2010, p. 481). Approaches integrating measles vaccination, ITN distribution, and vitamin A provision were also among the initiative taken by donors during this period (c.f. CORE and American Red Cross, 2004). Surveys done to measure the impact of the malaria policy suggest that 68% of households now have one or more ITN's or have received IRS in the year prior to the survey. 'This represents a 37% increase in household availability of effective malaria prevention nationally between 2006 and 2008 and a 5-fold increase between 2001/2 and 2008' (Chizema-Kawesha et al., 2010, p. 481). Training in microscopy was also expanded, like Rapid Diagnostic Test (RDT) use and availability of Artemisinin-based Combination Therapies (ACT's) in all health facilities. Antimalarial treatment was extended through increasing numbers of community health workers trained in malaria diagnosis and treatment (ibid.).

The concerted effort has led to a reduced number of cases of malaria and improved survival rates of those infected. Progress has also been made toward 'more equitable availability and use of malaria interventions and substantial and equitable reductions in malaria parasitemia and anaemia' (ibid.:484). Especially the rural areas remain hampered though by insufficient staff in the healthcare facilities (ibid.). Chizema-Kawesha et al. nonetheless argue that the large scale up in disease control efforts has contributed importantly to overall improved child survival (ibid., p. 486).

In this section we document the success of the malaria campaign, looking in particular at the effectiveness of the distributed bed nets. We use data from the Demographic and Health Surveys held in 2001/2 and 2006/7. According to the 2007 DHS report (chapter 12) more than 4 million bed nets were distributed between 2003 and 2006 through various programs. As mentioned already above, the number of bed nets has since grown further to 5.9 million by 2008. DHS surveys are household surveys, representative of the Zambian population and therefore show the impact of the bed net campaign at the household level. A disadvantage is these surveys can measure malaria prevalence only crudely, on the basis of self reported symptoms.

The DHS data for 2001/2 showed a fairly low availability of bed nets (Table 7.1). At that time only 25% of rural households reported having at least one bed net. In urban areas the percentage was higher (37%) but still very low. By 2007 these percentages had improved quite dramatically: to 71 and 72%, respectively (Table 7.2). Note that the pro-urban bias visible in Table 7.1 had been completely eliminated by 2007.

Table 7.1: Presence of Bed Nets in Households

Source: DHS 2001

		urban	rural	Total
no		931	3,173	4,104
	%	62.6	74.9	71.7
yes		556	1,066	1,622
	%	37.4	25.2	28.3
Total		1,487	4,239	5,726
	%	100	100	100

Table 7.2: Presence of Bed Nets in Households

Source: DHS 2007

		urban	rural	Total
no		632	1,373	2,005
	%	27.9	29.3	28.9
yes		1,636	3,308	4,944
	%	72.1	70.7	71.2
Total		2,268	4,681	6,949
	%	100	100	100

We now investigate whether an effect of bed nets on child mortality can be detected. (Obviously child mortality can fall for reasons unrelated to malaria. We consider this below.) Table 7.3 summarizes a regression using the DHS 2007 data. The unit of observation is a child born in the last 5 years. Some of these children (about 9%) were dead at the time of the survey. The dependent variable in the regression is a binary variable: 1 if the child is still alive, 0 if it has died.[7] Child survival could also reflect confounding variables rather than bed nets. This would bias the estimation. For instance, bed nets could be distributed (not very sensibly) more at locations where malaria prevalence is less. Also, household wealth and educational achievements could explain both the adoption of bed nets and lower malaria prevalence in the household. To avoid the effect of such confounding factors a number of control variables have been included in the regression (not reported).

[7] This implies that we estimate a linear probability model.

The survey asked whether at least one bed net was present in the household and also whether at least one under-5 child slept under a bed net in the night before the interview. Households may use bed nets irregularly in which case a bed net could have a positive effect (in the sense of reducing child mortality) even if it was not used last night. This is confirmed by the results in Table 7.3. Relative to the counterfactual of no bed net in the household a bed net present but not used by any under-5 child in the household during the preceding night (bed net present/not used = 1) increases the survival rate by almost 4 percentage points. In the case the bed net *was* used by at least one under-5 child ((bed net present/used = 1) the effect is even stronger: almost 5 percentage points. The two coefficients are highly significant (t-scores of 3.46 and 4.69 respectively). This suggests that bed nets are quite powerful.[8]

Table 7.3 Bed Nets and Child Survival

Dependent variable: Child (under 5) alive = 1

	Coefficient	t-value (robust)
Bed net present, not used	0.039	3.46
Bed net present, used	0.048	4.69
Number of observations		4319
R-squared		0.02

Controls used (not reported) include: wealth index, province and urban dummies, education of household head, and district level variables on poverty and health facilities.

*Un*observable factors might play a role in explaining the correlation between bed nets and child mortality. For instance, suppose that households differ in 'attitude': households with a "good" attitude are more likely to adopt bed nets for their children but are also more likely to adopt methods which would reduce their child's vulnerability to other fatal diseases. In this case the regression of child survival on bed net use might pick up a spurious correlation: the attitude variable has been omitted. Therefore, the regression in Table 7.3 has been repeated by including variables which measure the prevalence of the main other killer diseases. The proxies used are: absence of recent cases of diarrhea and coughing (a symptom of acute respiratory infections) among children, as well as negative HIV-test results. Each of these variables affect child survival but in the regression they will also pick up the effect of the (unobserved) attitude variable.

[8] A check of the robustness of the results in Table 7.3 is to repeat the regression using 'cluster fixed effects', showing essentially the same results. This effectively neutralizes the impact of unobserved location factors that could drive both child mortality and the use of bed nets.

The results are shown in Table 7.4. Remarkably, recent diarrhea or coughing cases do not seem to affect child survival significantly. However, HIV-negative testing of household members does. Table 7.4 also shows that unused bed nets are no longer significant in explaining child survival. (This suggests that the result in Table 7.3 was biased since the attitude effect was not taken into account.[9]) The conclusion that can be drawn from the Table is that using bed nets reduces child mortality significantly.

Table 7.4: Bed Nets and Child Survival: Confounding Factors

Dependent variable: Child alive = 1

	Coefficient	t-value (robust)
Bed net present, not used	0.014	1.22
Bed net present, used	0.027	2.60
All HIV-tests negative in household (and no test refusals)	0.023	2.14
No recent under-5 diarrhea in household	0.003	0.33
No recent under-5 coughing in household	-0.003	-0.38
Number of observations		3724
R-squared		0.01

Controls used (but not reported here) include: wealth index, province and urban dummies, education of household head, and district level variables on poverty and health facilities.[10]

Obviously, bed nets can affect child survival only by reducing malaria. The DHS data do not record the prevalence of malaria. However, we can measure this imperfectly since the survey data do record whether the household experienced a case of fever in the last two weeks. Such recent cases can of course not explain child mortality in the preceding 5 years. But we can investigate whether bed net use reduces the number of (recent) fever cases. Obviously, since bed net use is linked to fever cases there is reverse causality as well. A negative coefficient in a regression of fever on bed nets is therefore likely to be a serious *under*estimate.

[9] This is confirmed by a direct regression of bed net use on the negative HIV-indicator: this indeed shows a very strong positive correlation.
[10] Estimation with cluster fixed effects leaves the results essentially unchanged.

Table 7.5: Bed Nets and Recent Fever Cases

Dependent variable: fever case in last 2 weeks = 1

	Coefficient	t-value (robust)
Bed net present, not used	-0.057	-1.14
Bed net present, used	-0.096	-2.24
Number of observations		4751
R-squared		0.002

Controls used (but not reported here) include: educational attainment and cluster fixed effects.

Note that, as expected, bed nets reduce the number of recent fever cases only if they are actually used. The effect is very large: bed net use reduces the number of fever cases from 20% to 10%. (Recall that this probably is an underestimate.)

To how much reduction in child mortality does the coefficient of 0.027 in Table 7.4 correspond? It turns out that about 11% of the children in the sample cohort of 5-year olds did not survive. In the full sample under-5 mortality is 9%, so it seems reasonable to multiply the used bed net effect by 11/9=1.22, resulting in a coefficient of 0.033. Given that around 40% of the children live in households where bed nets are being used, one would be justified to conclude that bed nets have taken more than a full percentage point off child mortality (40% of 3.3%). This amounts to about 23,000 more children alive in 2007. However, this calculation attributes the effects of *all* bed nets to the intervention in the period considered. This overstates the impact since some bed nets were already available at the beginning of this period. A more conservative estimate for 2001-7 is 18 thousand children saved.[11]

[11] The number of under-5 children rose from 1.7 million in 2001 to 2.3 million in 2007. According to the DHS data in 2001 18% of the under-5s lived in households which reported that they had bed nets under which at least some under-5s slept in the preceding night; this percentage had doubled to 37.3% for 2007. We therefore estimate the increase in the number of under-5 children protected by bed nets as 552 thousand. Applying the coefficient of 0.033 to this number gives the estimate of 18 thousand extra children alive.
After the first version of this paper was completed the earlier work of Ashraf *et al.* (2010) came to our attention. The approach in this excellent paper is quite similar to ours, in using the DHS data for 2001 and 2007 and trying to link bed net use to under-5 mortality. The key differences are (a) that they seem to have a more extended version of the dataset so that they are able to use district fixed effects for both years (b) that they use bed net *distribution* at the district level rather than bed net *use* at the household level as the indicator of the intervention. They find an impact on child mortality which is about twice as large as our estimate. However, their estimates are not significant at the 5% level, possibly because the higher level of aggregation.

Distribution over wealth classes

The bed net campaign appears to be very effective. A possible concern is that it may have reached mainly the richer households. Figure 7.1 shows the concentration curve of bed nets. In this graph the lower the curve is below the diagonal line, the more skewed the distribution is in favor of richer households. Between the two survey years the distribution has become markedly more equal. In 2007 the curve was very close the 45° line, indicating almost complete equality. A similar curve showing *usage* of bed nets is even more striking (Figure 7.2).

Figure 7.1 : Distribution of bed nets by wealth indicator

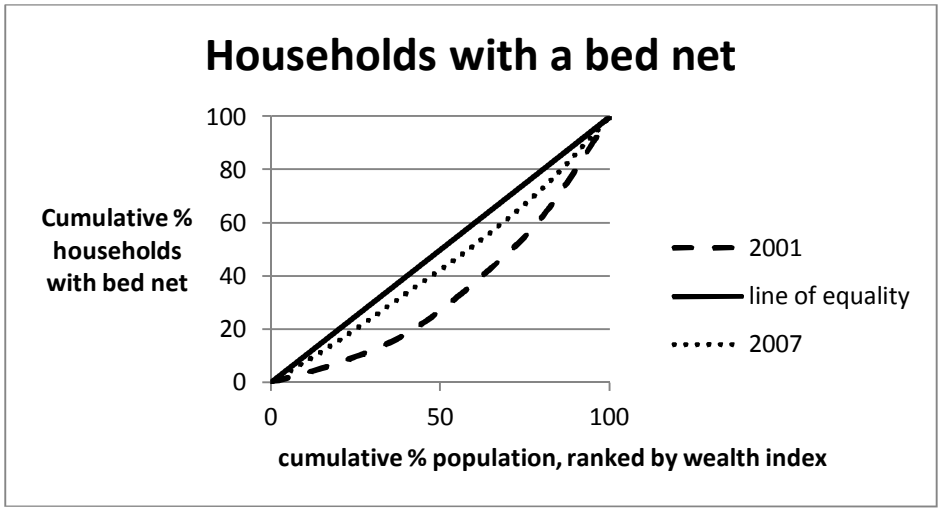
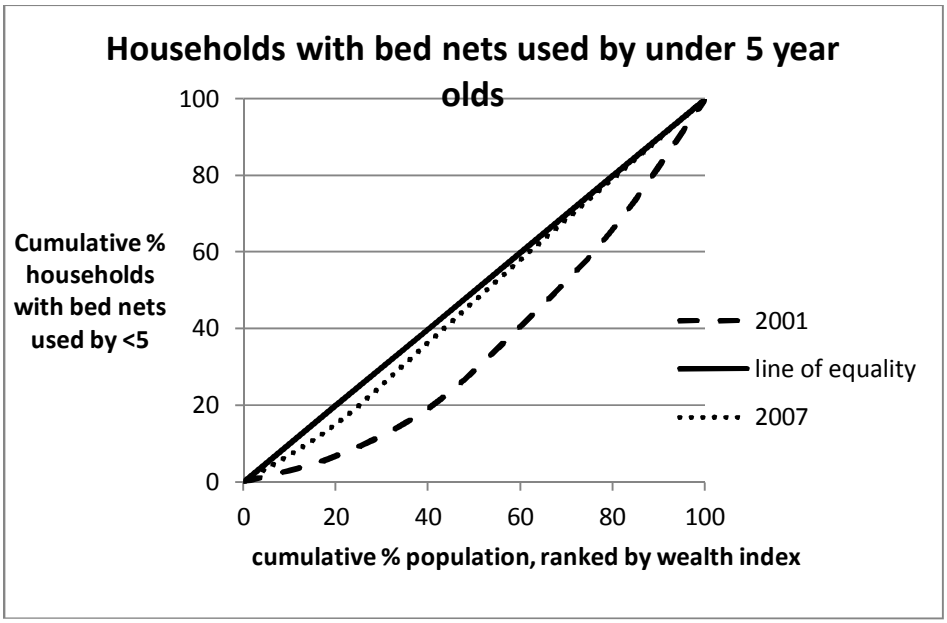


Figure 7.2: Distribution of bed net usage



7.2 Diarrhea

Next to malaria a major killer diseases for children is diarrhea. We cannot directly investigate the link between diarrhea prevalence and child mortality from the DHS surveys: the prevalence data are for recent recall (2 weeks or 6 months), the mortality data for the past 5 years. The administrative district data on health facilities cannot be used either, since the data do not include diarrhea counts.

In principle policies can affect mortality as a result of diarrhea in two ways: directly, by the treatment provided to children taken by their mother to government health facilities, and indirectly by affecting their decision to seek treatment in the first place. As indicated above, the direct channel cannot be investigated.

This leaves the indirect channel. DHS data record whether recent diarrhea cases led to a visit to a government health facility. There could be several barriers to such visits, notably the distance or travel time to the facility. In fact, in a regression linking the visits to variables related to this and other barriers only distance emerges as a significant factor. (This is further investigated below.) Since the number of government health facilities has increased over the past decade (from 1115 in 2002 to 1355 in 2008) distance should indeed have become less of a problem. This is confirmed by the DHS data. In 2001 53% of the women indicated that they find distance to the health facility a big problem in getting medical help for themselves. In 2007 this percentage had fallen to 45%. In the same period the percentage of diarrhea cases taken for treatment to a government facility rose dramatically, from 29% to 47%.

We now investigate whether this distance measure helps explain mothers' decision to take their children to the health facility for diarrhea treatment. Table 7.6 reports on two regressions linking the perceived distance problem to the use of health facilities for diarrhea treatment. The results indicate that the effect of distance is very similar in the two survey years: when it is seen as a 'big problem' it reduces the probability of bringing the child to a facility by about 8 percentage points. However, the situation differs markedly in the two years. In 2001 only 29% of mothers took their children for treatment to the health facility, in 2007 this had risen to 53%. The regression results of Table 7.6 can be used to estimate how much of this was due to a reduction in distance as measured by the indicator of distance being a 'big problem'. It turns out that only one percentage point of the 23 point increase can be explained in this way. Obviously this does not mean that the greater density of health facilities was unimportant but rather that we cannot demonstrate its importance with the DHS data.

An alternative explanation is that the treatment of diarrhea cases has improved over the period. However, this turns out not to be the case: in both years about six out of seven children suffering from diarrhea received the standard oral dehydration treatment.

There could be many reasons why parents are more likely to their children to a health facility, for instance better information on the risks of diarrhea. However, these explanations cannot be tested on the basis of the available data.

In summary: there is a remarkable progress in the use of health facilities for treating diarrhea among children. A small part of this improvement can be explained by better access to health facilities.

Table 7.6 Distance barrier to diarrhea treatment

Dependent variable: diarrhea case treated in government health facility	Coefficient	t-value (robust)
Distance a big problem = 1, otherwise = 0 (2001)	-0.088	-2.99
Distance a big problem = 1, otherwise = 0 (2007)	-0.082	-2.09
Observations 2001		1031
Observations 2007		762
R-squared 2001		0.034
R-squared 2007		0.078

Controls used (but not reported here) include: educational attainment, urban/rural and province fixed effects.

Distribution

Diarrhea is slightly more common among poorer households as can be seen from the concentration curves in Figure 7.3. The concentration curves for children suffering from diarrhea who have been taken to a health facility almost coincide with those in Figure 7.3, indicating that there is no pro-poor or anti-poor bias of the use of health facilities for diarrhea cases. Between the two DHS surveys the distribution of diarrhea prevalence over wealth did not change much, although the absolute numbers declined substantially (Figure 7.4).

Figure 7.3: Distribution of diarrhea among last borns

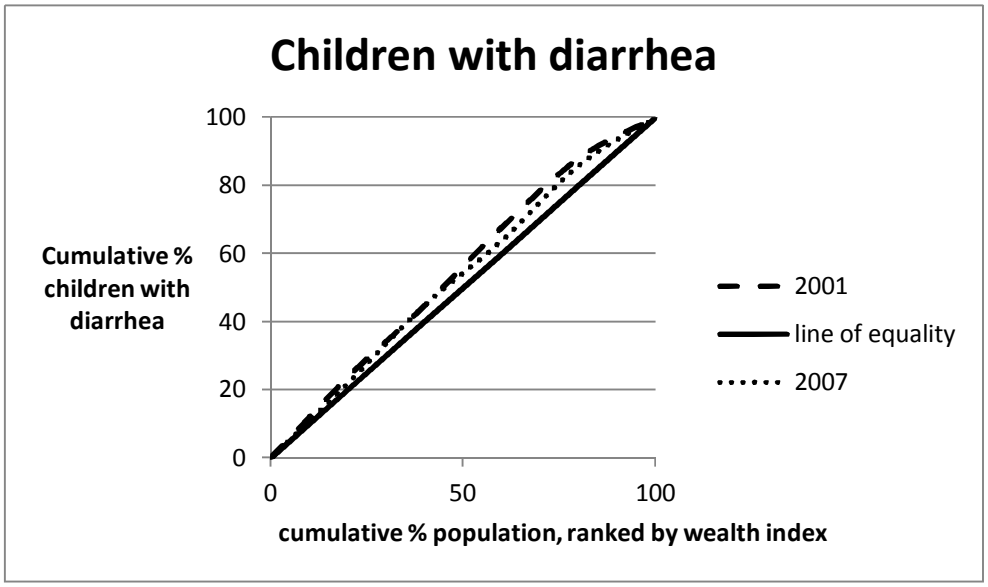


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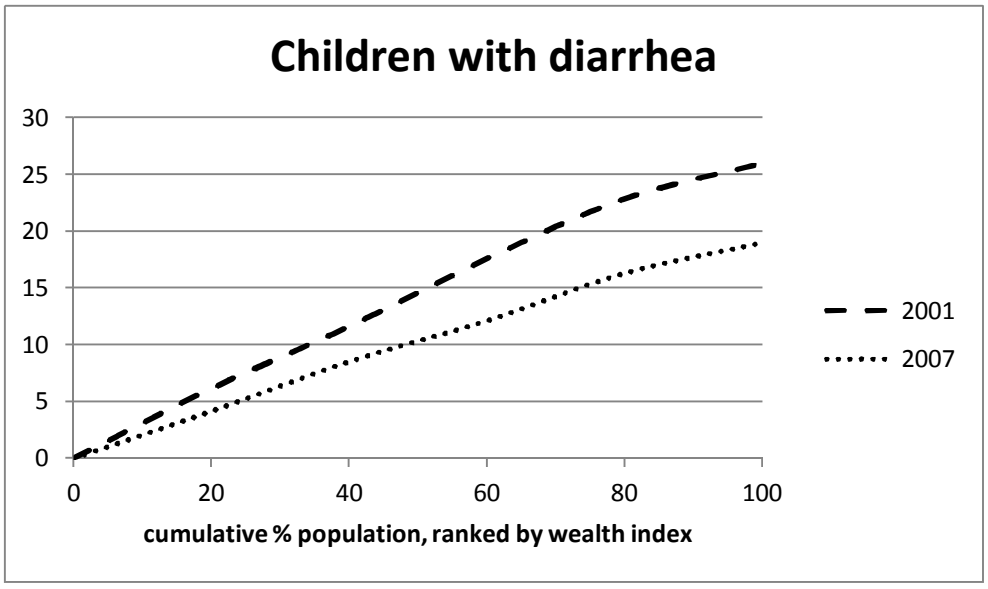
Figure 7.4: Diarrhea among last borns



7.3 Acute Respiratory Infections (ARI)

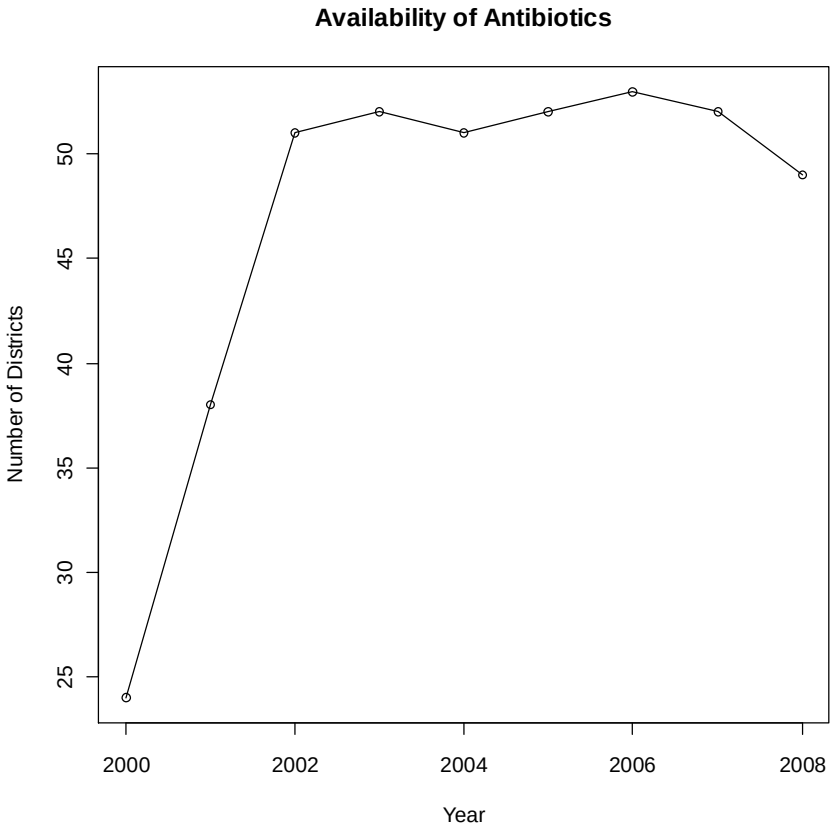
The DHS surveys collected data on ARI prevalence under children based on two symptoms: coughing in the two weeks before the interview in combination with rapid breathing. The data indicate that 12% of the children (under 6 years of age) suffered from ARI, thus defined, in 2001. The prevalence

declined substantially over time: to 8% in the 2007 survey.[12] There was no change in the propensity of mothers to seek treatment for children with ARI symptoms: in both years they did so in just under 50% of the cases. While in the case of diarrhea the survey data indicated a very significant rise in the propensity to seek treatment, for ARI we have to explain the significant fall in prevalence. One possibility is that treatment became more effective, because the availability of the relevant drugs improved. This particular channel can be investigated because the availability of drugs in health facilities is registered in the district level administrative health data and can be linked to the 2007 DHS survey.

We focus on the presence of a sufficient stock of antibiotics (in particular benzylpen and amoxicillin, both commonly prescribed for ARI). The administrative data record the stock of these drugs in terms of the number of months' of average use. Initial exploration of the data suggests that a distinction should be made between a stock of less than 9 months' usage or more. Accordingly, we construct a binary variable which takes the value 1 if the health facility has a stock of at least nine months for one of both of the drugs drug.[13] Figure 7.5 shows how the availability of antibiotics has evolved over the last decade. There was a very rapid improvement in the early years. After that the number of districts reporting sufficient stocks of antibiotics remains stable at about two thirds. Obviously the initial improvement is a favorable outcome in itself, although the subsequent stagnation is puzzling. Whether the improvement had impact in terms of reduced ARI prevalence remains to be seen.

[12] This decline partially reflects seasonal effects since the survey interviews were not held in the same period of the year. ARI prevalence calculated over a common period of interviews (April through June) was 11% in 2002 and 9% in 2007.
[13] The stocks of the two drugs are highly correlated (r = 0.71). The vast majority of facilities has a stock of more than 8 months for both drugs or for neither.

Figure 7.5 Number of districts (out of 72) reporting at least 9 months stock of benzylpen or amoxicillin



The timing of the improvement seems fortunate in the sense that it was not completed by the time of the DHS 2001. The decline in ARI prevalence between 2001 and 2007 occurs at the same time. Since the DHS data are for different samples we cannot use panel estimation methods to determine if this correlation is causal. However we could use the DHS 2007 for a cross section estimate of the impact of antibiotics availability in health facilities if there is sufficient variation in drugs availability. It turns out that no urban districts have insufficient supplies of antibiotics in 2007 while only two of the rural districts are in this situation, representing only 5% of the population. Also, it should be kept in mind that the data on drugs availability are district averages, a noisy measure for the availability of drugs at the health facility nearest to the household concerned. This implies that the effects reported in Tables 7.7 and 7.8 suffer from "attenuation bias": estimated coefficients will ten to *under*estimate the true effects (in absolute value). These *caveat*s must be kept in mind when interpreting the results in Tables 7.7 and 7.8.

Table 7.7 ARI and Antibiotics Availability

Dependent variable: ARI (self-reported, in last two weeks) = 1	Coefficient	t-value	
District stocks of antibiotics 9 months or more = 1	-0.039	-1.88	
Education: at least primary education completed by head of household= 1	-0.011	-1.39	
R-squared			0.001
Number of observations			4693

The regression in Table 7.7 indicates that the effect of sufficient stocks is substantial: it reduces ARI prevalence by four percentage points. Recall from Figure 7.1 that in the course of the decade the number of districts with sufficient stocks increased by 28. This suggests that the improvement in stocks alone reduced prevalence by around 1.6 percentage points (the regression coefficient multiplied by 28/72). This is very large relative to the total decline in the period of between two and four percentage points (see footnote 12).

The only control in Table 7.7 is education of the head of the household. Rather surprisingly, the effect of this is not significant. Likewise, controlling for wealth does not change the results (regression not reported here). As mentioned above, only two districts have insufficient stocks of drugs which makes the evidence of Tables 7.7 and 7.8 rather thin. An alternative indicator of antibiotics availability would be stocks of benzylpen: this is not available in three of the districts, representing 11% of the population. Repeating the Table 7.7 regression gives again a coefficient of -0.04 on drugs availability, but now with a higher t-score (-3.49). In footnote 12 it was already mentioned that ARI prevalence has a seasonal components. If the regression in Table 7.7 is repeated with dummies for months of interview, the coefficient on antibiotics availability increases (in absolute value) to -5.6 percentage points, with a t-score of -2.64.

Table 7.7 is in a sense a reduced-form regression: it does not explain the channel from antibiotics availability in health facilities to reduced two-week recall ARI prevalence. One channel that can be explored is that drugs availability is a reason for parents to seek help at a facility if their children show ARI symptoms. The regression reported in Table 7.8 suggests that this channel is indeed important: living in a district with sufficient drugs availability raises the probability of seeking treatment in a health facility by 14 percentage points. Surprisingly, education has no effect on seeking treatment. The double effect of sufficient stocks of antibiotics is therefore that it enables effective treatment for

those who seek it while increasing the number of parents who do so. If this reduces the duration of the disease and in addition leads to lower contagion it will lead to reduced observed prevalence.

Table 7.8 ARI Cases Treated at Health Facilities and Antibiotics Availability

Dependent variable: Mother of child with ARI symptoms seeks treatment at health facility = 1	Coefficient	t-value	
District stocks of antibiotics 9 months or more = 1	0.142	1.84	
Education: at least primary education completed by head of household = 1	0.005	0.16	
Urban household = 1	0.093	2.76	
R-squared			0.011
Number of observations			1210

Chapter 8 Summary and Conclusions

In chapter 2 we provided an overview of the key statistics of Zambia. Zambia has an estimated population of 12.6 million, an annual population growth rate of 3.2% and is one of the most urbanized countries in Africa with some 42% of the population living in urban areas. The health situation in Zambia is characteristic for sub-Sahara African countries. Negative economic developments, exacerbated by ineffective public spending have adversely affected Zambia's ability to improve the living conditions of its population and fight poverty. Throughout the 1990's, poverty and most MDG-related indicators deteriorated. There has been some moderate economic improvement in recent years as growth began to recover and most of the country's debt was cancelled, but Zambia remains a country with widespread poverty and relatively weak health outcomes.

Chapter two provides an outline of the key indicators for the health sector's three levels: health outcomes, health output and health input. Health indicators in Zambia are poor. The most striking phenomenon is the reverse in earlier improvements in life expectancy and mortality from 1990 to 2000. The main reason for this decrease is the devastating HIV/AIDS epidemic, coinciding with a TB epidemic. During the last two decades, adult health has indeed been seriously affected by the HIV and tuberculosis co-epidemic. The other major health problems facing Zambia include diarrheal diseases, malaria, acute respiratory infections, tuberculosis and malnutrition. With regard to some important health statistics, the following observations are described:

- The maternal mortality rate has improved slightly compared to 1990 and is lower than most of the surrounding countries, but is still high.
- The infant mortality rate is high. It is almost at the same level as in 1970 and is also high compared to the neighbouring countries (with exception of Angola and the Democratic Republic of Congo).
- The under-five mortality rate is also high, but has slightly decreased over time either, as it has in the other countries in the region, with exception of Malawi, Mozambique and Tanzania, where the situation regarding the U5-MR has improved.
- The life expectancy has dropped with more than ten years compared to 1980, but since 2000 is showing a positive trend.

Chapter three provides a comparison with other countries, and tries to put the findings of chapter 2 into perspective and get an idea of Zambia's relative performance. The comparison shows that Zambia is outperformed by its richer neighbours (Namibia and Botswana), but other neighbouring countries like Tanzania, have a similar level of healthcare spending at PPP as Zambia and even less at average exchange rates, but perform somewhat better on outcome indicators. The one exception – and possibly a real success story for the Zambian healthcare system – is the maternal mortality rate, which has significantly declined in Zambia, more so than in the neighbouring countries.

Chapter four provides a description of Zambian healthcare policies, and tries to establish links with the findings on health statistics provided in Chapters 2-3. Many of our findings should be placed in the context of a period of health sector reform implemented from the mid 1990's onwards. The initial plan was prepared at a time when the country and, in particular, the health sector, was facing

significant changes and challenges, including: high disease burden, compounded by the HIV/AIDS epidemic; critical shortages of health personnel; deteriorating health infrastructure; significant legal reforms; on-going restructuring of the health sector; a weak economy; and inadequate funding of the health sector. All these factors have significant implications on the organization and management of the health sector and, subsequently, its outcomes.

The reform implied:

- a goal-oriented, financially sound management system;
- clear accountability and responsibilities at every level - a mechanism for regular review of progress;
- enhancing the role and responsibilities of consumers;
- strengthening health centre supported community based healthcare - maintaining the role of public hospitals;
- integrating private sector strengths and resources;
- improving quality assurance and treatment effectiveness;
- broadening the range of health professionals, improving their conditions and strengthening team work among them in both clinical and public health settings.

We have found several sources that describe the Zambian Health Care Reforms strategy being hampered severely by economic recession, debt crisis, and shrinking donor support. While significant achievements were made with respect to decentralization, increased accountability and donor collaboration, the reform stalled in 1998 without having achieved its objectives, largely because of the handling of hospital reform and the civil servants in the health sector (Blas and Limbambala, 2001; Bosman, no date).

We describe the devastating effects of the Health Care Reforms in the 1990's and early years of this century with regards to the country's TB program, leading to a complete shutdown of the program with more incidence cases of TB and enhancement of the multi-drug resistance –TB problem. Although the case is applicable to TB, we believe that more sectors of the Zambian health system could have suffered from similar issues. Today, things have improved significantly. Some of the most devastating effects of Health Care Reforms have been addressed by changing part of the policies and governance structure during the first decade of the 2000's. Zambia's health expenditure is now just under the average level of all eight neighbouring countries, and in line – the past years even above - the estimated level of per capita expenditure on health (US$33) needed to deliver a Basic Health Care Package according to the WHO.

The case of malaria control stands out as a success story for the Zambian health sector. The concerted effort of international donors and local government significantly improved the incidence of malaria. Zambia's fight against HIV/AIDS, also discussed in chapter 4, shows the mixed blessing large external funding can be to the health sector. Whereas Zambia would not be able to provide free ART without the donors, the programme put considerable strain on the country's health workers without providing extra funds to counter this extra demand on an already overstretched system.

By 2008, the last year for which National Health Account estimates are available, more than 40 % of total health spending was being financed from external sources. The share has been the same

since the mid-1990s. The total health expenditure (THE) in Zambia amounted to 6.0% of GDP in 2008. It is estimated that 38% of the total health expenditure comes directly from households in the form of out-of-pocket payments. In 2000, donors' and partners' share of the MoH budget amounted to 41%.

We believe the external share of government funding is likely to have increased since then, because of a large expansion in financing from disease-specific 'vertical funds,' most notably PEPFAR and the Global Fund.

Chapters 5 through 7 add to the previous findings by analysing some specific issues on the basis of primary data, in particular Zambia's Health Management Information System (HMIS), covering the period between 2000 and 2009, and the last two Demographic and Health Surveys (2001 and 2007). Chapter 5 discusses these data sets and their potential usefulness. It concludes that a reliable HMIS would be an invaluable tool for the analysis of public health issues in Zambia.

Chapter 6 presents the HMIS data as a panel data set of district level information on public service provision and health outcomes. As such it is a promising source for testing causal relationships. The results suggest that service delivery indicators tend to respond positively to increases in expenditure, which could be seen as a finding in support of using budgets to (indirectly) improve outcomes. A further finding is that that child mortality is strongly reduced by the availability of DPT vaccines at health facilities and the number (per capita) of deliveries by trained traditional birth assistants.

The analysis of the administrative data is complicated by poor data quality and also by a selection effect: use of the health facilities is determined not only by the burden of disease in the population but also by the perception of the effectiveness of health services. An increase in patients can therefore reflect both failure (prevalence is rising) or success (the propensity to seek treatment has risen because the quality of health facilities has improved.) In chapter 6 we dealt with this problem in a crude way, by scaling. In chapter 7 we addressed the problem directly by using household level (DHS) data. We investigated three killer diseases: malaria, diarrhea and ARI. We found strong evidence (going beyond the before/after comparisons in the literature) that the national bed net campaign was effective in reducing child mortality. Regarding diarrhea, there has been remarkable progress in the use of health facilities for treating diarrhea among children. However, only a small part of this improvement can be explained by better access to health facilities. For the analysis of ARI we linked the household survey and administrative data. We found that ARI was much lower in areas served by health facilities with sufficient stocks of antibiotics. This has a double effect: it enables effective treatment for those who seek it but also increases the number of parents who do so.

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Annex I

Table 1. Selected health indicators – health outcomes

	Life expectancy (both sexes)*	Healthy life expectancy (both sexes)	IMR (probability of dying by age 1 per 1000 live births)	Under-5 mortality rate***	MMR (per 100,000 live births)	Adult mortality rate****	Underweight prevalence (children <5 years, %)	Prevalence of HIV (%)	Prevalence of TB (per 100,000)	Incidence of malaria*****	Incidence of cholera*****
Zambia	**45**	**40**	**92**	**148**	**591**	**515**	**14.9**	**15.2**	**260**	**3 080 301**	**2 061**
Angola	47	45	130	220	1400	421	27.5	2.1	190	3 432 424	10 511
Botswana	54	49	26	31	380	404	10.7	23.9	560	17886	8
Congo, Democratic Republic of	47	45	126	199	1100	407	28.2	3.2**	660	5 371 196	30 150
Malawi	53	44	65	100	1100	481	15.5	11.9	310	4 986 779	831
Mozambique	48	42	90	130	520	470	21.2	12.5	470	4 831 491	9 087
Namibia	61	52	31	42	210	320	17.5	15.3	290	119 711	3 496
Tanzania	56	45	67	103	950	458	...	6.2	130	9 611	2 911
Zimbabwe	44	39	62	96	880	772	14	15.3	790	1 003 846	60 055

Source: WHO, 2010-a; *Source regarding life expectancy: World Bank (2010) http://data.worldbank.org/topic/health; **USAID estimate, Probability of dying by age 5 per 1000 live births; ****Probability of dying between 15-60 years per 1000 population; Number of reported cases 2008http://www.usaid.gov/our_work/global_health/aids/Countries/africa/congo.html: No data on this in WHO set.

Table 2. Selected health indicators – health service delivery

	Immunisation coverage among 1-year-olds for MDG 4 Measles (in % in 1990/2000/2008)	Antenatal care coverage (1 visit/4 visits)	Births attended by skilled medical personnel (%)	Contraceptive prevalence rate (%)	Children under 5 sleeping under insecticide-treated nets (%)	Children under 5 with ARI symptoms taken to facility (%)	Children under 5 with diarrhoea receiving ORT (%)	Children under 5 with fever who received treatment with any antimalarial (%)	Births by caesarean section (%)
Zambia	**90/85/85**	**94/72**	**47**	**40.8**	**41**	**68.2**	**66.8**	**43**	**2.1**
Angola	38/41/79	80/...	47	6.2	17	...	...	28	...
Botswana	87/91/94	97/97	94	44.4	...	...	...	...	7.7
Congo, Democratic Republic of	75/34/79	85/47	74	20.6	6	...	44.9	30	4.0
Malawi	81/73/88	92/57	54	41	25	51.8	55.3	24	3.1
Mozambique	59/71/77	89/53	48	16.5	7	55.4	54.1	23	1.9
Namibia	.../69/73	95/70	81	55.1	...	71.5	69.3	23	12.7
Tanzania	80/78/88	76/62	46	26.4	16	59.4	62.2	58	3.2
Zimbabwe	87/75/66	94/71	69	60.2	3	26.3	61.6	5	4.8

Source: WHO, 2010-a

Table 3. Selected health sector indicators - input

	Total expenditure on health as % of GDP	Government expenditure on health as % of total expenditure on health	Government expenditure on health as % of total government expenditure	Private expenditure on health as % of total expenditure on health	External resources for health as % of total expenditure on health	Per capita expenditure on health, at average exchange rate (US$)	Per capita expenditure on health, PPP int. $	Out-of-pocket expenditure as % of private expenditure on health	Per capita government expenditure on health, at average exchange rate (US$)	Per capita government expenditure on health, PPP int. $
Zambia	**6.2**	**57.7**	**14.5**	**42.3**	**33.1**	**57**	**79**	**67.6**	**33**	**46**
Angola	2.5	80.3	5.3	19.7	3.7	86	131	100	69	105
Botswana	5.7	74.6	13	25.4	4.0	372	762	27.3	278	568
Congo, Democratic Republic of	5.8	20.8	6.4	79.2	47.8	9	17	51.7	2	4
Namibia	7.6	42.1	11.1	57.9	10.6	319	467	5.8	134	196
Malawi	9.9	59.7	11.9	40.3	59.9	17	50	28.4	10	30
Mozambique	4.9	71.8	12.6	28.2	57.8	18	39	42.1	13	28
Tanzania	5.3	65.8	18.4	34.2	49.9	22	63	75	14	41
Zimbabwe	8.9	46.3	8.9	53.7	0.2	79	20	50.4	36	9

Source: WHO, 2010-a

Table 4. Selected health indicators – health output , 2000-2009

	Physicians (number and density per 10 000)	Nurses and midwives (number and density per 10 000)	Dentistry personnel (number and density per 10 000)	Pharmaceutical personnel (number and density per 10 000)	Public and environmental health workers (number and density per 10 000)	Community health workers (number and density per 10 000)	Hospital beds (per 10 000 population)
Zambia	**649/1**	**8 369/7**	**56/<0.5**	**108/<0.5**	**803/1**	**...**	**19**
Angola	1 165/1	18 485/13	222/<0.5	919/1	...	...	8
Botswana	715/4	4 753/26	38/<0.5	333/2	172/1	...	18
Congo, Democratic Republic of	5 827/1	28 789/5	159/<0.5	1200/<0.5	...	...	8
Malawi	257/<0.5	3 896/3	211/<0.5	293/<0.5	318/<0.5	10 055/7	11
Mozambique	548/<0.5	6 214/3	159/<0.5	817/<0.5	564/<0.5	...	8
Namibia	598/3	6 148/31	113/1	288/1	240/1	...	27
Tanzania	300/<0.5	9 440/2	230/<0.5	81/<0.5	1 831/1	...	11
Zimbabwe	2 086/2	9 357/7	310/<0.5	883/1	1 803/1	...	30

Source: WHO, 2010-a

Table 5. Distribution of causes of death among children aged <5 years (%) in 2008

	HIV/AIDS	Diarrhoea	Measles	Malaria	Pneumonia	Prematurity	Birth asphyxia	Neonatal sepsis	Congenital abnormalities	Other diseases	Injuries
Zambia	**12.0**	**14.6**	**0.5**	**15.2**	**14.7**	**7.4**	**7.1**	**5.8**	**2.2**	**17.4**	**3.0**
Angola	1.8	25.0	0.7	8.4	20.0	6.3	5.8	4.6	1.8	22.7	3.0
Botswana	0	7.0	0	1.0	12.2	22.7	10.6	4.1	10.3	27.1	5.0
Congo, Democratic Republic of	1.1	18.6	0.7	17.0	20.4	9.9	6.5	4.2	2.7	16.9	1.9
Malawi	13.7	11.0	0	16.6	13.1	10.0	8.1	5.9	2.8	16.4	2.5
Mozambique	14.0	11.9	0	12.5	17.6	10.0	8.5	5.6	2.7	15.3	1.8
Namibia	18.2	6.3	6.5	5.1	13.8	18.1	8.4	3.9	5.7	12.5	1.6
Tanzania	8.5	11.6	0	16.4	14.3	9.8	9.7	7.5	3.1	15.7	3.4
Zimbabwe	21.2	9.3	7.5	3.4	13.3	11.5	8.2	4.4	3.5	16.0	1.8

Source: WHO, 2010-a

Table 6. Incidence of malaria and cholera in selected countries, 2008

	Population (mln.)	Malaria incidence (per 1,000 population)	Cholera incidence (per 1,000 population)
Zambia	**12.620**	**244**	**0.16**
Angola	18.021	190	0.58
Botswana	1.921	9.3	0.004
Congo, Democratic Republic of	64.257	83.6	0.47
Malawi	14.846	335.9	0.06
Mozambique	22.383	215.9	0.41
Namibia	2.130	56.2	1.64
Tanzania	42.484	0.2	0.07
Zimbabwe	12.463	80.5	4.82

Source: WHO, 2010-a

Annex II

Table 1 Life expectancy (both sexes)

Country	1990	2000	2008
Zambia	51.10	42.01	45.40
Angola	41.97	43.55	47.04
Botswana	64.09	50.55	54.24
Congo, Democratic Republic of	47.74	46.31	47.65
Malawi	49.23	51.00	53.06
Mozambique	43.34	47.58	47.89
Namibia	62.11	58.68	61.01
Tanzania	50.83	50.69	55.65
Zimbabwe	60.80	43.32	44.21

Source: World Bank (2010) http://data.worldbank.org/topic/health

Table 2. IMR (probability of dying by age, 1 per 1,000 live births)

Country	1990	2000	2008
Zambia	105.1	104.4	92
Angola	153.73	141.1	130.25
Botswana	38.91	55.06	25.95
Congo, Democratic Republic of	125.79	125.79	125.79
Malawi	132.9	100.2	64.7
Mozambique	166.2	124	90.4
Namibia	48.6	51.4	31.4
Tanzania	96.9	87.1	66.8
Zimbabwe	50.6	61.8	61.5

Source: World Bank (2010) http://data.worldbank.org/topic/health

Table 3. Under-5 mortality rate (probability of dying by age 5 per 1,000 live births)

Country	**1990**	**2000**	**2008**
Zambia	171.7	169	148
Angola	259.6	238.5	220.1
Botswana	49.9	81.3	31
Congo, Democratic Republic of	198.6	198.6	198.6
Malawi	224.5	162	99.7
Mozambique	248.9	182.7	129.8
Namibia	71.7	77.4	41.5
Tanzania	157.3	139	103.5
Zimbabwe	79.3	102.1	95.6

Source: World Bank (2010) http://data.worldbank.org/topic/health

Table 4. Prevalence of HIV (% of population ages 15-49)

Country	**1990**	**2000**	**2007**
Zambia	8.9	15.5	15.2
Angola	0.3	1.5	2.1
Botswana	4.7	26.5	23.9
Malawi	2.1	13.5	11.9
Mozambique	1.4	9.5	12.5
Namibia	1.2	14	15.3
Tanzania	4.8	7.1	6.2
Zimbabwe	14.2	27.3	15.3

Source: World Bank (2010) http://data.worldbank.org/topic/health

Table 5. Prevalence of TB (per 100,000)

Country	**2000**	**2008**
Zambia	350	260
Angola	360	190
Botswana	300	560
Congo, Democratic Republic of	650	660
Malawi	410	310
Mozambique	540	470
Namibia	250	290
Tanzania	180	130
Zimbabwe	470	790

Source: WHO, 2010-a

Table 6. Immunization coverage among 1-year-olds for measles (%)

Country	**1990**	**2000**	**2008**
Zambia	90	85	85
Angola	38	41	79
Botswana	87	91	94
Congo, Democratic Republic of	75	34	79
Malawi	81	73	88
Mozambique	59	71	77
Namibia		69	73
Tanzania	80	78	88
Zimbabwe	87	75	66

Source: WHO, 2010-a

Annex III

Zambia - National Expenditure on Health														
A. SELECTED RATIO INDICATORS* FOR EXPENDITURES ON HEALTH	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
I. Expenditure ratios														
Total expenditure on health (THE) as % of GDP	5,6	5,9	6,2	6,5	5,8	5,7	5,9	6,6	6,6	6,6	7,0	6,4	6,2	6,0
Financing Sources measurement														
External resources on health as % of THE	11,5	18,7	22,8	24,2	8,8	17,8	13,4	26,0	32,0	34,2	42,5	38,1	33,1	32,1
Financing Agents measurement														
General government expenditure on health (GGHE) as % of THE	60,6	62,1	65,3	62,2	49,4	51,3	57,0	63,9	61,6	57,3	54,9	60,7	57,7	61,8
Private expenditure on health (PvtHE) as % of THE	39,4	37,9	34,7	37,8	50,6	48,7	43,0	36,1	38,4	42,7	45,1	39,3	42,3	38,2
GGHE as % of General government expenditure	10,4	13,3	15,5	13,3	9,8	9,4	10,5	13,6	13,2	14,2	14,7	16,4	14,5	15,2
Social security funds as % of GGHE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Private insurance as % of PvtHE	0,9	0,9	0,9	0,8	0,7	0,7	0,8	0,9	0,8	0,6	2,1	3,7	3,7	4,1
Out of pocket	88,8	92,5	91,8	87,9	81,5	80,5	74,3	77,0	75,5	71,4	60,7	67,2	67,6	74,5

expenditure as % of PvtHE														
II. Selected per capita indicators for expenditures on health														
Total expenditure on health / capita at exchange rate	21	21	25	21	18	18	20	22	26	31	43	56	57	68
Total expenditure on health / capita at Purchasing Power Parity (NCU per US$)	46	51	55	56	50	50	55	63	66	70	79	77	79	81
General government expenditure on health / cap x-rate	13	13	16	13	9	9	11	14	16	18	23	34	33	42
General government expenditure on health / cap Purchasing Power Parity (NCU per US$)	28	32	36	35	25	26	31	40	41	40	43	46	46	50
* These ratios and per capita levels are automatically derived using the aggregate figures in Section B.														
B. VALUES UNDERLYING RATIOS AND LEVELS	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Health System														

Expenditure & Financing														
Financing Agents measurement(Million Kwacha)														
Total expenditure on health	168.310	232.580	319.202	393.545	433.189	570.754	776.722	1.084.583	1.362.650	1.719.374	2.243.644	2.442.614	2.814.142	3.215.990
General government expenditure on health	102.030	144.329	208.379	244.656	214.189	292.793	442.574	692.869	839.514	985.159	1.231.171	1.482.697	1.623.741	1.987.510
Ministry of Health	56.029	77.096	92.884	143.018	170.796	242.848	380.879	358.105	309.674	333.789	800.469	807.336	894.087	1.180.646
Social security funds	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Private expenditure on health	66.280	88.251	110.823	148.889	219.001	277.961	334.149	391.713	523.136	734.215	1.012.473	959.917	1.190.401	1.228.480
Private insurance	601	790	1.028	1.206	1.496	2.014	2.627	3.580	4.227	4.616	21.445	35.116	43.857	49.855
Non-profit institutions serving households (e.g. NGOs)	4.113	3.204	4.286	5.140	9.189	12.053	18.637	24.156	33.983	76.699	267.924	185.550	231.736	263.432
Out of pocket expenditure	58.827	81.647	101.682	130.881	178.401	223.777	248.153	301.471	395.152	523.962	614.447	644.622	805.078	915.193
Financing Sources measurement (Million Kwacha)														
Rest of the world funds / External resources	19.403	43.405	72.915	95.096	37.905	101.811	104.257	282.175	435.871	588.705	953.811	930.439	932.067	1.033.133
Macro-economic variables (Million Kwacha)														
Gross domestic product (GDP)	3.005.100	3.950.200	5.140.200	6.027.900	7.477.700	10.071.888	13.132.759	16.345.600	20.702.800	25.916.800	31.944.600	38.464.100	45.669.000	53.615.000

General government expenditure (GGE)	983.440	1.087.865	1.340.611	1.842.062	2.195.385	3.122.569	4.212.197	5.086.000	6.337.000	6.919.000	8.350.000	9.051.000	11.209.000	13.101.000
Private Final Consumption expenditure	2.175.500	3.019.400	3.692.900	4.550.400	6.088.900	8.803.800	11.437.000	13.040.500	15.001.600	16.934.100	22.756.000	22.831.000	28.514.000	32.414.000
Households final consumption	2.169.400	3.020.200	3.761.100	4.840.700	6.599.300	8.275.525	9.176.969	11.280.000	13.576.025					
non-profit institutions expenditure (NPI)														
Exchange rate (NCU per US$)	864,12	1.207,90	1.314,50	1.862,07	2.388,02	3.110,84	3.610,94	4.398,59	4.733,27	4.778,88	4.463,50	3.603,07	4.002,52	3.745,66
Purchasing Power Parity (NCU per US$)	404,15	487,47	603,97	713,76	853,83	1.086,62	1.318,99	1.570,78	1.843,49	2.127,64	2.414,81	2.654,24	2.890,65	3.133,52
Population (in thousands)	9.108	9.372	9.647	9.925	10.200	10.467	10.724	10.972	11.219	11.472	11.738	12.019	12.314	12.620

'n/a' Used when the information accessed indicates that a cell should have an entry but no estimates could be made.

'0' Used when no evidence of the schemes to which the cell relates exist. Some estimates yielding a ratio below 0.04% are also shown as '0'.

Source: WHO (2010) Estimates for National Health Accounts, http://www.who.int/nha/country/zmb/en/