

Example of essay on e-health in developing countries with a special focus on nige...

[Life](#), [Death](#)



New advances in medical science and technology have decreased the global burden of disease. However, low-income countries lack the necessary resources to provide for the healthcare needs of all their people. E-health systems have the potential to help low-income countries tap into the richer healthcare resources of more affluent countries, by providing cost-effective tools that can link them to global data management banks, clinical decision support organizations, and care-at-a-distance programs. However, to be effective, these resources must be used with care. The first step in prioritizing healthcare resources is to estimate the burden of disease. High-income countries have reliable systems to assess the causes of death in the population; however, low-income countries do not have such systems in place, and mortality rates from a specific disease have to be extrapolated from incomplete data. Several studies have approached the problem of estimating the burden of disease by using a variety of methods to determine which diseases are responsible for the most deaths, which countries are carrying the highest burden of disease and death, and which populations are at the highest risk of death. These data help the allocation of resources where they can have the greatest impact on the delivery of healthcare. Although the concept of e-health is relatively new, there is already evidence of the benefits of e-health in the management of data in developing countries, as well as of the benefits of an increasing number and variety of other e-health applications. The aim of this study is to evaluate the general impact of e-health in developing countries and to determine which e-health applications may be of special import in Nigeria.

Key words: burden of disease, health patterns, ICT

E-health in Developing Countries with a Special Focus on Nigeria

Chapter 1. Research Methodology

1. 1 Introduction

The burden of illness is increasing worldwide, and developing and transitional countries continue to carry the heaviest burden of disease.

Although therapeutics and treatments are available for many chronic diseases that increase the risk of mortality and impact quality of life, many of these countries lack access to proper healthcare. There are many factors that affect the ability of developing and transitional countries to meet the healthcare needs of their people, including political, administrative, socio-economic, environmental, and geographical barriers. To try to address some of these problems, policy makers have proposed a number of solutions, some of which are centred round newly available technologies.

Many healthcare policy makers, administrators and providers are turning their attention towards two new technological applications that show much promise in promoting universal delivery of quality healthcare: e-health and m-health. E-health uses information and communication technology to manage healthcare, while m-health uses mobile technology. The main attractions of these technologies are their accessibility, affordability, implementability, and universal application. The World Health Organization, the United States of America, and the European Union, are strong promoters of e-health and m-health, and have developed programmes to help underfunded countries incorporate these technologies into their health care systems. A few countries have begun taking advantage of their offers, and

the first results coming in are promising. However, the great majority of developing countries continue to struggle within their broken and terribly inefficient healthcare systems.

1. 2 Scope of the research

The scope of this study is to evaluate e-health system applications and platforms that can facilitate the management of medical and patient data, offer clinical decision support, allow healthcare from a distance, and promote medical research in nations within the African Region.

1. 3 Aim of the study

The primary purpose of this study is to evaluate some of the e-health applications that have already been proven, or may prove, of value in the delivery of healthcare in developing countries, and to identify the barriers that are preventing more widespread application of the technology. The secondary purpose of this study is to attempt to find solutions to any of the problems identified, with particular emphasis in Nigeria.

1. 4 Objectives

This study will identify e-health applications that have been used with success to address specific illnesses or diseases that place a high burden of illness and/or increase the risk of mortality in developing countries. This study will focus on countries within the African Region, and on Nigeria in particular. This study will also analyze factors that have been preventing wider application of this technology. Finally, it will determine how these factors could be addressed to clear the way for the establishment of successful e-health programmes, with special focus on Nigeria.

1. 5 Research questions

What e-health programmes have been successfully instituted in developed countries that could be adapted for implementation across the African Region, especially in Nigeria?

What e-health programmes have already been successfully instituted in other countries within the African Region that could be expanded for implementation in Nigeria?

What are the most significant factors that are preventing African nations from establishing national e-health programmes to meet the healthcare needs of their people?

What are the most significant factors that are preventing Nigeria from establishing national e-health programmes to meet the healthcare needs of its people?

1. 6 Hypothesis

Successful implementation of e-health systems relies on socio-technical, economic, and political factors. Government support will have the greatest impact on the continuity of implementation of e-health systems.

1. 7 Limitations

This study will rely on surveys to attempt to measure localized e-Health activity in selected areas around Nigeria. One problem will be the identification of healthcare experts within those regions, and to then induce them to complete the survey. Another problem is that survey responses will by design be based on self-reporting by the expert responder, particularly where open-ended questions are concerned. It will also be difficult, if not

impossible, to verify the accuracy of their responses.

Moreover, there are wide variations in the definition of terminology and while the survey will be presented with detailed instructions, there is no guarantee that the respondents will rely on these instruction to complete the survey.

2. Global Burden of Disease

2. 1 Introduction

Science is an evidence-based endeavour, and health science is no different. The healthcare system must have reliable and consistent data on the burden of diseases to allocate its resources and develop health policies to eradicate these diseases. However, a system has yet to be developed that can deal with all the fragmentary data that is still coming out of many areas of the world, unreliable data which unfortunately comes from those areas in the world with the greatest need of consistent data. Information technology has the potential of playing an important role in filling the missing gaps of information. New technological developments have made it possible for even those with minimal training to gather and consolidate data, where in the past it was a task reserved for the highly skilled.

2. 2 Global Burden of Disease Analysis

Burden of disease analyses are central to health policy in several ways. Analyses of the demographics of disease help in the long-term assessment of performance within a country or region, or between countries and regions, and allow the tracking and judging of progress. Assessment of the burden of disease brings together a multi-disciplinary team of specialists, including epidemiologists and policy makers, who debate values and priorities and determine national health policy. Knowing where the burden of disease is

highest allows countries to prioritize and target specific diseases in need of intervention, like HIV/AIDS or malaria across the African Region, or poliomyelitis in Nigeria (Akom, 2008).

Burden of disease analyses can also guide the training of healthcare specialists for the delivery of healthcare interventions where the need is highest. Medical personnel are a limited resource and like any valuable resource they should not be wasted; effective use of human resources is especially crucial in countries with the lowest doctor/nurse-patient ratios, like Niger and Sierra Leone, and many other countries in the African Region (Akom, 2008). In countries such as these, information-driven allocation of resources can generate the greatest good. Unfortunately, data is not always available and the majority of the information that is available is either not consistent, or not very reliable.

Murray and Lopez (1997) evaluated the 1990 mortality rates in eight regions of the world, and found there were no data available for 15 million out of the 50 million people who die each year worldwide. Nevertheless, there were methods that could be used to estimate the cause of death. This is possible if one examines the epidemiological patterns and characteristics of a particular community. For example, Murray and Lopez collected data from a variety of sources to estimate cause of death patterns for 107 different causes of death. The various sources were then collated and compared to compile a pattern and derive a holistic picture of mortality. The findings of their study showed that 98% of the deaths of children below the age of 15 occurred in the developing world. The probability of death in this age group was highest in sub-Saharan Africa, with a mortality rate of 22.0%, compared to a low

rate of 1. 1% in developed countries. Global deaths in 1990 were mainly due to non-communicable diseases (28. 1/50 million deaths), followed by communicable and nutritional disorders (17. 2/50 million deaths). Pediatric deaths were attributed to perinatal disorders (2. 4/50 million deaths), diarrhoea (2. 9/50 million deaths), and measles (1. 1 million/50 million deaths). Thus, half the leading causes of deaths were diseases that affect mainly children. This is particularly poignant because these diseases are largely preventable when access to healthcare is available and preventive methods followed. Injuries account for 10% of deaths around the world, but wide variations in the cause of these deaths preclude the assessment and management of data.

In 2006, Lopez et al. conducted a systematic analysis to evaluate the mortality, morbidity, and prevalence of 136 diseases and injuries for seven geographic areas of the world for 1990-2001, as well as 19 risk factors associated with these diseases. The results showed that out of 56 million people who died in 2001, 10. 6 million were children, and 99% of them were from developing or transitional countries. Over 50% of the children deaths were caused by acute respiratory infections, diarrhea, malaria, HIV/AIDS, or measles. As high as these figures appear, the figures are 20% lower than the figures for 1990, except for the region in Sub-Saharan Africa, where the burden of disease increased due to the rampant HIV/AIDS epidemic. Half the disease rate was from non-communicable diseases and the leading factor was malnutrition. In addition, risk factors do not act in isolation but in concert with each other, thus 45% of global deaths are due to a combination of at least two risk factors. Overall, the burden of disease has improved

around the world, although the numbers remain intolerably high.

Other studies continued to expand on the work of Murray and Lopez (1996). Mathers and Loncar (2006) conducted a study to project global mortality and burden of disease from 2002 to 2030 and found that Murray and Lopez had underestimated the impact of HIV/AIDS around the world. Mathers and Loncar projected future health trends using three scenarios; namely, baseline, optimistic, and pessimistic projections against data from previous studies. The advent of information technology (IT) technology has made data more readily available, although there are areas where the collection of reliable data remains illusive. In their study, Mathers and Loncar projected a shift in the burden of death from the younger to the older generation, and from communicable to non-communicable diseases, as is now seen in industrialized nations. The risk of death for children under 5 years of age is expected to fall by 50%. At the same time the study also projected a global rise in deaths due to HIV/AIDS, from 2.8 million in 2002 to 6.5 million in 2030. HIV/AIDS is projected to account for the largest number of deaths in developing and transitional countries by the year 2015, even under the most conservative baseline scenario. Of note, the fourth largest cause of death was projected to be due to road accidents. Figure 1(adapted from Mathers and Loncar 2006, e442) shows the estimated deaths in 2002 and the projected deaths in 2030. The vertical bars bisecting the points 2030 represent the range of deaths projections under the optimistic (7.5 million, age 45-59; 9.2 million, age 60-69) and pessimistic (11.5 million, age 5-59; 12 million, age 60-69) scenarios.

Fig. 1: Estimated 2002 deaths extrapolated to the year 2030

The authors acknowledged the limitations of their study and pointed out the transitional patterns of epidemiological characteristic of developing countries. Nevertheless, their projections seem more realistic than those in previous studies, as they took into account the aging of the global population, and used different scenarios by manipulating the same variables under various conditions. A more recent study by Mathers, Boerma, and Ma Fat (2009) also found that one-half of global children deaths are from the same four preventable and treatable communicable diseases described in earlier studies i. e., diarrhoeal diseases, prematurity and low birth weight, neonatal infections, and malaria. Their study also found that around 60% of global deaths occur from non-communicable diseases, again despite rising deaths due to HIV/AIDS. In addition, the study found major differences in the ranking of diseases between high-/mid- and low-income countries. The main causes of pediatric deaths in low-income countries were infectious and parasitic diseases, specially malaria, and perinatal conditions. The top three causes of death for adults in low-income countries were lower respiratory infections, HIV/AIDS, and ischaemic heart disease (Table 1, adapted from Mather, Boerma, and Ma Fat 2009, p. 20).

Table 1. The Ten Top Causes of Death in Low-Income Countries in 2004

Low-income countries*

Deaths in millions

% of deaths

Lower respiratory infections

Diarrhoeal diseases

Cerebrovascular disease

Neonatal infections

Prematurity and low birth weight

All causes

COPD, chronic obstructive pulmonary disease; IHD, ischaemic heart disease; TB, tuberculosis.

*Countries grouped by gross national income per capita—low income (\$825 or less)

Mather, Boerma, and Ma Fat 2009

In contrast, in high-/mid-income countries, 90% of deaths were due to noncommunicable diseases or injuries (Tables 2a and 2b, adapted from Mather, Boerma, and Ma Fat 2009, p. 20). The top three causes of disease in high-/mid-income countries were ischaemic heart disease, stroke and other cerebrovascular diseases, and lower respiratory infections. In the paediatric population, diarrhoeal diseases were the predominant cause of death. Tables 2a and 2b summarise the ten top causes of death in the world for all populations in mid- and high-income countries, respectively. The total number of deaths for all causes combined according to income was 26. 3, 24. 3, and 8. 1 million deaths, for low-, middle-, and high-income countries,

respectively.

Table 2a. The Ten Top Causes of Death in Middle-Income Countries in 2004

Middle-income countries*

Deaths in millions

% of deaths

Cerebrovascular disease

Lower respiratory infections

Trachea, bronchus, lung cancers

Road traffic accidents

Hypertensive heart disease

Stomach cancer

Diabetes mellitus

All causes

COPD, chronic obstructive pulmonary disease; IHD, ischaemic heart disease;

TB, tuberculosis.

*Countries grouped by gross national income per capita—middle income (>

\$825, < \$10, 066)

Mather, Boerma, and Ma Fat 2009

Table 2b. The Ten Top Causes of Death in High-Income Countries in 2004

Middle-income countries*

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Deaths in millions

% of deaths

Cerebrovascular disease

Trachea, bronchus, lung cancers

Lower respiratory infections

Alzheimer and other dementias

Colon and rectum cancers

Diabetes mellitus

Breast cancer

Stomach cancer

All causes

COPD, chronic obstructive pulmonary disease; IHD, ischaemic heart disease; TB, tuberculosis.

*Countries grouped by gross national income per capita—high income (more than \$10, 066)

Mather, Boerma, and Ma Fat 2009

This difference in the patterns of diseases between high-/mid-income and low-income countries reflects the differences in the demographics of mortality. The majority of deaths in low-income countries occur in the youngest population aged <15 years, whereas the majority of deaths in

high-/mid-income occur in populations aged > 15 years (Figs. 2-4). Figure 2 shows the death distribution by age in high-income countries. The majority of people (71%) in high-income countries lived beyond the age of 70. The predominant cause of death for this age group was chronic diseases, with cardiovascular and cerebrovascular diseases accounting for 15.6% and 8.7% of all deaths, respectively (WHO 2011). The only leading infectious cause of death was lower respiratory infections, causing 3.8% of all deaths (WHO 2011).

Fig. 2: WHO 2011 death distribution by age and income

Figure 3 (WHO 2011) shows the death distribution by age in middle-income countries. Nearly half (45%) the people live beyond the age of 70; and, like high-income countries, chronic diseases were the predominant cause of death, with cardiovascular and cerebrovascular diseases accounting for 13.7% and 12.8% of all deaths, respectively (WHO 2011). However, unlike high-income countries, chronic obstructive pulmonary disease represented a significant cause of death, at 7.2%. Infectious diseases like tuberculosis and HIV/AIDS were also among the leading causes of death, at 2.4% and 2.7%, respectively. Diarrhoeal diseases accounted for 4.4% of all deaths, mainly in the pediatric population (WHO 2011).

Fig. 3: WHO 2011 death distribution by age and income

The demographics are quite different for low-income countries (Fig. 4, WHO 2011); less than 20% of the population lived beyond the age of 70, and 40% died below the age of 15. Table 1 shows the top ten leading causes of death in low-income countries. Infectious diseases accounted for the majority of

deaths, including pulmonary infections (11.3%), diarrhoeal diseases (8.2%), tuberculosis (4.3%), HIV/AIDS (7.8%), and malaria (5.2%), a similar pattern of diseases as that found by Murray and Lopez (1997) in their study of the global burden of disease in 1990. The leading causes of deaths for mothers and infants are complications of pregnancy and childbirth, together accounting for close to 9% of deaths. Diarrhoeal diseases and malaria were also responsible for a significant number of paediatric deaths. These too corresponded to findings of earlier studies (Lopez et al., 2006; Murray and Lopez, 1997).

Fig. 4: WHO 2011 death distribution by age and income

Table 3 summarizes the studies by Murray and Lopez (1997), Lopez et al. (2006), Mathers and Loncar (2006), and Mathers, Boerma, and Ma Fat (2009).

Table 3. Summary of Studies on Global Burden of Disease and Mortality

Region with greatest burden of death

Major causes of

paediatric death

(millions)

Major causes of global death

(millions)

Murray and Lopez (1997)

50 million

Sub-Saharan Africa,

22. 0% versus 1. 1% in developed countries

Perinatal disorders, 2. 4/50

Diarrhoea, 2. 9/50

Measles, 1. 1

Non-infectious diseases, 28. 1/50; infectious diseases and nutritional disorders, 17. 2/50

Lopez et al. (2006)

56 million

Sub-Saharan Africa,


50% due to acute respiratory infections, diarrhea, malaria, HIV/AIDS, or measles

Malnutrition, leading factor;

Non-infectious diseases, 50%;

HIV/AIDS

Mathers and Loncar

57  73. 2 million

African Region

Diarrhoeal diseases, prematurity and low birth weight, neonatal infections, and malaria

HIV/AIDS, 2. 8 6. 5

Non-communicable, 59% 69%

Mathers, Boerma, and Ma Fat (2009)

58. 8 million

African Region

Infectious diseases, 50%

60% non-infectious

However, the picture is even more complex because there still exist wide regional variations in disease patterns among the various countries within each of these three income categories, especially among low-income countries. Thus, in recognition of the inequity in health among the various regions of the world, and with the standardization of data collection and analysis in mind, WHO organized all countries into six designated WHO regions: WHO African Region, WHO Region of the Americas, WHO South-East Asia Region, WHO European Region, WHO Eastern Mediterranean Region, and WHO Western Pacific Region, roughly equivalent to the categories used in the Lopez et al. (2006) study. A comprehensive list of the countries within each region may be found in World Health Statistics 2011 footnotes pages 169–170. Figures 5 and 6 (WHO 2011) represent the WHO 2011 global infant and adult death estimates, respectively, according to each of the six WHO designated regions, with the high-income countries from each region separated off as a seventh group, the High Income Region. In accordance with other studies (Lopez et al., 2006; Mathers, Boerma, & Ma Fat, 2009;

Mathers & Loncar 2006; Murray & Lopez, 1997), the African Region carried by far the greatest burden of disease; where the mortality rate exceeded that of all other regions by a factor of 2-5, in both the paediatric and adult populations.

Fig. 5: WHO 2011 Global Death Statistics for Children 0-4 Years

Fig. 6: WHO 2011 Global Death Statistics for Adults 15-59 Years

Figure 7 (WHO 2004) represents the WHO 2004 estimated child mortality rates by cause and region; 99% of deaths occurred in low-income and middle-income countries. Prenatal conditions and diarrhoeal diseases account for 42% and 54% of all deaths in children under the age of 5 in most regions except the Africa Region (25%), where post-natal mortality rates due to malaria (16%) drove the numbers down (WHO 2004). The highest burden of death for children under five years was borne by the African Region, amounting to 4.7 million out of 10.4 million deaths (45%). The second highest death rate occurred in the Eastern Mediterranean, at 3.1 million (30%), which means that the death rate in the African Region is more than double that of all but one of the other six WHO regions. Diarrhoeal diseases and respiratory infections were the two leading infectious diseases.

Fig. 7: WHO 2004 child mortality rates by cause and region

The ranking of mortality rates according to region differs for the adult population, where low- and middle-income countries of the European Region have the second highest rate of mortality (Fig. 8, WHO 2004). In addition, the difference in adult mortality rates between countries in the High Income

Region and those in the six other regions is less pronounced than for child mortality, due in part to the presence of a large adult population in the High Income Region; except for the African Region, where AIDS/HIV drove the adult mortality rates up, to ten times that of the High Income Region.

Fig. 8: WHO 2004 adult mortality rates by cause and region

There were also wide variations within each of the WHO regions, although the widest variations were found amongst countries in the African Region. Figure 9 (OECD 2008) shows a breakdown of child mortality rates in the African Region according to country. A cluster of countries in West Africa between the Tropic of Cancer and the Equator, including Nigeria, Niger, Chad, Sierra Leone, and Liberia, had some of the highest levels on infant mortality in the world, with more than 150 deaths per 1000 live births (Fig. 9, OECD 2008). This area lies within a challenging environment and is a hot pocket of parasitic and infectious diseases, like malaria, cholera, and meningitis, as well as a host of other diarrhoeal diseases, and HIV/AIDS (OECD 2008).

Fig. 9. Infant mortality in Africa; WHO, World Health Statistics 2007 Highlights and Table

The usual gender differences in the pattern of diseases were also found, although HIV/AIDS claimed by far the most lives for either sex. The second most common cause of deaths for both sexes was other infections and parasitic diseases. The main difference between the sexes was in the third cause of death, where males tended to lose their lives to injuries, and females died due to maternal and nutritional conditions (Fig. 10, WHO 2004).

Fig. 10: WHO 2004 adult mortality rates in the African Region, by sex and major cause of death group

2. 3 Problems of gathering primary data

As critical as the acquisition of these data is, there remains considerable controversy regarding the methods of collection and analysis, as well as the sources of data, especially in African countries. An important factor to consider is that too often, the cause of death remains unknown. It is hoped that new developments in IT technologies may prove useful in facilitating the collection and evaluation of data in areas that have largely remained out of reach to researchers trying to collect demographic and epidemiological data.

As far back as 1976, Ayeni (1976) decried the lack of adequate health data in Africa, including patterns of disease, the extent to which medical facilities are used, the populations affected, and morbidity. These data would help health administrators understand the current health status of the population in the country, increase the ability to detect changes in this status, and allow for predictions of health trends. Unfortunately, data is incomplete, and when available, there is lack of uniformity in the way it is reported. Ayeni suggested that data collection should be delegated to skilled personnel trained for that specific purpose.

In 1988, Adekolu-John conducted a statistical study on the health status of the Kainji Lake Area of Nigeria and found that 42% of deaths occurred in children below 10 years of age. The leading causes of death were malaria, diarrhea, and measles. There were also epidemics that accounted for sporadic spikes in death rates. One curious statistic is that the number of

births in the hospitals exceeded the number of registered births and there were no data recorded for hospital deaths of infants, let alone for deaths occurring at home. The reason for this omission is that there was little awareness of the need to register these data for national concern. Non-indigenous people who moved into the area did attempt to register the births of their children, but neglected to register their deaths.

In 2003, fifteen years after the Adekolu-John study, Agundu conducted a study on the type of health statistics and the way these statistics were being collected and found that there is no systematic approach to the collection of data, as well as a general lack of appreciation for the significance of statistical data. Data for the study was collected from 120 senior public health officials in Nigeria. The officials had little knowledge of statistics and their relevance to their work and the data was simply filed away for some unknown future use.

Thirty years later, Okonjo-Iweala & Osafo-Kwaako (2007) were still concerned about the lack of proper statistical data on the health patterns and morbidity in African countries. The authors suggest that the deplorable statistics on the health of African nations is due in part to the lack of statistical data to guide the allocation of necessary, and scant, resources. Setel et al (2007) referred to this phenomenon as “ a scandal of invisibility,” stating that people don’t “ count” unless they are counted, and discussed socio-political and economic, as well as cultural factors that impact the delivery of healthcare in developing and transitional countries.

2. 4 Potential role of IT in gathering data

People living in developing countries, particularly those living in the sub-Saharan African region, face the heaviest burden of disease. It is a crisis that is deepened by poverty and the skewed allocation of resources. The problem is further exacerbated by a inefficient and fragmented healthcare systems that lack continuity in the flow and sharing of healthcare information.

Bukachi and Pakenham-Walsh (2007) suggested that access to new information and communication technologies (ICTs) can help improve the delivery of healthcare in these areas. In fact, healthcare workers are already using information technology with remarkable success as a means of communication, collaboration, to access health data including clinical information and records, and for continuing health education. However, one problem the authors of this study encountered is the lack of uniformity in infrastructure, and that different cultural contexts require different models and approaches, especially when patients represent a major part of the equation. Bukachi and Pakenham-Walsh suggested