

**Inpatient household economic burden of child
malnutrition in Zimbabwe: a case study conducted at
Harare Central hospital**

By

Student: Rufaro Masiwa
MSWRUF001

SUBMITTED TO THE UNIVERSITY OF CAPE TOWN

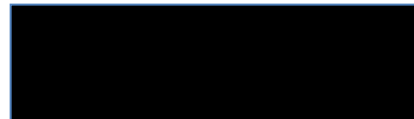
In partial fulfilment of the requirements for the degree
Masters of Public Health (Health Economics)

**Faculty of Health Sciences
UNIVERSITY OF CAPE TOWN**

October 2013

Supervisor: Dr Olufunke Alaba
School of Public Health and Family Medicine

University of Cape Town



The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

PREAMBLE

I. DECLARATION

I, Rufaro Masiwa, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I empower the university to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

Signed by candidate

Signature removed

University of Cape Town

II. THESIS ABSTRACT

Background: Severe acute malnutrition is one of the leading underlying causes of mortality in children under the age of five years. Nearly one to two million child deaths worldwide can be attributable to this illness. Although it is considered to be a global public health issue, severe acute malnutrition imposes an uneven burden on health resources across the world, with low-income countries shouldering much of this burden.

Like any illness, severe acute malnutrition imposes an economic burden on households that, if significantly large could result in the impoverishment of households. However, despite the existence of a large volume of literature on the intergenerational economic consequences of malnutrition, little is known about the short term household economic consequences of malnutrition. This mini-dissertation sets out to estimate the household economic burden imposed by severe acute malnutrition in children under the age of 5 years in Zimbabwe. Furthermore, it aims to investigate and evaluate household responses to the economic consequences of malnutrition and the effect of the responses on household economic welfare.

Methods: The study was conducted in the malnutrition ward at Harare Central hospital. The hospital is among one of the few tertiary health care facilities that provide inpatient care for severely malnourished children. The study was divided into two research phases. In the first phase of the research was a retrospective review of medical charts of under-fives admitted to the hospital with confirmed diagnosis of severe acute malnutrition between 1 April 2008 – 31 July 2008 and 1 April 2009 – 31 July 2009 were reviewed to obtain data relating to hospital stay duration, utilisation data relating to treatment medical inputs including the quantity of diagnostic tests and drugs.

The second phase of the research involved a prospective study of patient medical records of 40 children admitted to the malnutrition bay in May 2011. Participants recruited into the prospective arm of the research were monitored from date of hospital admission until date of hospital discharge. During this period, data relating to quantities of medical inputs was collated. Furthermore, caretakers of children admitted to the malnutrition bay were interviewed using a structured questionnaire to collate information on household demographics, the quantity of lost productive time and information on the household's response to the direct and indirect costs of malnutrition.

Results: Inpatient treatment of severe acute malnutrition yielded positive medical outcomes. 35 out of 40 children recruited in the prospective arm of the research were discharged and no deaths were recorded. Severe acute malnutrition imposes a significant economic burden on households in Zimbabwe. Without accounting for the presence of co-morbidities, it was estimated that households recruited in the prospective of the research incurred direct costs amounting 36.75 US\$, which is equivalent to 24% of monthly household income. Furthermore, it was estimated that caretakers lost an average of 11 working days - an amount equivalent to 31% of household monthly income.

Explicitly accounting for the presence of co-morbidities, the direct cost of severe acute malnutrition in the absence of any co-morbidity was estimated to be 29.69 US\$. The presence of co-morbidities had an incremental effect on the total direct costs of severe acute malnutrition. The direct costs of treating SAM in the presence of pneumonia and fever; and SAM in the presence of diarrhoea is 31.55 US\$ and 30.94 US\$ respectively. To cope with the additional expenditure related to direct costs of illness, 65% of households reduced household food consumption. To cope with the time lost to production, 58% of households relied on intra-household labour substitution.

Households observed in the study, though living in urban areas, they were found to be living in absolute poverty and had limited access to regular clean water and sanitation services. It is highly likely that from their initial household poverty status that the economic burden imposed by malnutrition exerted impoverishing effects that precipitated a decline in household welfare.

Conclusions: Given that inpatient treatment of severe acute malnutrition at a tertiary health facility imposes a significant economic burden on households, substantial improvements in funding of primary health care facilities will contribute towards meaningful strides in lowering the household economic burden, thus possibly increasing affordability of accessing treatment for malnutrition.

III. ACKNOWLEDGEMENTS

This research was made possible by funding offered through the University of Cape Town's Health Economic Unit by SIDA (Swedish International Development Agency). A very special thanks is extended to Dr Olufunke Alaba for her valuable input and suggestions that framed this study.

Additional gratitude is extended to Mr Vera (Harare hospital administrator), Matron Tangende and her staff for their wonderful assistance during the data collection period.

University of Cape Town

IV. LIST OF FIGURES AND TABLES

RESEARCH PROTOCOL

| | |
|--|----|
| FIGURE 1: TRENDS IN CHILD MORTALITY AND GROSS DOMESTIC PRODUCT GROWTH IN ZIMBABWE BETWEEN 1980 AND 2009..... | 4 |
| FIGURE 2: TRENDS IN AVAILABILITY OF SELECTED ESSENTIAL DRUG IN HEALTH FACILITIES..... | 5 |
| FIGURE 3: PREVALENCE OF MALNUTRITION IN ZIMBABWE 1980 – 2008..... | 5 |
| FIGURE 4: CONCEPTUAL FRAMEWORK OF CHILDHOOD ILLNESS AND HOUSEHOLD ECONOMIC WELFARE..... | 18 |
| FIGURE 5: HEALTH IMPAIRMENTS AND LABOUR SUPPLY..... | 23 |

LITERATURE REVIEW

| | |
|--|----|
| FIGURE 6: TYPES OF MALNUTRITION (UNDER-NUTRITION)..... | 3 |
| FIGURE 7: THE STUDY CONCEPTUAL FRAMEWORK..... | 28 |

JOURNAL ARTICLE

| | |
|--|----|
| FIGURE 8: THE CAUSES AND CONSEQUENCES OF MALNUTRITION..... | 4 |
| FIGURE 9: THE CONCEPTUAL FRAMEWORK DESCRIBING THE POTENTIAL PATHWAYS BETWEEN..... | 6 |
| FIGURE 10: MAP OF HARARE..... | 9 |
| FIGURE 11: HOUSEHOLD TREATMENT SEEKING BEHAVIOUR ON ONSET OF CHILD ILLNESS – PROSPECTIVE PARTICIPANTS..... | 17 |
| FIGURE 12: DESCRIPTIVE ANALYSIS OF HOUSEHOLDS BY RESIDENCE..... | 21 |
| FIGURE 13: HOUSEHOLD DIRECT COST OF ILLNESS BURDEN AS A % OF MONTHLY HOUSEHOLD INCOME..... | 27 |

POLICY BRIEF

| | |
|---|---|
| FIGURE 14: HOUSEHOLD DIRECT COST EXPENDITURES AS % OF AVERAGE MONTHLY HOUSEHOLD INCOME..... | 4 |
| FIGURE 15: THE EFFECT OF HOUSEHOLD DIRECT COSTS OF SAM ON HOUSEHOLD WELFARE..... | 5 |

RESEARCH PROTOCOL

| | |
|--|----|
| TABLE 1: MORTALITY PATTERNS AGES 1-4 IN HARARE BETWEEN 2007 AND 2008..... | 7 |
| TABLE 2: MINIMUM MONTHLY WAGE DATA BY SECTOR IN ZIMBABWE (2009)..... | 25 |
| TABLE 3: PROFILE OF ZIMBABWE CULTURAL BACKGROUND..... | 29 |
| TABLE 4: WHO CLASSIFICATION OF MALNUTRITION..... | 34 |
| TABLE 5: INSTRUCTIONS TO CALCULATE UNIT INPUT COST..... | 35 |
| TABLE 6: SUMMARY OF UNIT INPUTS..... | 35 |
| TABLE 7: TOTAL DIRECT COST OF ILLNESS (WITHOUT EXPLICITLY ACCOUNTING FOR CO-MORBIDITIES)..... | 36 |
| TABLE 8: EXAMPLE OF CO-MORBIDITY DISEASE MATRIX FOR PATIENTS RECRUITED IN THE PROSPECTIVE STUDY..... | 36 |
| TABLE 9: TOTAL DIRECT COSTS OF SEVERE ACUTE MALNUTRITION: THE ADDITIVE EFFECT OF CO-MORBIDITIES..... | 37 |
| TABLE 10: EXAMPLE OF TOTAL INDIRECT COST TABLE..... | 37 |
| TABLE 11: TOTAL COST OF SEVERE ACUTE MALNUTRITION (WITHOUT ACCOUNTING FOR THE EFFECT OF CO-MORBIDITIES)..... | 38 |
| TABLE 12: TABLE SUMMARISING HOUSEHOLD COPING STRATEGIES..... | 38 |

LITERATURE REVIEW

| | |
|---|----|
| TABLE 13: COMPONENTS OF DIRECT COSTS FROM RECENT COST OF ILLNESS STUDIES..... | 15 |
|---|----|

JOURNAL ARTICLE

| | |
|---|----|
| TABLE 14: WAGE RATE ASSUMPTIONS..... | 14 |
| TABLE 15: COMMON SYMPTOMS OF ILLNESS PRESENTED BY UNDER-FIVES RECRUITED IN THE PROSPECTIVE ARM OF THE RESEARCH UPON HOSPITAL ADMISSION..... | 16 |
| TABLE 16: A DISEASE MATRIX OF CO-MORBIDITIES REPORTED BY CARETAKERS OF CHILDREN RECRUITED IN THE PROSPECTIVE ARM OF THE RESEARCH..... | 16 |
| TABLE 17: COMMON SYMPTOMS PRESENT UPON HOSPITAL ADMISSION FOR PATIENTS RECRUITED IN THE RETROSPECTIVE PATIENTS..... | 18 |
| TABLE 18: THE PRESENCE OF CONFIRMED AND RECORDED COMMON CO-MORBIDITIES ON DURATION OF HOSPITAL STAY (RETROSPECTIVE PATIENTS)..... | 18 |
| TABLE 19: SUMMARY LIST OF UNIT INPUT DATA AND KEY ASSUMPTIONS..... | 19 |
| TABLE 20: SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLDS RECRUITED IN PROSPECTIVE & RETROSPECTIVE STUDY..... | 21 |
| TABLE 21: DIRECT COST OF SEVERE ACUTE MALNUTRITION WITHOUT EXPLICITLY ACCOUNTING FOR THE PRESENCE OF COMORBIDITIES..... | 22 |
| TABLE 22: TOTAL INDIRECT COST OF ILLNESS FOR HOUSEHOLDS IN THE PROSPECTIVE ARM OF THE RESEARCH..... | 24 |
| TABLE 23: TOTAL COST OF SEVERE ACUTE MALNUTRITION IN CHILDREN INCURRED BY HOUSEHOLDS RECRUITED IN THE PROSPECTIVE ARM OF THE RESEARCH (WITHOUT EXPLICITLY ACCOUNTING FOR THE PRESENCE OF COMORBIDITIES)..... | 25 |
| TABLE 24: TOTAL DIRECT COST EXPLICITLY ACCOUNTING FOR THE INCREMENTAL EFFECT OF CO-MORBIDITIES ON THE DIRECT COST OF SEVERE ACUTE MALNUTRITION..... | 26 |
| TABLE 25: SENSITIVITY ANALYSIS OF TOTAL COST OF SEVERE ACUTE MALNUTRITION IN CHILDREN UNDER VARYING WAGE RATE ASSUMPTIONS (EXCLUDING DRUG COSTS INCURRED PRIOR TO HOSPITAL ADMISSION & WITHOUT EXPLICITLY ACCOUNTING FOR THE PRESENCE OF CO-MORBIDITIES)..... | 28 |
| TABLE 26: SENSITIVITY ANALYSIS OF INDIRECT COST OF SEVERE ACUTE MALNUTRITION IN CHILDREN UNDER VARYING ASSUMPTIONS ON INTRA-HOUSEHOLD LABOUR SUBSTITUTION (EXCLUDING DRUG COSTS INCURRED PRIOR TO HOSPITAL ADMISSION & WITHOUT EXPLICITLY ACCOUNTING FOR THE PRESENCE OF CO-MORBIDITIES)..... | 29 |

TABLE OF CONTENTS

| | |
|---|----|
| PREAMBLE..... | 1 |
| I. DECLARATION..... | 1 |
| II. THESIS ABSTRACT..... | 2 |
| III. ACKNOWLEDGEMENTS..... | 3 |
| IV. LIST OF FIGURES AND TABLES..... | 4 |
| 1. RESEARCH PROTOCOL..... | 1 |
| 1.0. INTRODUCTION..... | 1 |
| 1.1. RATIONALE AND JUSTIFICATION OF THE STUDY..... | 7 |
| 1.2. OBJECTIVES OF THE STUDY..... | 9 |
| 1.3. BRIEF LITERATURE REVIEW..... | 10 |
| 1.4. CONCEPTUAL FRAMEWORK AND EMPIRICAL FINDINGS..... | 17 |
| 1.5. THEORETICAL FRAMEWORK: THE HUMAN CAPITAL APPROACH..... | 21 |
| 1.6. METHODOLOGY..... | 23 |
| 1.7. DATA ANALYSIS..... | 33 |
| 1.8. ETHICS..... | 39 |
| 1.9. REFERENCES..... | 42 |
| 2. LITERATURE REVIEW..... | 1 |
| 2.1. INTRODUCTION..... | 1 |
| 2.2. ZIMBABWE NUTRITION POLICY..... | 2 |
| 2.3. MALNUTRITION AND THE CONSEQUENCES OF THE DISORDER..... | 3 |
| 2.4. THEORETICAL LITERATURE..... | 6 |
| 2.4.1. HOUSEHOLD COST OF ILLNESS..... | 6 |
| 2.4.2. COPING WITH THE ECONOMIC CONSEQUENCES OF ILLNESS..... | 9 |
| 2.4.3. HOUSEHOLD WELFARE IMPACT AND THE SUBSEQUENT VICIOUS CYCLE OF ILLNESS AND POVERTY..... | 10 |
| 2.5. EMPIRICAL LITERATURE..... | 11 |
| 2.5.1. HOUSEHOLD COST OF ILLNESS..... | 11 |
| 2.5.2. HOUSEHOLD RESPONSES TO ILLNESS..... | 22 |
| 2.5.3. IMPACT OF ILLNESS ON HOUSEHOLD WELFARE..... | 23 |
| 2.6. KEY LESSONS FROM LITERATURE..... | 25 |
| 2.7. A CONCEPTUAL FRAMEWORK OF MALNUTRITION AND HOUSEHOLD WELFARE..... | 26 |
| 2.8. REFERENCES..... | 29 |
| 3. JOURNAL ARTICLE..... | 1 |
| 3.0. BACKGROUND..... | 2 |
| 3.1. STUDY CONCEPTUAL FRAMEWORK..... | 5 |
| 3.2. METHODS AND MEASUREMENTS..... | 8 |
| 3.3. DESCRIPTIVE DATA ANALYSIS..... | 16 |
| 3.4. RESULTS..... | 19 |
| 3.5. DISCUSSION..... | 30 |
| 3.6. CONCLUSIONS..... | 35 |

| | | |
|------|---|----|
| 3.7. | COMPETING INTERESTS..... | 35 |
| 3.8. | ACKNOWLEDGEMENTS..... | 35 |
| 3.9. | REFERENCES..... | 36 |
| 4. | POLICY BRIEF | 1 |
| | POLICY BRIEF | 1 |
| 5. | APPENDICES..... | 1 |
| 5.0. | KEY DEFINITIONS | 1 |
| 5.1. | SAMPLE SIZE CALCULATION | 1 |
| 5.2. | CONSENT FORMS..... | 2 |
| 5.3. | PATIENT MEDICAL RECORD CAPTURE FORM..... | 10 |
| 5.4. | HOUSEHOLD QUESTIONNAIRE SURVEY..... | 13 |
| 5.5. | UNIVERSITY OF CAPE TOWN - STUDY PROTOCOL LETTER OF APPROVAL (ETHICS) | 21 |
| 5.6. | MEDICAL RESEARCH COUNCIL OF ZIMBABWE - STUDY PROTOCOL LETTER OF APPROVAL (ETHICS)..... | 22 |
| 5.7. | BMC PUBLIC HEALTH INSTRUCTIONS TO AUTHORS | 23 |

University of Cape Town

1. RESEARCH PROTOCOL

1.0. INTRODUCTION

Background

Malnutrition is a significant contributor to child mortality in several regions across the world. The burden of malnutrition is most notably higher across countries situated in Asia and Sub-Saharan Africa where the prevalence of the disease is high. It is approximated that fifty per cent of deaths in children under the age of five years can be directly or indirectly attributed to malnutrition (UNICEF, 2001.)

Malnutrition is well acknowledged as being a contributory risk factor that increases case fatality rates in children. It suppresses the body's immune system ability to resist infection, thereby increases the probability of common childhood illness such as pneumonia and diarrhoea being developed. While deaths owing to malnutrition tend to be underreported because of the presence of comorbidities, it can be implied that malnourished children are more likely to suffer death from reported childhood diseases such as pneumonia or diarrhoea (WHO, 2011; Rowell D, 2010; Mulholland K, 2005).

For several years, malnutrition has been viewed as a multifaceted condition of ill health. However, malnutrition is not only a consequence of inadequate intake of nutrition, but an additional consequence of poor political structure and weak economic fundamentals that leads to a deprivation of financial resources and inability to provide adequate health care (UNICEF, 1990).

Zimbabwe is among one of the countries in Sub-Saharan Africa where the prevalence of child malnutrition is considered to be relatively high, particularly when compared to global standards. Political instability, which can be defined as the deterioration of rule of law and the collapse of good governance in government, is one factor that precipitated the increase in the prevalence of child malnutrition. The trickle down effects of political instability in Zimbabwe between 1999 and 2008 included several consecutive years of negative economic growth, hyperinflation and shortages in foreign currency. Furthermore, the effects of political instability were illustrated by the inability of government to provide basic services such as sanitation, food security and a stable economic environment have been argued as some of the contributing factors in increasing the prevalence of child malnutrition (Pimhidzai O, 2008; Mail and Guardian, 2006). Recurrent droughts, and HIV/AIDS have additionally contributed to rising prevalence of child malnutrition (WFP, 2013)

An additional factor argued to be highly significant in increasing the prevalence of child malnutrition is the impact of HIV on health status as well as household structures (Mail and Guardian, 2006). HIV is argued to be highly impoverishing on households. It is argued that households affected by HIV, divert financial and time resources from several activities, which include the generation of household food provision towards the time dedicated to caring for HIV positive members in the household and the payment of medical and transport costs.

Given an HIV prevalence of 19% in Zimbabwe in the year 2005, aid workers have argued that child malnutrition is significantly correlated with HIV orphaned status households, which in turn is closely related to food insecurity (United Nations World Food Programme, 2008). A survey on orphans affected by HIV revealed that a household with at least one orphan was 41% more likely to experience food insecurity, in contrast to a household with no orphans (Greenbolt K, 2007).

A third of children between the age of zero and five years residing in Zimbabwe are reported to suffer from chronic malnutrition. Chronic malnutrition is a type of malnutrition where children fail to grow mentally and physically to their genetic potential. Children living in the rural areas are at higher risk of suffering chronic malnutrition as it has been estimated that approximately 93% of households do not have access to financial or agricultural resources to provide a minimum acceptable diet (Zimbabwe National Nutritional Survey, 2010).

Another type of malnutrition that is highly prevalent in developing economies is severe acute malnutrition. Severe acute malnutrition is defined as very low weight for height with visible signs of severe wasting or the presence of nutritional oedema (WHO, 2010). Although severe acute malnutrition is less prevalent in Zimbabwe, the number of new cases of severe acute malnutrition has doubled among children aged 6-18 months over a 5 year period. In one of Zimbabwe's largest referral hospitals, it is approximated that a daily average of 15 children are admitted to hospital because of severe acute malnutrition (Mutseyekwa T, 2008). Nationally, It is approximated that on an annual basis that 12 000 children are at high risk of death from severe acute malnutrition.

The rising prevalence of child malnutrition should not only be associated with long-term effects as emphasized in several literature, including (Behrman J, 2004; Alderman H et al, 2006). The rising prevalence of child malnutrition additionally presents short-term implications on the welfare of households. For instance, the problem associated with the rising prevalence

of child malnutrition represents a potential increase in the number of Zimbabwean households that are likely to be impoverished or enter into poverty. A decrease in household wealth is positively correlated to rising poverty and poor health status of the household (Muyanga M et al., 2010).

Often households make a trade-off between providing care to ill individuals and providing labour to income generating labour markets. In the case of ill children, caretakers often forgo income-generating activities to provide care to the ill child. The opportunity cost of providing care to the ill child could be assumed to be equivalent to wages lost due to reduced productivity (Segal J, 2006). In amalgamation, a decrease in household income earned, coupled by the financial costs of seeking treatment for the child reduces the household wealth and increases the likelihood of households falling into poverty.

From a macro-economic perspective, it has been expressed that child malnutrition hinders economic growth (Chacheta, 2010). The link between reduced economic growth and child malnutrition can be linked to the economic theory of growth developed by (Solow R, 1956). It is hypothesized that the main drivers of economic growth include capital accumulation, technological advancement and productivity of labour. Therefore, child malnutrition may slow economic growth as labour productivity decreases because caretakers may forgo participation in labour market activities. Losses in labour productivity are directly linked to an annual loss of economic growth equivalent to 2-3% of gross domestic product (World Bank, 2006).

The relatively high prevalence of child malnutrition in Zimbabwe has significant economic implications over short and long horizon. The severity of malnutrition in Zimbabwe represents a significant barrier for the Zimbabwean government in achieving some of the Millennium Development Goals, for instance reducing the under-5 child mortality rate and halving poverty levels. It is estimated that 35% of child deaths in Zimbabwe are caused by malnutrition (Zimbabwe National Nutritional Survey, 2010). Furthermore, if the household financial and time burden of malnutrition and its co-morbid diseases represent a significant proportion of household wealth such that they are impoverishing, it is likely that Zimbabwe will be unable to succeed in its goal of reducing household poverty. Therefore, it can be reasonably argued that, unless Zimbabwe addresses the high levels of child malnutrition, it will fail at meeting its commitment of fulfilling some of the Millennium Development Goals.

The evolution of the health sector and history of child malnutrition in Zimbabwe

Since 1980, the health care sector in Zimbabwe has undergone three distinct phases; the first period (1980-1990) was characterized with high social investment into social services including

health. The period of high social investment was followed by the second period (1990 -2000) during which government with the aid of multilateral institutions like the IMF implemented the economic structural adjustment programme (ESAP) as macro-economic policy. Under the economic structural adjustment programme, the health sector underwent several reforms which contributed towards the growth of the private health care sector (Munyiki E, 2009).

The third period from 2000-2008 was characterised by negative trends in the health sector. Health indicators such as under-5 mortality rate as illustrated in Figure 1 worsened as the economy spiralled into a period of hyperinflation and negative economic growth beginning in 2000. The negative economic growth conditions filtered down and influenced the collapse of the health sector which, post-2000 was characterized by shortages of medical supplies, mass emigration of health care personnel (Munyiki E , 2009) and closure of several hospital wards.

Zimbabwe is currently in the fourth phase in the evolution of the health sector. The formation of a government inclusive of members from two of Zimbabwe’s largest political parties in 2009, precipitated the current period of economic revival. The shared goals of the new government included the prioritisation of restoring the health sector. One of the initiatives implemented by the Ministry of Health and Child Welfare in Zimbabwe in a bid to restore the health sector was the 100 day plan (Nderere B, 2010). The outcomes of the 100 day plan includes a greater staff turnout, an increase in availability of medication at health care facilities as illustrated in Figure 2, reopening of previously closed hospital wards and an increase in health care utilisation.

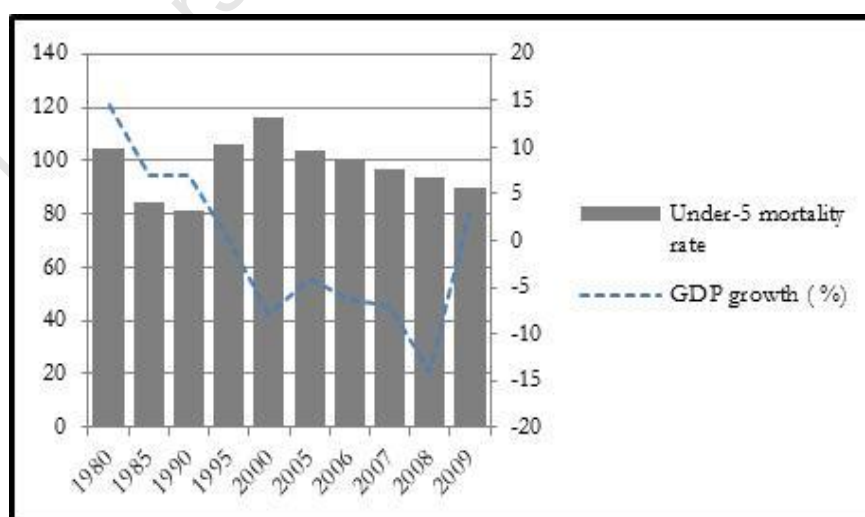


FIGURE 1: TRENDS IN CHILD MORTALITY AND GROSS DOMESTIC PRODUCT GROWTH IN ZIMBABWE BETWEEN 1980 AND 2009

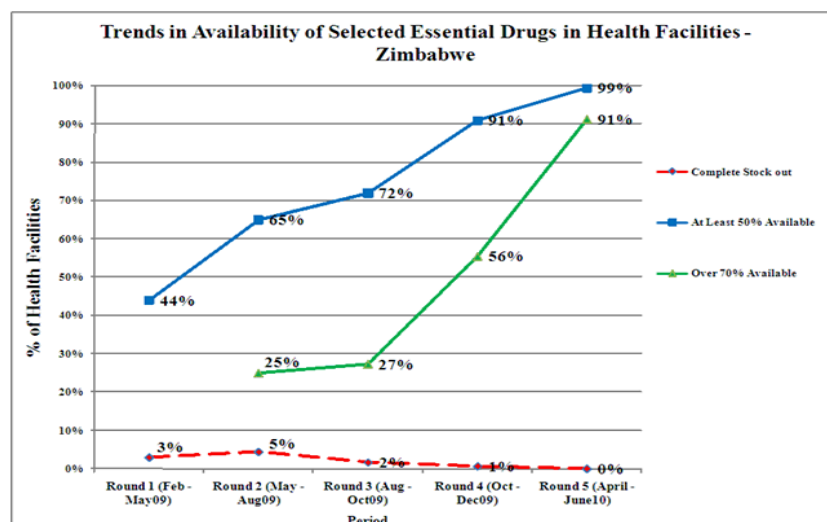


FIGURE 2: TRENDS IN AVAILABILITY OF SELECTED ESSENTIAL DRUG IN HEALTH FACILITIES
Source: MOHCW, vital Medicines and health service survey

Malnutrition trends in Zimbabwe

Trends in the state of child health have closely mirrored trends in the health sector and the macro economy of Zimbabwe. For instance in 1980, when Zimbabwe transitioned from colonial rule towards a democratic political system, the prevalence of malnutrition was relatively high. However as part of the success of health reforms initiated to increase health care coverage so as to redress the health inequities inherited from colonial rule, the prevalence of malnutrition declined significantly. A comparison of national nutrition surveys (Tagwireyi, J, 1992) between 1982 and 1990 illustrate that the level of children who are underweight for their age decreased significantly from 23% (1982) to 9% (1990).

Figure 3 mirrors the trends in malnutrition against in Zimbabwe from 1980-2008. The levels of malnutrition declined from 1980 – late 1990's. However, the trend reversed post-2000 and the levels of malnutrition, in particular stunting malnutrition increased from 27% to 33% between 2003 and 2009.

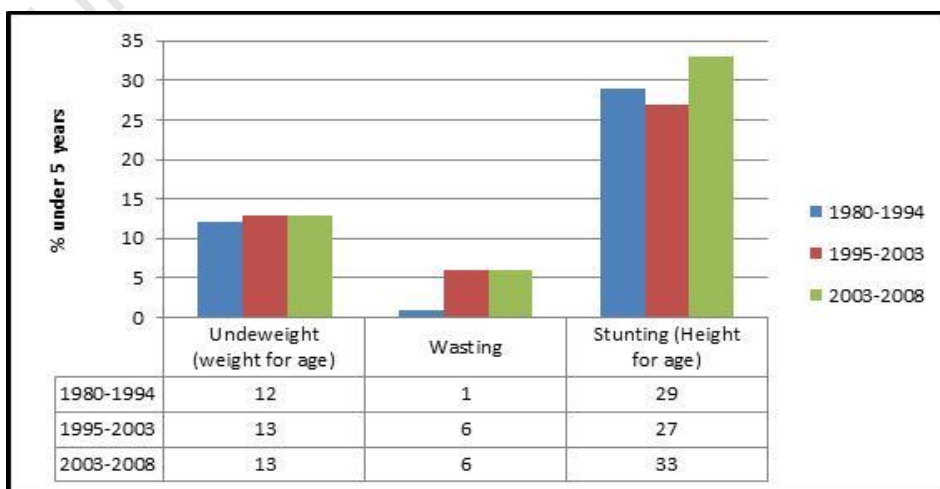


FIGURE 3: PREVALENCE OF MALNUTRITION IN ZIMBABWE 1980 – 2008
Data source: UNICEF state of the world's children statistics :www.unicef.org/rightsite/sowc/statistics.php

The increase in the levels of child malnutrition post 2000 is associated with underlying socio-economic and political problems. Although the recurrent droughts and the impoverishing effects of HIV on households have been argued to be significant in increasing child malnutrition, some human rights activists have argued that political affiliation in Zimbabwe played a role in the increasing level of malnutrition. For instance, in Binga, a rural district in Zimbabwe, it was reported that donor agencies including Save the children and OXFAM were prohibited from feeding children in the region owing to the majority vote resulted in favour of the opposition party during the 2002 elections (Solidarity Peace Trust, 2004).

In other rural areas it is cited that households known to oppose the government were deemed ineligible for food aid and thus community leaders or village chiefs refused to include their names as beneficiaries in food aid programmes (Burnett O, 2002).

The rising prevalence of child malnutrition in early 2000 amidst the negative economic growth conditions attracted the attention of the humanitarian agency UNICEF. Given that children's rights to food and health care were not been met by government, UNICEF increased its investment into establishing Community based Management of Acute Malnutrition (CMAM) health centres (UNICEF, 2002). The community-based approach includes out-patient and inpatient treatment. Out-patient or community based treatment entails early detection and treatment of malnutrition cases at the lower levels of health care provision including outpatient clinics and community services. While out-patient treatment is reserved for uncomplicated cases of malnutrition, in-patient treatment are reserved for complicated cases of malnutrition which are often characterised by the existence of several co-morbidities (UNICEF and MOHCW, 2008).

A significant number of the in-patient CMAM centres are financed by foreign donors including UNICEF (Chigonga N, 2008). Therefore, despite a poorly government funded public health sector in Zimbabwe, funding from donor and development agencies play a significantly important role in the provision of treatment of malnutrition. During 2008, when the health sector had collapsed and several hospital wards were closed, many of the malnourished children were referred to the malnutrition wards at Harare central hospital and Parirenyatwa hospital. These wards are significantly funded by development agencies where they received treatment (Harare City Council Health Department, 2008).

The presence of malnutrition is additionally associated with increased risk of mortality from opportunistic infections and development of diseases such as diarrhoea and pneumonia. It is estimated that malnutrition is an underlying contributor in 35% of under-fives deaths that are owing to pneumonia, measles, diarrhoea (WHO, 2011). However, malnutrition is hardly ever cited as a cause of death in developing economies like Zimbabwe (Davies R, 1987), as there are no detailed published vital statistics registry citing malnutrition deaths in children. Therefore, although the vital registry may cite common child killers including pneumonia and diarrhoea as a cause of under-five mortality, it is likely that malnutrition accounts for 35% of the officially recorded deaths.

In a report published by the Harare City Council health department, the number of deaths registered due to malnutrition increased between 2007 and 2008. As illustrated in Table 1, the number of registered deaths of children between the age of 1 - 4 years increased by 2%. However, as malnutrition commonly presents with co-morbid conditions, it is likely that the number of deaths owing to indirectly to malnutrition is higher.

| Cause of death | 2008 | | 2007 | |
|-----------------------|------------|------------|------------|------------|
| | Number | % | Number | % |
| Pneumonia | 238 | 33% | 203 | 28% |
| Gastroenteritis | 168 | 23% | 181 | 25% |
| Malnutrition | 89 | 12% | 70 | 10% |
| HIV and TB related | 63 | 9% | 97 | 14% |
| Tuberculosis | 22 | 3% | 17 | 2% |
| Meningitis | 28 | 4% | 26 | 4% |
| Misadventure | 17 | 2% | 16 | 2% |
| Road Traffic Accident | 15 | 2% | 7 | 1% |
| Burns | 10 | 1% | 7 | 1% |
| Dysentery | 5 | 1% | 12 | 2% |
| Other | 74 | 10% | 82 | 11% |
| | <u>729</u> | | <u>718</u> | |

TABLE 1: MORTALITY PATTERNS AGES 1-4 IN HARARE BETWEEN 2007 AND 2008
Source: Harare city council health report 2008

1.1. RATIONALE AND JUSTIFICATION OF THE STUDY

Although a large volume of literature has shown that child malnutrition has significant and adverse implications on economic growth, there are additional micro economic consequences that have received less research investigation. Child malnutrition presents a considerable amount of microeconomic challenges in the form of poor clinical outcomes (Rowell D, 2010) as well as lower household productivity and reduced household budgets.

Clinically, it has been argued that malnutrition distorts the true benefits of health interventions of treating underlying co-morbidities such as malaria and pneumonia. The coexistence of malnutrition with other diseases is often associated with poor clinical treatment outcomes, which consequently increases health care expenditure (Rowell D, 2010). It can therefore be argued that health interventions that aim to reduce malnutrition may therefore contribute towards improved clinical outcomes of other childhood illness such as diarrhoea. Given that malnutrition is predominantly a micro-economic problem, it follows that micro-economic studies may necessitate the baseline understanding of the problem from which adequate interventions can be formulated.

Individual illnesses from diseases, especially in children often present negative externalities in the form of caretaking of the ill, which falls on other healthier members of the household unit. Recognition of the negative impact of a period of disease on the household has precipitated a large volume of studies that investigate the household economic cost of diseases such as malaria, TB, and HIV (Chuma J, 2006; Kamolraankul P et al, 1999; Russell S, 2004).

While, household economic studies have proliferated literature in recent years a scan of literature across databases including Medline, Science Direct, PubMed, Social Science and Cochrane reviews reveals that to date there are no published research efforts have focused on estimating the household economic cost of child malnutrition despite the acknowledged perception that malnutrition is more of a household problem that severely affects micro-economic households than a macroeconomic problem (United Nations, 1990)

In the context of a country where annually, 12 000 children are at risk of dying from child malnutrition and constrained health resources, a cost of illness study provides policy makers, including hospital directors with useful information that can assist in the prioritization of health sector resources. As discussed by (Mulholland K, 2005), malnutrition increases the risk of developing diseases such as pneumonia, thus a cost of illness study of malnutrition can begin to provide a view of areas where interventions can be focused to reduce the incidence of multiple illnesses in children.

It is estimated that approximately 90% of households in Zimbabwe do not have health insurance (DHS, 2006), thus during an episode of illness the common means of payment for treatment are direct out of pocket payments. Out of pocket payments have been shown to have impoverishing effects on households (World Bank, 2006). Therefore, given the high prevalence of child malnutrition in Zimbabwe and the national government's decision to make

nutrition a development priority (MOHCW, 2009), an understanding of how households are affected by malnutrition will aid in the formulation of policies that may help insulate households from being pushed into poverty. Insight provided by micro economic level studies which includes the extent of the economic burden and the behavioural coping mechanisms of households when reacting to the external health shock of child malnutrition can be helpful in designing appropriate policy instruments.

Against the backdrop of health-related Millennium Development Goals, the renewed interest in malnutrition and the dearth of nutrition-related micro-economic studies, the main purpose of this research is to explore the economic consequences of child malnutrition on household welfare. The primary research question that the study will address is:

What is the household economic impact of severe acute malnutrition in children under the age of 5 years in Zimbabwe?

The economic impact will be determined by answering two related questions:

- i. What is the total household economic burden i.e. what are the direct, indirect and total costs associated with accessing inpatient treatment care for severe acute malnutrition?
- ii. When faced with the cost of treating malnutrition, how do households cope?
- iii. What are the implications of the direct costs of illness on household economic welfare?

1.2. OBJECTIVES OF THE STUDY

The main objective of this study is to estimate the household economic cost of malnutrition among children between the ages of zero and five years. In order to estimate the economic cost, the research will answer the following sub-set of specific objectives:

- i. Estimate the direct costs associated with treating malnutrition. Direct costs that will be measured include the out of pocket costs incurred when travelling to the health facility, the user fees or insurance premiums paid, and the costs of medicines, formula and diagnostic tests.
- ii. To estimate the indirect costs associated with seeking treatment. The indirect costs considered include the opportunity cost incurred by the caretakers of not participating in the labour market or forgoing the participation in income generating activities as a consequence of giving care to a malnourished child.
- iii. Identify the coping mechanisms that households employ when faced with the child malnutrition.
- iv. Evaluate the effect of the economic burden and coping mechanisms on a household welfare status.

1.3. BRIEF LITERATURE REVIEW

Malnutrition is defined as an inadequate intake of nutrition or the over consumption of nutrients (WHO, 2010). Although there is growing societal concern of over consumption of nutrients in the developed world, the aim of this literature review is to synthesize literature on under-nutrition as it remains a significant developmental challenge for developing economies. The review aims to describe the classification of the broad types of malnutrition. In addition, the objective of the literature review is to summarize the various methodologies of estimating economic cost of illness that have been applied in empirical studies. The last aim of the review is to highlight the association between ill health and household poverty status.

Types of malnutrition

The two major types of malnutrition are *chronic* and *acute* malnutrition. Chronic malnutrition is defined as the inadequate intake of nutrition over an extended period of time which leads to failure of the child to grow the optimal height. Whereas acute malnutrition is defined as inadequate intake of nutrition that precipitates rapid weight loss or leads to a failure to gain weight normally (Woodruff B et al, 2009). Acute malnutrition can further be sub-grouped according to severity namely *moderate acute malnutrition* and *severe acute malnutrition*.

Moderate acute malnutrition is defined as moderate wasting of body fat and tissue while severe acute malnutrition is considered to be the worst type of wasting that characterised by a significant loss of body fat and muscle tissue (Action Against Hunger, 2011). There are three variants of severe acute malnutrition namely Kwashiorkor, Marasmus and maramic-kwashiorkor (UNICEF, 2009). Kwashiorkor is an indication of protein deficiency, whereas marasus is an indication low energy intake of nutritious food.

Methods to measure the types of protein-energy malnutrition

The nutrition status of children under the age of 5 years can be determined using various approaches (Zere E et al, 2003). Malnutrition can be assessed using clinical signs, biochemical indicators or anthropometry. Each of the approaches to identifying malnutrition has some advantages and disadvantages. The most notable disadvantage of using clinical signs and biochemical approach to determining malnutrition is the inadequacy of the measurement tools to detect acute cases of malnutrition (Zere E et al, 2003).

A majority of research papers that have measured malnutrition in children have used the anthropometry approach. This approach measures the child's height, weight and age. Using these three measures, the individual measurements are converted into standardized z-scores

and compared to a reference population of healthy children. The degree with which the child's measurements deviate from the reference population determines the type of malnutrition (WHO, 2000).

There are three broad types of malnutrition indicators, namely stunting or chronic, acute and underweight malnutrition. Using the anthropometry approach chronic malnutrition is defined as height-for-age between -2 standardized z-score and -3 standardized z-score. Similarly, scores below 3 standardized z-scores are an indication of severe acute malnutrition (WHO, 2004).

The rationale for popular use of anthropometry as an approach to measure malnutrition is inherent in the measurement instrument's ability to detect wide variety of types of malnutrition through comparison to a reference population. Other advantages include their objective nature, as well as the characteristic of being non-invasive when collecting data. However, the main disadvantage in using anthropometry is centred around the literature debate relating to whether the reference population is appropriate in some regional settings (World Bank, 2004).

Although less popular in literature, other anthropometric measurements that have been used to measure malnutrition include the Body Mass Index, which is the weight of the child divided by the squared height (WHO,2008).

Consequences of child malnutrition

There are several short term and long term consequences associated with child malnutrition. Over the short run, it is widely agreed in literature that child malnutrition impairs the ability of the immune system to resist infection. It follows that children are more susceptible to developing respiratory infections, diarrhoea and malaria (Fillol F, 2009). The immediate financial implications of child malnutrition and its co-morbidities is thus a decrease in financial resources as payments to health care treatment are paid. Furthermore as children rely on adult caretakers during the episodes of illness, other short term consequences of child malnutrition may include absenteeism from work or income generating activities (WHO, 2004).

The effects of malnutrition extend beyond mortality and morbidity (Behrman J, 2004). There are direct links between malnutrition and productivity as well as indirect links between malnutrition and cognitive development. Several research studies have mapped an intergenerational link between malnutrition and labour productivity (Vorster H, 2010; World Bank 2006). It is hypothesized that the reduced physical and mental development in early

childhood owing to malnutrition will extend into adulthood in the form of reduced worker productivity.

Child malnutrition indirectly affects the child's ability to learn in school. A cohort study conducted in Zimbabwe reveals that malnourished children delayed school enrolment and completed less school years in comparison to healthy children (Behrman J, 2004). However, despite a greater volume of studies finding evidence to support the negative effect of child malnutrition on child development, a few studies have refuted the relationship. For instance, an Indian scientist argued that children under the age of 5 years could adapt to malnutrition and continue to develop normally because of the ability of the body's hormonal system to adapt thereby refuting the argument that child malnutrition leads to retarded growth (Gulati J, 2010). However, the consensus view expressed by the greater volumes of literature supports that malnutrition is a major child killer and the effects extend beyond the childhood years.

Child malnutrition and the micro-macroeconomic linkages

At a household level it has been estimated that the lifetime earnings lost to lower worker productivity owing from the long term consequence on malnutrition is 10% (World Bank, 2006). At a macroeconomic level the cumulative effect of reduced productivity has been empirically shown as reducing the gross domestic production of Latin American countries by at least 3-6% per annum (World Bank, 2006).

During the episode of illness from child malnutrition and its co-morbidities, the productivity of the care giver may be affected through absenteeism from income generating activities. Theoretically, the affected households supply less labour to the labour market or may be unproductive as they may be absent from income generating activities. However, to date, no published literature has estimated the short term effects of child malnutrition on wage rates and labour supply within the household.

Measuring the household cost of illness: economic and non-economic

The growing interest in the impoverishing effects of medical costs on households has resulted in a notable increase in research estimating the cost of various illnesses on households (WHO, 2004). Individual ill health produces negatives externalities on the household as the economic costs of illness fall on other healthy members of the households (Sauerbon R, 1996).

The economic cost of an illness is defined as an aggregation of direct costs, indirect costs and intangible costs (Segal J, 2006), however a majority of studies typically exclude the intangible

costs because of the difficulty in quantifying them. Intangible costs are costs of physical pain and emotional suffering endured by the patient as a consequence of the disease (Xeï F, 2008).

Measuring direct costs of illness

Direct costs can be classified as financial costs that are incurred as a consequence of out of pocket payments paid for seeking treatment at a health care facility, purchasing of drugs and transportation to the health care facility. Direct costs can be estimated using one of three techniques namely; the bottom-up approach, top-down approach and econometric estimation (Segel J, 2006).

The bottom-up approach estimates direct costs by multiplying the unit cost of a particular item by the utilization rate. For instance the unit cost of a diagnostic test multiplied by the number of times the test was administered. Contrast to the bottom up approach, the top-down approach derives the cost of illness through multiplying total health care expenditure incurred by the proportion of health care services used by the disease group (Sam K et al, 2009). Lastly, the econometric approach estimates direct costs as the difference between treatment costs for a group of non-diseased persons and treatment costs for a group of diseased persons.

The bottom-up approach is the most commonly used approach in estimating direct cost in household cost of illness studies. A notable number of studies conducted in developing countries that assume the perspective of the household when estimating the cost of illness including (Sauerbon R, 1996; Aye R et al, 2010; Kemp J et al, 2007) have estimated cost of illness using the bottom up approach.

Contrast to the bottom up approach, the top down approach which estimates costs beginning from a macro perspective standpoint, has been favoured in the application use of estimating cost of illness from the perspective of the provider in the developed world. As good quality aggregated national health data is a prerequisite for generating accurate estimates using the top down approach, it follows that this approach is favoured in studies conducted in the developed world as the data collected is of high quality and is readily accessible. Studies that have applied the top-down approach are most common in the developed world and include investigations into the cost of diabetes, depression and heart disease (Jonsson B et al, 1998; Liu J, 2002).

Of the cost of illness studies estimated using the top down approach and the econometric approach, a significant volume of the studies have been conducted in the developed world contrast to the developing world economies. A possible explanation for this bias is that

countries in developed world have historically invested more in developing strong health surveillance systems than countries in the developing world. Therefore, as a consequence of developed countries higher investment in health surveillance, the quality of national data has improved in quality and volume and can thus be relied upon for use in cost of illness studies.

Applying any of the three approaches blindly can lead to several errors in estimation. The top down approach has been argued to increase the probability of double counting, thus producing over-inflated estimates, while the bottom up approach has been argued to underestimate the cost of illness. Several household cost of illness studies conducted in low-income countries tend to underestimate the total direct costs as they fail to capture certain hidden costs. Hidden costs are costs that include money paid to traditional healers or money spent on self-medication that are rarely captured in the review of medical records and national aggregated health data (Russell S, 2005).

Measuring indirect costs of illness

Indirect costs consist of the opportunity cost of time lost due to morbidity (Kirigia J, 2009). Components of indirect costs include loss of productive time as a consequence of seeking health care services, which is inclusive of the time spent in hospital, time spent queuing at the hospital and the time travelling to and from the hospital.

Indirect costs represent the opportunity cost associated with illness. The opportunity cost may arise from abandonment of leisure or productive time. Indirect costs are estimated using three approaches, namely the (i) human capital approach, (ii) friction cost approach and (iii) the willingness to pay approach (Segal J, 2006). The human capital approach is widely applied in literature and values the opportunity cost in terms of forgone earnings. Studies including (Sauerbon R, 1996; Chuma J, et al 2010; Onwujekwe et al., 2000) have estimated indirect costs using the human capital approach.

An alternative to the human capital approach is the Willingness to pay (WTP) approach. The WTP suggests that the monetary value of the opportunity cost incurred as a result of illness can be deduced from the amount people would be willing to pay to avoid or reduce the probability of illness. Although less commonly applied in empirical studies, applications of this approach include the estimation of the economic burden of malaria in several African countries including Nigeria, Chad and Ghana (Jimoh A et al, 2007; Okorosobo Tuoyo et al, 2011).

The least commonly applied estimation method is the friction cost approach which measures indirect costs as the time needed to return to normal production activities.

Across several studies that have measured the economic cost of illness, the greatest variation in measurement of costs is exhibited in the measurement of indirect costs (McIntyre D et al, 2006). The variations are attributed to the estimation techniques applied in calculating the losses accruing to household production. For instance, using the human capital approach, (Asenso-Okyere W, 1997) estimate the cost of forgone labour as the average farm wage multiplied by the number of productive days lost to ill health. (Asenso-Okyere W, 1997) varies the wage earned by adults according to the individual's age. In contrast, (Somi M, 2007) estimates the forgone wages without differentiating the wage earned by adults according to age or experience.

Measuring co-morbidities

Particularly in developing countries, children often present multiple illnesses which significantly increase the cost of illness of a particular ill health period. For example treating a child suffering from pneumonia may require treatment of the underlying causes such as malnutrition. Ignoring co-morbidities of illness has been shown to grossly underestimate the cost of an illness (Segal J, 2006), however inclusion of all the costs of multiple diagnoses may result in double counting.

To account for the presence of co-morbidities, additional costs of co-morbidities can be estimated using one of two approaches, namely the econometric approach and attributable risk analysis approach (Segal J, 2006). The attributable risk approach estimates the proportion of disease that is attributed to risk exposures and uses aggregate cost data to calculate the cost of illness. In contrast, the econometric approach estimates the difference in costs between a cohort of the population presenting the disease and cohort of the population without the disease (Segal J, 2006). Very few studies have attempted to isolate the effect of co-morbidities in cost of illness studies. One such study was conducted in Australia where the researchers estimated the malnutrition added 1,745 AUD\$ to the cost of treating symptomatic co-morbidities (Rowell D, 2010)

Measuring the economic burden

To measure the economic burden of illness imposed on households, several studies including (Russell S, 2005) calculate the total cost associated with ill health as a proportion of household wealth. Arbitrary thresholds have been set to determine whether the economic cost of ill health

is significantly catastrophic to push a household into poverty, however there is no consensus on the thresholds. The WHO argues that households that spend more than 50% of their monthly non-food expenditure are at risk of falling into poverty. In contrast, (Xu K, 2005) set the threshold as 40% of non-food expenditure.

Household coping strategies

Other indirect costs incurred by households relate to the costs incurred as the households adjust to the shock of ill health of an individual. (Sauerbon R, 1996) highlights the different coping strategies such as removing children from school so that they can provide care to the ill individual, selling of household assets and obtaining a loan. The costs of some of these coping strategies are often associated with increasing household indebtedness and eroding household wealth which over the long run impair a household's ability to respond to future ill health costs (Alamgir N et al, 2010).

The vicious circle between illness and poverty

Several studies have illustrated a vicious cycle between ill health and deteriorating socioeconomic standing of a household. For instance, (Chuma J et al, 2006) detail a conceptual framework illustrating the negative association between the economic cost of malaria and household impoverishment. It is hypothesized that households with individuals suffering from illness are faced with financial and time costs (Sauerbon R, 1996). It argued that when these costs are significantly large as a proportion of household wealth, households adapt to the additional burden through adopting coping mechanisms which may include labour substitution, inter-household borrowing, liquidation of household assets or drawing from household saving. The cumulative effect of these coping strategies if unsuccessful in averting household economic decline may further reduce the household wealth, thus push the households into poverty.

Malnutrition and poverty exhibit a complex relationship typically described to as recurring vicious cycle. It is argued that household income poverty causes household food insecurity, while subjecting households to live in unsanitary conditions where diseases thrive. Children living in these households have a higher probability of becoming malnourished and falling ill (UNICEF 1999; Vorster H, 2010).

It is argued that the vicious cycle of child malnutrition is initiated in early childhood. The long term health outcomes of malnutrition including poor physical and mental development, are argued as translating into reduced worker productivity and consequently lower wage earnings in

adulthood (Vorster H, 2010). Lower wage earnings translate in fewer financial resources that can be used to purchase nutritious food and fewer financial resources that enable households to live in areas with access to clean water and good sanitation. It follows that as a result of the adult members in the household's incapacity to generate sufficient financial resources, children belonging to the household are deprived of nutritious food, thus the cycle of child malnutrition and poverty is initiated.

1.4. CONCEPTUAL FRAMEWORK AND EMPIRICAL FINDINGS

The research will draw upon the conceptual framework depicted in Figure 4. The framework was drawn from a review of studies conducted by (Russell S, 2004; McIntyre D et al, 2006) and is adapted to address childhood cost of illness. This framework draws out and maps the relationship between illness and the subsequent illness related costs on the outcome of household poverty status. The framework details linkages between the onset of illness and the treatment seeking behaviour, the subsequent costs associated with seeking treatment, the consequential household responses to the economic costs and the outcome of economic costs and household responses on a decline in household's economic welfare.

The framework illustrates the various components to explore and measure, which include exploring treatment seeking behaviour, measuring direct and indirect costs and analysing household coping mechanisms. For the purposes of this study, the main unit of analysis from which the various components will be explored and measured is the household. In this framework a household unit is defined a group of individuals that reside under the same roof and eat from the same cooking pot for a period of more than six months.

Onset of illness and household treatment seeking behaviour

The conceptual framework in Figure 4 depicts that on the onset of illness in a child, households are faced with a decision to either (i) seek treatment from the formal health care system or (ii) forgo seeking treatment from the formal health care centre. A review across literature highlights that contextual and institutional factors such as health policies, household asset portfolio play a crucial role in determining the treatment seeking behaviour on the onset of illness (Chuma J et al, 2006). While ignoring the symptoms of illness is often observed as a treatment seeking attitude in adults, it is less commonly observed in children. For instance, (Mota R et al, 2009) illustrated that 36.9% of caretakers with children under the age of 5 years sought healthcare services from the formal health sector on the onset of malaria, contrast to 23.6% of adults who sought formal care on the onset of fever. Therefore when a child falls ill, households tend to immediately seek health care services.

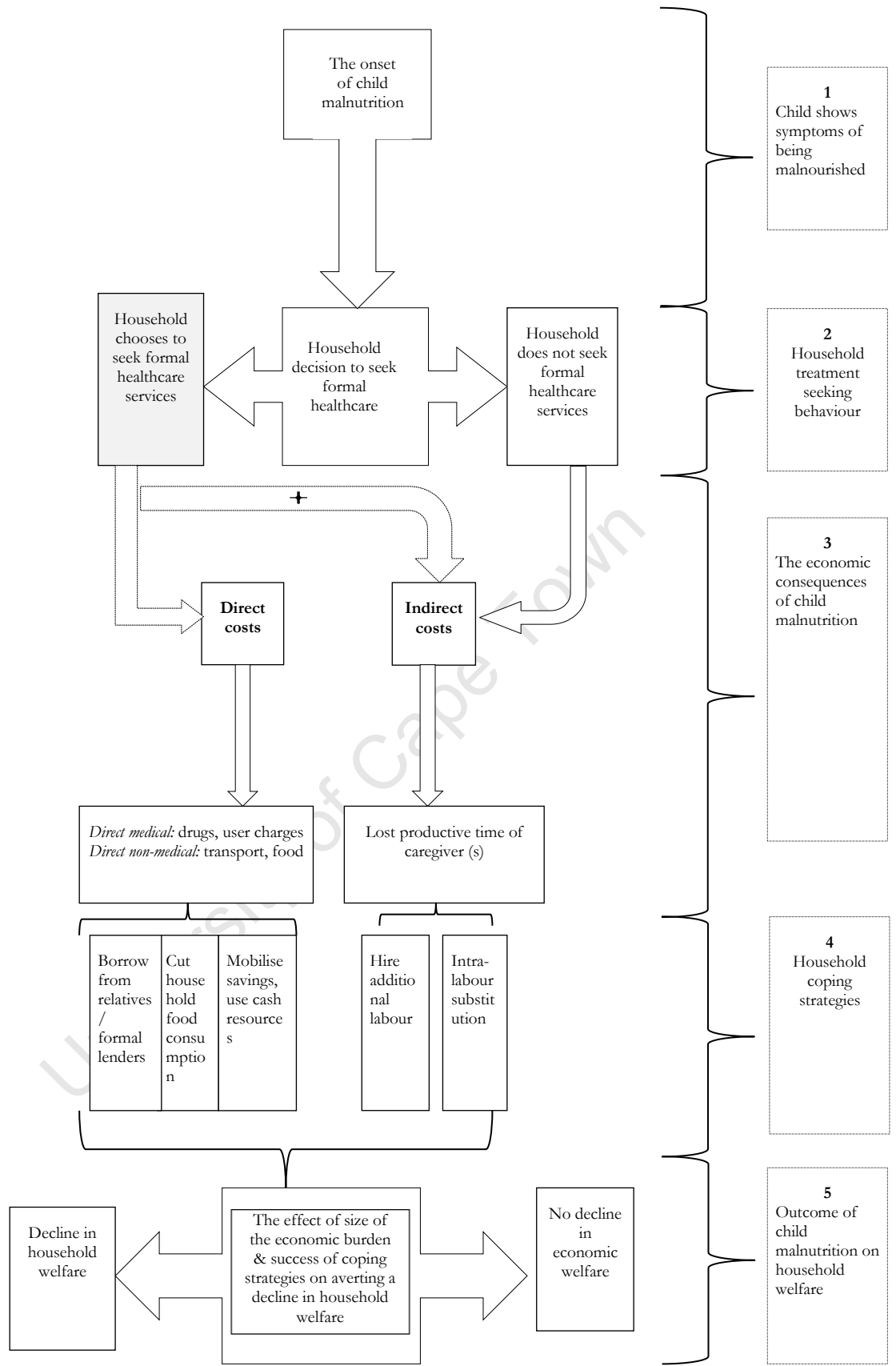


FIGURE 4: CONCEPTUAL FRAMEWORK OF CHILDHOOD ILLNESS AND HOUSEHOLD ECONOMIC WELFARE

The economic burden of direct and indirect cost of disease

As highlighted in the preceding literature review, illnesses exert economic costs on households. These illness related costs can be summarised (Equation 1) as a summation of direct medical and non-medical costs, lost productive time, loss of resources owing to changing household behaviour or consumption patterns and intangible costs (Malaney P, 2003).

$$\text{Cost of illness} = \text{Medical cost} + \text{non-medical costs} + \text{labour lost} + \text{loss in investment} \\ + \text{non market value personal burden}$$

Equation 1

Where:

Medical costs represent the cost of medicines, cost of hospital bed stay and, diagnostic tests

Non-medical costs represent the patient and caretaker transport costs, additional expenditure on food and accommodation costs incurred while seeking treatment

Labour lost the time the caretaker or patient are absent from productive activities including work and school

Loss of investment is the loss capital and labour investment as resources are diverted to meet financial obligations

Non-market value personal burden is the value of emotional suffering and pain

As depicted in the conceptual framework households will face direct and indirect costs as a consequence of their decision to seek health care treatment. The direct costs include the medical and non-medical costs identified in Equation 1, while the indirect costs include labour hours lost. Direct financial costs and indirect costs reduce the household budget and household wealth. The household budget is reduced by the expenditure on direct financial costs that include the medical costs of seeking treatment (Russell S, 2004), like diagnostic tests, medicine and hospitalization bed costs. In addition, households incur non-medical costs (Segal J, 2006) such as out of pocket cash payments for transportation and changes in household consumption.

Empirical findings suggest that the extent of out of pocket payments incurred by households varies according to health system contexts. For instance in Mozambique households incurred 3% of total out of pocket payments on user charges, contrast to Papua New Guinea where households incurred 37% of total out of pocket expenditures on user charges for treatment of malaria (Castillo-Riquelm et al, 2008; Sicuri E et al, 2011). A similar variation in the magnitude of expenditure on drugs varies across contexts as well. For instance in Kenya, households did not incur any expenditure on drug when seeking treatment for malaria possibly owing to a free drug dispensation policy (Ayieko P, 2009). On the contrary, households in Mozambique allocated 40% of total out of pocket payments on drugs (Castillo-Riquelm et al, 2008). However, despite the variation in the extent of the different out of pocket payments, households tend to expend less than 10% of their income on out of pocket payments.

In addition to increased medical expenditure, the household's ability to spend is reduced by a leakage of wage earnings of the caretaker that may be attributed to absenteeism. When faced with a decision to seek treatment, households or caretakers make a trade-off decision between forgoing productive activities, such as work and giving care to the ill child (WHO, 2009). The loss of labour earning constitutes an indirect cost that is borne by the household.

The number of days lost due to illness varies across disease burdens and endemicity (McIntyre D et al, 2003; Chuma J et al, 2010). In Papua New Guinea, (Sicuri E et al, 2011) find evidence to corroborate the argument that the more severe the illness the higher the indirect costs. They find that care givers lose a proportionally higher number of productive days in seeking malaria treatment for an ill child. Households with hospitalised cases of illness lost an average of 30.03 days of production contrast to 15.74 days lost to households with patients who sought out-patient care.

Household responses to economic consequences of illness

Economic theory dictates that individuals seek to smooth consumption between time periods (Friedman M, 1956). It follows that when households are faced with the immediate economic burden of illness that they may attempt to reduce the adverse impact of the burden on household consumption by adopting a series of actions to meet the obligation without adversely impacting the normal consumption levels.

Households often employ several coping strategies. For instance Kenyan households faced with the economic burden of malaria relied predominately on the sale of assets and borrowing. However, it was observed that the poorest household could not receive a line of credit easily because they were considered to be of a high default risk, thus borrowing was a less common strategy among the poorest households (Chuma J et al, 2006).

Other coping strategies observed in Burkina Faso include relying on gifts from family and friends. 93% of households affected by malaria in Burkina Faso received a gift that was used to help meet the economic costs of malaria (Sauerbon R, 1996).

Depending on the magnitude of direct and indirect costs that households are burdened with, it has been shown that households may adopt coping strategies (Sauerbon R, 1996; Alagmir, 2010; Russell S, 2004) that may exacerbate the economic burden and thus lead to impoverishment. For instance (Mutangadura G, 2000) observed that Zimbabwean household withdrew school children from school system as strategy to cope with labour shortages at

home owing to HIV. The long term effect of such a coping strategy is argued to exhibit negative long term productivity effects.

Implication on household welfare

Coping strategies are taken by households in order to cope with while possibly alleviating a significant decline into economic poverty, however if the burden is significantly large as proportion of household income and the household portfolio of asset is insufficient in meeting the economic burden, households may experience a decline in economic welfare. In the case of childhood pneumonia in Bangladesh, 10% of households were observed to be more impoverished as they had to borrow from another creditor to settle an initial debt they had incurred when they first encountered the household cost of illness (Alagamir, 2010).

In Kenya, it was reported that some households experienced a decline in economic welfare while others did not experience a change in welfare despite similar economic burdens. The authors discuss that although economic burdens can lead to impoverishment, however, other factors such as initial household portfolio wealth play a significant role in determining impoverishment (Chuma J et al, 2006). In their study the authors classified households according to different levels of vulnerability or likelihood of entering poverty status. They argued that highly vulnerable households were households who had a low asset base, had previously incurred large debts in the past and had already experience a stressful event that they had not yet recovered from. Of the 6 households that were deemed to be highly vulnerable, the authors found that 5 of the 6 households had experienced a decline when faced with an economic burden that accounted for 11% of monthly income.

The findings from (Chuma J et al, 2006) imply that a decline in economic welfare is not only precipitated by the magnitude of the burden, but by the initial household poverty status and the effectiveness of coping strategies

1.5. THEORETICAL FRAMEWORK: THE HUMAN CAPITAL APPROACH

There are two predominant channels through which health impairments affect productivity. Through the first channel, it is assumed that inputs into production are remunerated according to the level of marginal productivity, thus impairments to health reduce a worker's marginal product to labour while on the job leading to a reduction in worker productivity. The second channel through which health impairments reduce productivity is argued to be through the worker's decision to allocate labour hours to production (DeLiere R et al, 2004; Strauss J et al, 1998).

When children fall ill, they do not necessarily incur losses to productivity themselves. However caretakers of the ill children may incur productivity losses from their decision to allocate less time to engaging in income producing activities and spend more time taking care of the ill child. It follows that the productivity of the adult caretaker is directly affected by child illness through the reallocation of time. The less quantity of labour supplied, the lower the income earned – assuming that income earned is equal to wage rate multiplied by quantity of time allocated to work.

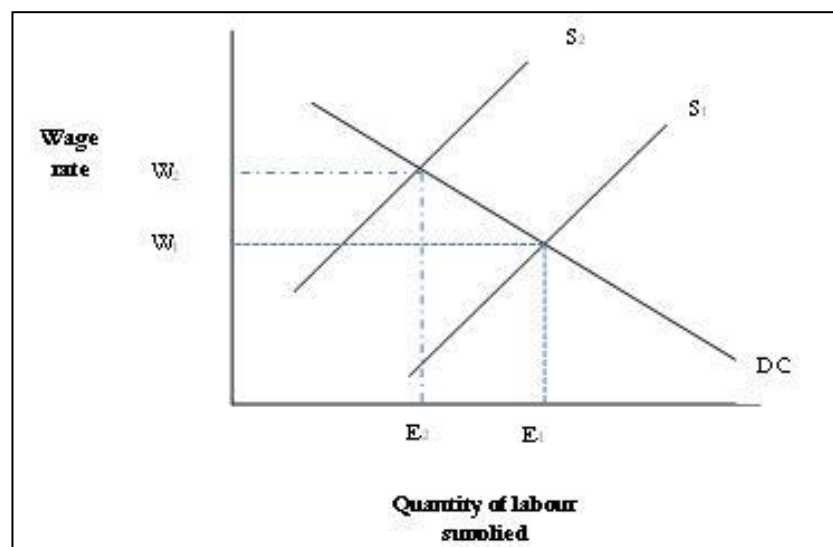
Neo-classical economists hypothesize that the cumulative demand curve for labour is downward sloping in the wage rate as individual firms will continue to employ workers as long as the wage equals the output price multiplied by the incremental unit labour (Deleire T et al, 2004). This implies that the supply of labour is usually upward sloping as illustrated in Figure 5.

Given a downward sloping labour demand curve, (Deleire T et al, 2004) propose an economic model that illustrates that impairment in health lowers the amount of labour demanded by firms and amount of labour supplied which cumulatively lower the equilibrium wage rate.

Health impairment effects on labour supply

Assuming no change in the amount of labour demanded by firms, impairment in health can result in individuals reducing the amount of time allocated to productive activities (Deleire T et al, 2004). As illustrated in Figure 5 individuals may allocate more time towards seeking health care, in which case the amount of labour supplied shifts from S1 to S2, and the number of hours supplied to labour declines from E1 to E2, thereby increasing in wage paid by the firm. Although workers may earn a higher wage as result of higher wage paid, it is argued that the full cost of reduced productive time is greater than the higher income that is earned, assuming that the firm does not substitute labour for capital.

As highlighted in Figure 5, the prevalence of illness effect on the income earning capacity is substantially affected. Although (Currie J, 2008; Alderman H, 2006) shows strong evidence between child health and intergenerational productivity, this research will primarily use the theoretical model developed by (Deleire T et al, 2004) to estimate the effect of health impairment of the child on the caretakers' productivity owing to their decision to allocate less labour to the labour market.



* Assumptions: 1. Introduction of an exogenous health shock reduces the amount of labour supplied by care taker
 2. Firms do not change their demand for labour when the quantity of labour declines (i.e. no substitution effects)
FIGURE 5: HEALTH IMPAIRMENTS AND LABOUR SUPPLY

1.6. METHODOLOGY

To estimate the cost of child malnutrition, the research proposes that the total cost of malnutrition will be estimated as a summation of the average direct costs and indirect costs.

The research will generate the total cost of illness under two scenarios namely; (i) the total cost of illness without accounting for the presence of co-morbidities and (ii) the total direct cost of illness while explicitly accounting for co-morbid diseases.

i. The total cost of illness without factoring for the presence of co-morbid diseases

Without factoring out the effect of co-morbid diseases, the total cost of illness will be estimated as a summation of average direct cost and average indirect costs as illustrated in Equation 2.

$$\text{Total cost of malnutrition} = \sum \text{Directcost} + \text{indirect cost}$$

EQUATION 2

Direct costs

Direct costs will be estimated using the formula detailed in equation 3. Direct costs are a summation of all the medical treatment administered, the cost of medication prescribed and nonmedical direct payments.

$$\text{Directcost} = \sum \text{direct medical treatment} + \text{medication} + \text{nonmedical direct payments}$$

EQUATION 3

Medical treatment costs are calculated using equation 4. Medical treatment costs are inclusive of the hospital bed costs, diagnostic tests and medical and surgical procedures. Hospital bed costs are calculated as the number of days hospitalized multiplied by the daily hospital bed rental rate. Diagnostic tests are inclusive of tests that measure glucose levels, chest x-rays, and

urine specimen examination and tests to measure the haemoglobin levels (WHO, 2009).

$$\text{Medical treatment} = \sum \text{hospital bed costs} + \text{diagnostic tests} + \text{surgical procedures} + \text{medical procedures}$$

EQUATION 4

The cost of medication is the summation of nutrients and drugs administered as part of the treatment therapy. Medication is inclusive of the cost of antibiotics, oral salts, glucose, feeding formula and micronutrients.

The costs of nonmedical direct payments are assumed to be inclusive of transport costs to the hospital and cost of food for the accompanying caretaker.

Indirect costs

The indirect cost of malnutrition is the monetized value of the time trade-off between; (i) time that is generally spent participating in labour productive activities and (ii) the time spent in providing care to the child suffering from malnutrition. To monetize the value of lost productive time, the aggregate quantity of labour hours lost to caretaking must be determined by aggregating the total amount of time spent waiting for medical attention at the hospital queue, time spent while engaging in caretaking activities as well as time spent travelling to the hospital. Once the aggregate quantity of lost labour hours is determined, this value is multiplied by average wage rate of the primary caretaker as indicated in Equation 5. The wage of the caretaker may be determined by the occupation or the use of minimum wage as stipulated by the Zimbabwe Trade Councils Union (ZTCU) as a proxy for caretakers not employed. Table 2 summarises the wage rate assumptions to be applied in determining the value of lost production.

$$\text{Indirectcost} = \sum \text{time lost to production} \times \text{average wage rate}$$

EQUATION 5

To calculate the value of time lost per hour, it is assumed that caretakers allocate an average of 20 days per month to production and allocate an average of 8 hours per day to production related activities.

For individuals that are unemployed, the research identifies that the opportunity time cost for these caretakers is assumed to reflect forgone productivity losses equivalent the minimum wage to that of an urban farmer. This value is assumed to be 0.51 US\$ per hour. This value is derived as an arithmetic division of the monthly wage of 80.81 divided by 20 working days and further divided by 8 hours.

| Occupation sector | | Monthly wage |
|-------------------|----------------|--------------|
| White collar | Engineering | \$150 |
| | Commercial | \$150 |
| | Media | \$250 |
| | Urban Council | \$70 |
| | Civil Service | \$150 |
| Blue collar | Construction | 150.4 |
| | Agriculture | 80.81 |
| | Mining | \$100 |
| | Domestics | \$30 |
| | Catering | \$85 |
| | Security Guard | \$150 |

* Wages reflected are minimum wages as set by the ZCTU

TABLE 2: MINIMUM MONTHLY WAGE DATA BY SECTOR IN ZIMBABWE (2009)
Source: ZCTU 2009

Total cost of illness

The total household cost is calculated as the summation of direct and indirect costs

ii. The total direct cost of illness explicitly estimated to account for the presence of co-morbidities

To estimate the total direct cost and the effect of co-morbid disease on the total direct cost of illness, the research will identify cases of malnutrition that are not concurrently being treated for other co-morbidities. Once those cases have been identified, the research will estimate the total direct costs of the sub-group of cases that are only suffering from severe acute malnutrition using Equation 6. These cases will be assumed to represent the total direct cost of only treating severe acute malnutrition.

$$\begin{aligned} & \text{Total direct cost of malnutrition}_{\text{SAM without any co-morbidities}} \\ & = \sum \text{direct medical treatment} + \text{medication} + \text{nonmedical direct payment} \end{aligned}$$

EQUATION 6

To estimate the additive cost of treating a co-morbidity such as pneumonia, a subgroup of cases suffering from severe acute malnutrition and pneumonia exclusively will be identified. To estimate the total direct cost for this sub-group of cases, Equation 7 will be applied.

$$\text{Total direct cost of malnutrition}_{\text{SAM \& pneumonia}} = \sum \text{direct medical treatment} + \text{medication} + \text{nonmedical direct payment}$$

EQUATION 7

To evaluate and calculate the effect of treating a co-morbid disease in addition to severe acute malnutrition it is assumed that the cost of treating cost of treating severe acute malnutrition with a co-morbidity like pneumonia less the total direct cost of treating severe acute malnutrition exclusive of any comorbidities will represent the additive cost of the co-morbidity (Equation 8).

$$\text{Incremental cost of comorbidity}_{\text{pneumonia}} = \text{Total direct cost}_{\text{SAM \& pneumonia}} - \text{total direct cost}_{\text{SAM without any co-morbidities}}$$

EQUATION 8

1.6.1 Study design

The research is designed as a cross-sectional study. Applying a retrospective and prospective cost-of-illness approach, the study will estimate the economic cost of malnutrition. While adopting the perspective of the households, the study will estimate the economic cost as summation of direct and indirect costs associated with child malnutrition.

By estimating the retrospective and prospective cost of malnutrition, the research will be able to provide insight as to whether the economic cost is influenced by endemicity and macroeconomic climate. As the retrospective approach can only provide data on quantities of pharmacological, other medical inputs and diagnosis, the use of the prospective data analysis provided additional data on non-medical costs that could not be determined from a retrospective review of medical charts alone. The prospective data will thus collate household responses on out of pocket payments that will be used as inputs to calculate household cost of illness for the prospective arm of the research while additionally being extrapolated to calculate some components of the direct cost of malnutrition for cases to be identified in the retrospective arm of the research.

To aid with the data collection the study will recruit a trained nurse during the data collection period. The nurse alongside the principal investigator will retrospectively review patient medical records of children under the age of 5 years (i.e. 0 – 59 months) who were admitted to the hospital's malnutrition ward during the period 1 April 2008 – 31 July 2008 as well as from 1 April 2009 – 31 July 2009. The aim of the review will be to collate data on the type of malnutrition diagnosed, the co-morbidities diagnosed, the length of hospital stay, the quantity of health inputs (i.e. quantities of drugs administered and diagnostic tests performed) and the treatment outcome.

In addition to retrospectively reviewing patient medical charts, the nurse recruited for this study will prospectively review patient medical charts of children admitted into the malnutrition bay in May 2011. Prospectively reviewing patient medical charts will require that the nurse review the patient medical charts of children enrolled in the study on a daily basis, from the date of hospital admission or study enrolment to the date of discharge. Similar to the retrospective review, the data collated from the prospective medical chart review will include the length of hospital stay, quantities of health inputs, disease diagnosis and the outcome of treatment.

To determine the prospective direct medical, direct non-medical costs and indirect cost of malnutrition, a household questionnaire will be administered to caretakers accompanying minors under the age of 5 years. For the one month period of data collection, the nurse or the principal investigator will interview all the caretakers accompanying children into the malnutrition ward. The nurse or the principal investigator will record verbal responses provided by caretakers onto the questionnaire. Caretakers will only be interviewed provided their child is under 5 years of age and informed consent have been granted by the caretaker.

Justification for Study Design

Although, it is relatively easy to obtain data on the nutritional status of children under the age of 5 years from a household survey like the Demographic Household Survey (DHS), there are several limitations associated with data collated from these surveys. For instance, household surveys like the DHS do not provide comprehensive data on the quantities and types of medical inputs or responses to various components of out of pocket health expenditures thus such survey data cannot be used in the estimation of a cost of illness study from a perspective of a household. Given the limitations of data that has already been collated, it follows that a study designed to prospectively collate data from caretakers as well as collate data from patient medical charts will provide adequate data that can be inputted in estimation of cost of malnutrition.

The periods chosen for the retrospective medical record review, correspond to the period negative macroeconomic growth, rising unemployment and poverty levels which collectively played a role in increasing the levels of malnutrition in Zimbabwe. The first period chosen for the medical review (1 April 2008 – 31 July 2008) was purposely selected as the incidence of severe acute malnutrition was high with an estimated 15 new cases admitted on a daily basis (Mutseyekwa T, 2008). Given the high number of malnutrition hospital admission cases and possibly the diversity of cases, the selected period provides a deeper insight into costing malnutrition such that the results can be generalized to other economies that may have a similar macroeconomic and political profile as was experienced during that time period. Namely, results can be generalised to economies with high incidence of severe acute malnutrition, where inflation levels are high, a large proportion of the economy lives below the poverty line and the political climate is relatively unstable.

Lastly, by collating data from two different time periods, the study design provides insight as to whether macroeconomic forces have a significant influence on the household cost of malnutrition.

1.6.2 Study location

Data will be collected from Harare Central Hospital. Harare Central hospital is situated in Zimbabwe's capital city, Harare. Harare Central hospital is one of two referral public hospitals which provide medical care to two-thirds of the urban population in Harare as well as patients that are referred from lower levels of health care services such as clinics around the country as well as district hospitals.

Harare Central hospital is situated in a high density urban settlement (Mudyarabikwa O et al, 2006). Harare hospital typically caters for households from a poor socioeconomic standing, who cannot afford private health insurance (Dambaza S, 2006). In 2008 it was estimated that 15 new cases per day of severe acute malnutrition are recorded as Harare central hospital (Musteyekwa T, 2008).

1.6.3 Study population and enrolment

The study population recruited for the prospective arm of the research consists of child patients between the age of 0 – 5 years, admitted to the hospital's paediatric malnutrition ward with a confirmed diagnosis of malnutrition and who will be accompanied by caretaker to the ward during May 2011. While the study population recruited for the retrospective arm of the research consists of children between the ages of 0 – 5 years admitted to the paediatric malnutrition ward with a confirmed diagnosis of malnutrition between 1 April 2008 – 31 July 2008 and 1 April 2009 – 31 July 2009.

As Harare Central hospital is a referral hospital, it provides services to urban dwellers in Harare, as well as individuals who have been referred from municipal clinics and district hospital for higher level of care (Direct relief international, 2011).

Demographics of study population

The population is comprised of predominantly urban dwellers. Given Zimbabwe's demographic profile (Table 3) the study population is likely to be predominantly Shona speaking. Households that seek treatment in this hospital tend to belong to the lower socioeconomic quintiles of wealth and reside in high density suburbs of Harare.

| Cultural background | |
|---------------------|-----|
| Shona | 82% |
| Ndebele | 14% |
| Asian & mixed | 1% |
| White | 1% |

TABLE 3: PROFILE OF ZIMBABWE CULTURAL BACKGROUND

Study enrolment

Retrospective direct medical costs of malnutrition

The study population is inclusive of all the children under the age of five years who were admitted or sought care in the malnutrition ward during 1 April 2008 and 31 July 2008 and 1 April 2009 – 31 July 2009. The study will review patient medical records and case notes of children under the age of 5 years who were admitted to the hospital with the medical diagnosis of malnutrition. The nurse and the principal investigator will determine the eligibility of medical records to be included into the review based on a set of pre-specified inclusion and exclusion criteria.

Inclusion criteria

- Patient medical records of children who on hospital admission were under the age of five years and had not reached their 60 months of age upon hospital admission.
- Patient medical records of children under the age of 5 years (i.e. 0 – 59 months) who have a confirmed diagnosis of malnutrition.
- Patient medical records of ward admissions between 1 April 2008 and 31 July 2008 and 1 April 2009 – 31 July 2009.

Exclusion criteria

- Patient medical records of children who upon hospital admission were older than 5 years or 59 months
- Patient medical records of participants who were admitted to the ward prior to 31 March 2008, as well as between 1 August 2008 – 31 March 2009 and any period after 1 August 2009.

Prospective

To determine the direct medical, direct non-medical costs and the indirect cost of malnutrition, the study population is inclusive of all children between the age of 0- 5 years who are accompanied by a caretaker during one month of data collection.

The nurse will administer anthropometric body measurements to child participants. In addition, the nurse or the principal investigator will administer a 30-minute household survey to all caregivers accompanying children to the ward. The nurse and the principal investigator will determine eligibility for inclusion of study using a set of specified inclusion and exclusion criteria.

Inclusion

- Children between the age of zero and five years
- Caretakers accompanying children who are between the age of 0 of 5 years to the malnutrition ward.
- Caretakers who have understood and have provided consent to conduct the interview as well as provided consent for the child to be enrolled into the study.
- Participants who can comprehend either English, Shona or Ndebele

Exclusion

- Caregivers accompanying children who are older than 5 years at the date of admission.
- Children who upon hospital admission were older than 5 years
- Participants who cannot comprehend or understand either English, Shona or Ndebele
- Informed consent to allow child to participate and caregiver to participate in survey has not been granted verbally and in writing.

1.6.4 Sampling Strategy

Sampling strategy

Retrospective medical record review

No Sampling strategy will be employed in reviewing medical records. All medical records of children under the age of 5 years who have a confirmed diagnosis of malnutrition and were admitted to the malnutrition between periods 1 April 2008 to 31 July 2008 and from 1 April 2009 – 31 July 2009 will be reviewed to minimize sampling bias.

Prospective cost of illness

The outcome variable of interest for the research is child malnutrition. Sample size was calculated using the formula developed by (Kish L,1965) , which is widely used in studies that record body anthropometry.

$$n = \frac{t^2 \times p(1 - p)}{d^2}$$

Where n = calculated sample size;
t =level of confidence;
p= estimated prevalence;
d= margin of error.

EQUATION 9

The variable of interest is acute malnutrition. The estimated prevalence of inpatient severe acute malnutrition in Zimbabwe is 2.4% (FNC, 2010). The calculated sample size based on prevalence of 2.4% and a 95% level of confidence is equal to 36 participants. However, making contingencies for the possibility of non-response or incomplete data, the sample size will be increased by 10%. Thus the sample size for the prospective study is 40 child participants.

1.6.5 Outcome Measures

Variables

The main variables that will be measured by the study include direct medical costs, direct non-medical costs, indirect costs and anthropometric indices.

The study will draw upon three instruments to measure the study variables; *patient medical charts, questionnaire survey and body anthropometry measurements*. To measure the direct medical costs associated with malnutrition, a trained nurse will use the patient medical records to record utilization of medicines, diagnostic tests and the duration of inpatient hospital stay. To measure the non-medical costs as well as the indirect costs of malnutrition, a trained nurse will administer a questionnaire survey. The objective of the questionnaire is to measure variables relating to socio-economic status and indirect labour costs as well non-medical direct costs of illness.

i. Anthropometric measurements

As part of the participant recruitment, once a trained nurse has identified children eligible to participate in the prospective arm of the study, the nurse will measure the child's height, weight and age. The anthropometric measurements will be recorded using the internationally recommended procedures prescribed by the World Health Organization online training course on child growth assessment (WHO, 2011).

Height

Children between the ages of 0-2 years will be measured whilst lying in a horizontal position. Each child within this age group will be placed flat onto the length board (infatometer). If the child is between the ages of 2-5 years, measurements will be recorded whilst the child is standing in a vertical position using a height board (stadiometer). Measurements will be recorded to the nearest millimetre.

Weight

For children who weigh less than 16 kilograms, their weight will be measured using a baby scale. For children who weigh more than 16 kilograms an electronic scale will be used to measure the precise weight. The scales will be calibrated to zero each time before measuring a child. Furthermore, children should be lightly dressed to ensure that accurate measurement of body weight. To ensure precision in the measurement, the weight of each child will be measured twice. All weight measurements will be rounded up to the nearest kilograms.

Age

The trained nurse will utilize data recorded in the medical records and births certificates to record the child's age.

Once the nurse has collated the data relating to height, age, and weight, the trained nurse will apply the WHO standardized growth tables to validate the type of malnutrition diagnoses that is recorded in the medical records.

ii. Patient medical records

Medical records will be used to measure and record the quantities of drugs prescribed, the diagnostic tests performed as well as to confirm the nutritional status and medical diagnosis of the participants.

Once the quantities of health inputs have been determined, estimation of direct medical costs incurred by households will be estimated using the bottom-up approach. This approach will estimate direct medical costs as, the unit cost of the health input multiplied by the quantity consumed (Segal J, 2006). The study will calculate the cost of medical treatment on a line item basis using unit prices published by UNICEF's and WHO 2009 publication on Sources and Prices of Selected Medicines for Children.

iii. Survey questionnaire

To collect data related to non-medical direct costs such as transport, accommodation and food costs, the attending nurse will administer a 20 minute questionnaire to the primary caretaker. The questionnaire will attempt to capture information relating to demography, socio-economic status of the households, the cumulative labour hours forgone by the caretaker while providing care to the child, household expenditures on transport costs associated with bringing the child to the hospital and information on costs incurred while seeking alternative sources of treatment from either a traditional healer or a pharmacy.

To estimate the indirect cost of productive time lost by caregivers, the study will apply the human capital approach to measure the lost production in terms of forgone wages (Segal, 2006). The study will use the average daily wage to estimate the cost of forgone income that is derived from labour market participation.

In the case of home production and unemployment, the cost of forgone income from income generating activities will be computed as the average agricultural wage multiplied by days lost in providing care. In the case of unemployed individuals, it is assumed that unemployed members engaged in home production activities such as urban agriculture thus the wage applied to estimate indirect costs is that of an urban agriculture farmer.

Questions relating to loss of labour productivity in the questionnaire are adapted from the Short Form and labour questionnaire (SF-HQL) which have been applied in several economic evaluation studies including (Beusterin K et al, 1999; Muntigh A et al, 2009). Therefore, questions in this research questionnaire estimating the loss of labour productivity have a high degree of construct validity.

The face validity of the questionnaire is depended on how the questions are phrased and understood. To improve face validity and the reliability of measurement in the questionnaire, the questionnaire will be piloted before the data collection period. If there are ambiguous questions or questions that fail to capture the truth about the variable, the questions will be revised accordingly.

1.7. DATA ANALYSIS

Data management

All completed questionnaires and patient medical record data will be collected daily from the study sites and transported to a secure location. Data will be captured electronically on an ongoing basis. To minimize data capturing errors and ensure data quality, data will be re-entered on 2 occasions using two different data capturers. All electronic data will be stored such that it is only accessible with a use of an authorized to ensure confidentiality.

To ensure quality data collection, the principal researcher will visit the study sites and observe the data collection process. Furthermore, a weekly review of the collection process will be conducted with all fieldworkers to identify any potential challenges that may need to be addressed.

For the prospective arm of the research, where a participant record is incomplete, i.e. where the household survey was not administered, the observations for that particular participant will be excluded from the study.

Data analysis

Once data has been cleaned, it will be analysed using 2 software programs; Microsoft Excel and WHO Anthro.

i. Classification of malnutrition

Calculation of nutritional indices and determining type of malnutrition prevalent

To identify the type of malnutrition standardized nutritional indices: height-for-age, weight-for-age and weight-for-height will be computed using the WHO Anthro software program. The computed nutritional indices will be compared against a reference population to determine the type of malnutrition. The reference growth standards that will be applied in the analysis are the new WHO growth standards that were generated to account for different ethnicity (WHO, 2009)

Using the computed indices generated by the WHO Anthro software program, each data point will be examined against the threshold levels used to classify malnutrition. For example, if a participant is identified as suffering from kwashiorkor, their height-for-age index will fall below the threshold level of -3 standard deviations, thus they will be classified as suffering from severe under-nutrition. In addition to using the indices to determine the nutritional status, the research will rely on the medical charts of the patients to confirm the type of malnutrition each participant is suffering from.

| | Indicator | Index | Threshold level |
|-----------------------------|--------------------------|-------------------|------------------------|
| Severe acute malnutrition | Severe wasting | Weight-for-height | < -3 SD |
| | Severe stunting | Height-for age | < -3 SD |
| | Severe under nutrition | Height-for-age | < -3 SD |
| Moderate acute malnutrition | Moderate wasting | Weight-for-height | < -2 SD |
| | Moderate stunting | Height-for age | < -2 SD |
| | Moderate under nutrition | Height-for-age | < -2 SD |

TABLE 4: WHO CLASSIFICATION OF MALNUTRITION

Source: WHO Child Growth Standards

ii. Presentation of direct cost of illness – without explicitly accounting for co-morbidities

To analyse the total direct cost of malnutrition for participants in the prospective arm the research, average input costs will be calculated using instructions detailed in Table 5. Once average input data has been calculated, it will be summarised in Table 6. Using the summarised input data in Table 6, the total direct cost will be calculated on a line-by-line item basis as summarised in

Table 7.

The total direct cost will be calculated as the average unit input multiplied by the average unit quantity. For instance the cost of transport will be calculated as the average unit cost of a round-trip by the average number of days the caretaker travelled to the hospital.

To estimate the total direct cost for participants in the retrospective arm of the research, selected unit cost input derived from the prospective arm of the research will be used to extrapolate the direct non-medical costs (i.e. transport, accommodation and food).

iii. Analysis and presentation of direct cost of illness and the incremental costs of co-morbidities

To analyse the incremental cost of co-morbidities, cases from the prospective arm of the research will be sub-grouped according to the prevailing co-morbidity as illustrated in Table 8.

Once a sub-group of cases has been identified, the total direct costs for this sub-group will be summarised using Table 9. Inputs used to derive the total costs in this table will be calculated in a similar manner as described in Table 5, however the average input data will only be calculated for the specific sub-group.

| Input data | | Calculation | Source |
|----------------------|-------------------|---|---|
| Direct Non-medical | Transport | Using the household responses provided in the questionnaire survey relating to the transport cost, calculate the average cost of transport as the total round-trip cost divided by total number of participants. | Household Questionnaire |
| | Food | Using the household responses provided in the questionnaire survey relating to additional expenditure on food, calculate the average unit cost of food as the total daily food expenditure divided by total number of participants. OR use the average cost of a meal at the hospital cafeteria | Household Questionnaire / Hospital cafeteria |
| | Accommodation | Using the household responses provided in the questionnaire survey relating to accommodation, calculate the daily average hotel cost | Household Questionnaire |
| Direct medical costs | Drugs | Published as a unit input WHO and UNICEF 2009 | UNICEF and WHO Sources and Prices of Selected Medicines for Children 2009 publication |
| | Diagnostic test | Given as a unit input in the Relative value scale published by medical aid societies in Zimbabwe | Relative value scale published by medical aid societies in Zimbabwe |
| | Hospital bed cost | Given as a unit input by the WHO | WHO-Choice unit costs for service delivery 2008 |

TABLE 5: INSTRUCTIONS TO CALCULATE UNIT INPUT COST

| | Unit | Unit total |
|---|-------|------------|
| Average length of hospital stay | Days | |
| Average time spent waiting for medical attention | Hours | |
| Average time spent in providing caretaking activities | Hours | |
| Average expenditure on drugs/medication at the pharmacy | US\$ | |
| Average expenditure on drugs/medication at the hospital | US\$ | |
| Average expenditure on diagnostic tests | US\$ | |
| Average cost round-trip transport cost | US\$ | |
| Average cost of 1 meal (Staple sadza & relish) | US\$ | |
| Average hospital bed cost per day | US\$ | |
| Average consultation/ hospital admission fee | US\$ | |

TABLE 6: SUMMARY OF UNIT INPUTS

| Total direct costs of severe acute malnutrition - without explicitly accounting for co-morbidities (Prospective participants) | | | |
|---|------------------|----------|-----------------------------|
| | Unit cost (US\$) | Quantity | Total monetary value (US\$) |
| Direct medical costs | | | |
| <i>1. Direct medical costs incurred before admission into hospital</i> | | | |
| 1a. Traditional healers | | | |
| 1.b Pharmacy | | | |
| Drugs | | | |
| Micro-nutrients | | | |
| <i>2. Direct medical costs incurred after admission into hospital</i> | | | |
| 2a. Drugs | | | |
| 2b. Diagnostic tests | | | |
| 2c. Hospital bed charge | | | |
| 2d. Consultation/ user charges | | | |
| Total direct medical costs | | | |
| Direct non-medical costs | | | |
| Transport | | | |
| Food | | | |
| Accommodation | | | |
| Total direct non-medical costs | | | |
| Total direct costs | | | |

TABLE 7: TOTAL DIRECT COST OF ILLNESS (WITHOUT EXPLICITLY ACCOUNTING FOR CO-MORBIDITIES)

| Co-morbidity disease matrix for patients recruited in the prospective study | | | | | | | |
|---|------|-----------|-----------|----------|-------|-------|--------|
| | None | Diarrhoea | Pneumonia | Vomiting | Cough | Fever | Oedema |
| None | | | | | | | |
| Diarrhoea | | | | | | | |
| Pneumonia | | | | | | | |
| Vomiting | | | | | | | |
| Cough | | | | | | | |
| Fever | | | | | | | |
| Oedema | | | | | | | |

TABLE 8: EXAMPLE OF CO-MORBIDITY DISEASE MATRIX FOR PATIENTS RECRUITED IN THE PROSPECTIVE STUDY

| Total direct costs of severe acute malnutrition : The additive effect of co-morbidities | | | |
|---|--|--|--|
| | Severe acute malnutrition with no co-morbidities | Severe acute malnutrition with pneumonia | Severe acute malnutrition with diarrhoea |
| Direct medical costs | | | |
| <i>1. Direct medical costs incurred before admission into hospital</i> | | | |
| 1a. Traditional healers | | | |
| 1.b Pharmacy | | | |
| Drugs | | | |
| Micro-nutrients | | | |
| <i>2. Direct medical costs incurred after admission into hospital</i> | | | |
| 2a. Drugs | | | |
| 2b. Diagnostic tests | | | |
| 2c. Hospital bed charge | | | |
| 2d. Consultation/ user charges | | | |
| <i>Total direct medical costs</i> | | | |
| Direct non-medical costs | | | |
| Transport | | | |
| Food | | | |
| Accommodation | | | |
| <i>Total direct non-medical costs</i> | | | |
| Total direct costs | | | |

TABLE 9: TOTAL DIRECT COSTS OF SEVERE ACUTE MALNUTRITION: THE ADDITIVE EFFECT OF CO-MORBIDITIES

iv. Analysis and presentation of indirect costs of illness

Indirect costs will be summarised using Table 10. The total indirect cost as summarised in Table 10 will be estimated as the total spent performing caretaking activities such as going to the hospital, feeding the child, visiting the child multiplied by the caretaker's hourly wage. If the normal duties or activities of the primary care giver are performed by other members of the household (intra-household labour substitution), the quantity of lost productive time is reduced. Therefore the total indirect costs will be an arithmetic formulation that adds the monetary value of waiting and care taking time, less the monetary value of intra-household labour substitution.

| | Average hours per day | Number of days | Average hourly wage | Monetary value of lost production |
|-----------------------------|-----------------------|----------------|---------------------|-----------------------------------|
| Waiting time | | | | |
| Caretaking/visiting | | | | |
| Labour Substitution | | | | |
| Total indirect costs | | | | |

TABLE 10: EXAMPLE OF TOTAL INDIRECT COST TABLE

v. *Analysis of total costs of illness*

Total costs of illness will be summarised using Table 11. Using the average household income across the 40 recruited households, the total cost of illness will be represented as a percentage of monthly household income.

| | Including costs incurred before hospitalisation | | Excluding costs incurred prior to hospitalisation | |
|-----------------------|---|-----------------------|---|-----------------------|
| | Amount in US\$ | % of household income | Amount in US\$ | % of household income |
| Direct Costs | | | | |
| Indirect costs | | | | |
| Total cost of illness | | | | |

TABLE 11: TOTAL COST OF SEVERE ACUTE MALNUTRITION (WITHOUT ACCOUNTING FOR THE EFFECT OF CO-MORBIDITIES)

vi. *Analysis of household coping strategies economic costs on household welfare*

Table 12 will be used to summarise and analyse the coping strategies used by households to cope with illness related costs. The costs will be analysed according to (i) coping strategies used to cope with burden of direct costs and (ii) coping strategies used to cope with the burden of indirect costs.

| | | Total number of households | % of households |
|--|-----------------------------------|----------------------------|-----------------|
| Strategies to cope with direct costs | Cash & savings | | |
| | Loan from relatives | | |
| | Loan from formal financial sector | | |
| | Reduction in food consumption | | |
| | Sale of household assets | | |
| | No coping strategies | | |
| Strategies to cope with indirect costs | Hired labour | | |
| | Intra-labour substitution | | |
| | Working additional hours | | |

TABLE 12: TABLE SUMMARISING HOUSEHOLD COPING STRATEGIES

To analyse whether the total direct costs will reduce household welfare, the research will determine whether the total direct costs as a percentage of monthly household income exceed the pre-specified threshold level of 10 %. If expenditures are greater than 10% of monthly income, it will be assumed that the total cost of malnutrition are impoverishing and lead to decline in household welfare.

1.8. ETHICS

The main ethical issues in this protocol relate to the use of confidential patient medical records as well as intrusive questions relating to socio-economic status of the household. Furthermore, the recruitment of children into the study is a significant ethical consideration, given that children are considered a highly vulnerable group (Schenk K, 2005). Additional pertinent ethical issues relate to the issue of conducting research in an uncertain political environment, where confidentiality may be breached upon request of a change in legislation. Given the history of political intimidation there is a probability that data collected about participants, if confidentiality is breached for legislative purposes may be used inappropriately to intimidate or oppress research participants based on their political preferences. Other ethical issues associated with the protocol include the potential inconvenience the fieldworkers may pose to the health care facility during the data collection period.

While there are several potentially controversial ethical issues associated with this research, the information is important in formulating optimal policy in the allocation of health resources. This is particularly important given the highly resource constrained Ministry of Child and Health welfare budget allocation. Furthermore, information on the medical costs of treating malnutrition in Zimbabwe can be adapted for use in future economic evaluation, such as determining cost-effectiveness of nutrition interventions.

Although the study does not anticipate significant adverse risk to participants, minor risks to participants include the time inconvenience of the caregiver whilst administering the questionnaire, the intrusion of personal privacy relating to other medical diagnosis such as HIV and minor discomfort the child may be subjected to whilst taking anthropometric measurements.

Although, it would be ideal to eliminate all risks that participants may face during the research, it would not be feasible possible to obtain accurate information without the use of questionnaires and the patient medical records. Although mathematical or econometric modelling would minimize the risk to participants, it would be impossible to apply to the Zimbabwean context as there is currently no data that has been collated on cost of treating malnutrition cases in Zimbabwe.

The benefits to participants may accrue in improved health resource allocation decision. If the research is used in decision making, the participants and the communities will benefit in terms

of well informed and possibly improved nutrition interventions. Although the benefits may not be immediate, they far outweigh the risk that participants may experience during the research. To minimize the risk to participants and to address some of the ethical issues in this research the following safeguards will be implemented into the research;

Informed consent

Every participant has the right to choose whether or not to participate in a study. However, in the case of children under 5 years who cannot provide valid assent the research will rely on guardian consent to act as a proxy consent. Written and verbal consent will be obtained from the legal guardians or the care givers who have brought the child to the health care facility. The consent forms will be translated from English into two of the official language, namely Shona and Ndebele.

If a participant cannot read and understand English, Shona, or Ndebele, they will be excluded from recruitment of the study.

| |
|--|
| Steps in obtaining consent for prospective study |
| 1. Fieldworker approaches caregiver and informs caregiver about the research |
| 2. Fieldworker give caregiver the parental informed consent form to read |
| 3. Fieldworker gives caregiver the adult informed consent to read |
| 4. Fieldworker answers questions and clarifies aspects of the research to caregiver |
| 5. Once caregiver has verbally consented and signed 2 copies of the parental informed consent and the adult form, the fieldworker will give the caregiver a copy of he signed forms. |

If the caregiver does not provide consent, the child will be excluded from the recruitment of the study. To protect the right to self-determination throughout the study, participants will be informed of their right to withdraw their child and themselves from the study at any time during the study.

Whilst proxy consent will be adequate for the purposes of the research, the fieldworkers will attempt to maximize the protection of children rights. It is well established that malnutrition is a problem stemming from household instability. Therefore, in instances where the trained nurse may observe signs of abuse, neglect or ignorance, they are obliged to attempt to address some of these problems. In instances of neglect, the nurse will have to escalate these problems to the hospital caseworkers.

Minimize Harm

Children are vulnerable research group and therefore it is important to minimize the risks that they may experience. Although this research had minimal physical risk to participants, they

maybe some discomfort experienced while recording the weight and height of the child. Therefore, to minimize this risk, all measurements will be recorded by a trained nurse with the aid of a medical student. In addition, the research will exclude recruitment participation of children who are severely ill and are in an intensive care ward.

To further minimize harm to the household and child participants, the research will strictly collect data that is necessary. For instance, the questionnaire has been designed to only extract relevant information that is pertinent in answering the research question. In addition, the optimal recruitment size of the study sample had been calculated to minimize the risk of recruiting number insufficient participants that will yield robust conclusions.

Lastly, all information from patient medical records and questionnaires will be kept confidential. Once all the data has been collated, personal information maker such as name will be removed from the data to maximize the protection of privacy and intimidation or oppression.

To maximize protection of participants, formal ethical clearance will be sought from UCT Faculty of Health Sciences Human's Ethics Committee at the University of Cape Town. In addition, permission to conduct research at Harare Central Hospital Lastly, Clearance to conduct the study will be sought from the Medical Research Council of Zimbabwe.

Stakeholders

The main stakeholders in the proposed research include hospital administration staff at Harare Central hospital, Medical research council of Zimbabwe and UNICEF department of nutrition. Harare Central hospital administrators and medical workers affected through inconvenience of the presence of the field workers. To minimize the interruptions of hospital operations, trained nurses will attempt to minimize obstruction of normal hospital operations by efficiently recording information at a time where medical workers are not concurrently attempting to provide health care services to the patients.. In addition the study will be conducted over a minimum time period. Once all the appropriate participants have been recruited and data has been collated or after two months the data collection portion of the study will be terminated.

1.9. REFERENCES

- Alagmir, N., Naheed, A., Luby, S. (2010). Coping strategies for financial burdens in families with childhood pneumonia in Bangladesh. *BMC Public health* **10**(622)
- Bani I, Al-Kanhal M (1998) Malnutrition among hospitalized patients in King Khalid university hospital, Riyadh *Saudi Journal of gastroenterology*, 4(3) 172-175
- Behrman J, A. H. (2004). Hunger and malnutrition. *Copenhagen Conesus - Challenges and opportunities*. Copenhagen.
- Beusterin M., Rogers A., Walsleben J., Emsellem H., Reblando J., Wang L., Steinwald B(1999) Health-related quality of life effect of modafinil for treatment of narcolepsy *Sleep* **22**(6) 757-65
- Bloom D, Canning D, Sevilla J (2003). The effect of health on Economic growth: a production function approach *World Development* **32**(1) 1-13
- Chimhunya S, K. R. (2007). The levels of malnutrition and risk factors for mortality at Harare Central hospital Zimbabwe: an Observational Study. *The Central Journal of African Medicine* , **53**
- Currie J.(2008) Healthy, wealthy, and wise: economic status, poor health in childhood and human capital development *National Bureau of Economic Research* working paper 13987
- DeLeire T, Manning W(2004). Labour market cost of illness: prevalence matters *Health economics* **13** 239-250
- Fillol F, S. J. (2009). Impact of child malnutrition on the specific anti-Plasmodium falciparum antibody response. *Malaria* , **8**, 116.
- Food and Nutrition Council (2010) Zimbabwe National Nutritional Survey, Harare, Zimbabwe Food, Agriculture, and Natural Resources Policy Analysis Network (FARPAN). (2006). *Silent Hunger*. Harare: Food, Agriculture, and Natural Resources Policy Analysis Network (FARPAN).
- Harare City Council Health Department. (2008). *Harare City Council Health Department annual report*. Harare: Harare City Council Health Department.
- Health, Z. N. (2011, January 6). *Progress Report 2010 and Plans 2011*. Retrieved February 2, 2011, from Zimbabwe Network for Health: <http://zimhealth.org/wp-content/uploads/2011/01/Zimhealth-Update-Report-2010.pdf>
- Julia Tagwireyi, T. J. (1992). *Nutrition-Relevant Actions in Zimbabwe*. Harare.
- Geeta A, J. H. (2009). Reliability, technical error of measurements and validity of instruments for nutritional status assessment of adults in Malaysia. *Singapore Medicine Journal* , **50** (10), 1013.
- Hodgson T, Rice D, Crum G (1982) The value of human life *The American journal of public health* **73**(6) 536-538
- Kamolratanakul, P., Sawert, H., Kongsin, S., Lertmaharit, S., Sriwongsa, J., Na-Songkhla, S., Wangmanee, S., Jittimane, S., Payanandana, V. (1999) Economic impact of Tuberculosis at the household level. *international journal Tuberculosis lung disease* , **3**(7), 596-602
- Kemp, J., Mann G., Simwaka , N., Salaniponi, F., Squire, B.(2007). *Bulletin of the World health Organisation* **85**(8)
- Malaney Pia (2003). Micro-economic Approaches to evaluating the Burden of Malaria. CID working paper No. 99. Harvard
- Mudyarabikwa O, Normand C, Chwala M, Needleman J (1996) *Resource Mobilization for the Health Sector in Zimbabwe*
- Mullholland K (2005). Commentary: Comorbidity as a factor in child health and child survival in developing countries *International Journal of Epidemiology*, **34**(2): 375-377
- McIntyre D, Thiede M, Dalgren G, Whitehead M (2006) What are the economic consequences for households of illness and of paying for health care in low-middle income country contexts *Social Science and Medicine* **62** 858-865
- Muyanga M, Jayne T, Burke W (2010). *The pathways into and out of poverty: a study of determinants of rural household wealth dynamics in Kenya*
- Nderere B (2010) Health summit 100 day plan: implementation progress report, Harare
- Rowell D, Jackson T, (2010) Additional cost of inpatient malnutrition , Victoria, Australia 2003-2004 *European Journal of Health Economics*
- Russell, S. (2004). The economic burden of illness for households in developing countries: a review of studies focusing on Malaria, Tuberculosis and human immunodeficiency virus/ acquired immunodeficiency syndrome. *The American Society of Tropical Medicine and Hygiene* , **71** (2), 147-155.
- Russell, S. (2005). Illuminating cases: understanding the economic burden of illness through case study household research. *Health Policy and Planning* .

- Sauerbon R, (1996). Household Strategies to cope with the economic costs of illness. *Social Science and Medicine* , 43 (3), 291-301.
- Segel, J. (2006). *Cost of illness Studies - Primer*. RTI International.
- Somi M, B. J. (2007). Economic burden of malaria in rural Tanzania: variations in socioeconomic status and season. *Tropical Medicine and International Health* , 12 (10), 1139-1147.
- Solow R (1956) A contribution to the theory of economic growth *Quarterly Journal of Economics* 70 (1): 65–94.
- Strauss J, T. D. (1998). Health, Nutrition and economic development. *Journal of economic literature* , 36 (2), 766-817.
- UNICEF (1990). A UNICEF policy review: strategy for improved nutrition of children and women in developing countries, UNICEF New York
- UNICEF (2001) Child malnutrition, UNICEF, United Nations special session on children, New York
- World Bank(2006). *Repositioning Nutrition as Central to Development*, World Bank, Washington DC.
- WHO, (2010) . *Severe acute malnutrition* [online] Available at <http://www.who.int/nutrition/topics/malnutrition/en/index.html>"
- <http://www.who.int/nutrition/topics/malnutrition/en/index.html> [accessed 27 November 2010].
- WHO (2003) Guidelines for the inpatient treatment of severely malnourished children, Geneva, World Health Organization
- WHO (2009) WHO guide to identifying the economic consequences of disease and injury, WHO Geneva Switzerland
- Xu K, A. A. (2005). EV: Distribution of health payments and catastrophic expenditures Methodology. *World Health Organization Discussion Paper* , 2.
- Zere E, M. D. (2003). Inequities in under 5 child malnutrition is South Africa. *Journal for Equity in Health* , 2 (7).
- Zimbabwe Ministry of health and child welfare (2010) [online] available at http://www.mohcw.gov.zw/index.php?option=com_content&view=article&id=26&Itemid=68 [accessed 16 October 2010].
- AVERT. (2011). *AIDS Orphans*. Retrieved February 3, 2011, from <http://www.avert.org/aids-orphans.htm>
- Ticklay M . (1997). HIV infection in malnourished children in Harare, Zimbabwe. *East Africa Medical Journal* , 217-20.
- Munyiki E, J. S. (2009). *Capital flows in the health care sector in Zimbabwe: Trends and implications for the health sector*. Harare: EQUINET.
- Chigongo N. (2008). Community Based Management of Acute Malnutrition in Zimbabwe. *International Workshop on CMAM*. Washington: UNICEF.
- Pimhidzai O. (2009). Distributional effects of market distortions: an application to health inequality in Zimbabwe.
- S, D. (2006, May 25). hospital horrors for Harare residents. Retrieved February 3, 2011, from The Zimbabwean: http://www.thezimbabwean.co.uk/index.php?option=com_content&view=article&id=7207:hospital-horrors-for-harare-residents&catid=35:opinion-a-analysis&Itemid=31
- United Nations World Food Programme (WFP). (2008). HIV/AIDS Analysis: Integrating HIV/AIDS in Food Security . Rome: United Nations World Food Programme .
- USAID. (2010). *HIV/AIDS Health Profile*. USAID.
- Vorster H.(2010) The link between poverty and malnutrition: A south African Perspective *Journal of Interdisciplinary Health Sciences* 15(2) 1-6

2. LITERATURE REVIEW

2.0. LITERATURE REVIEW

2.1. INTRODUCTION

In light of the growing interest in increasing healthcare affordability and lowering the barriers of accessing healthcare, researchers and development agencies have sought to understand the link between ill health, the costs associated with ill health and how coping mechanisms employed by households when faced with costs of illness can lead to the decline in a household's economic welfare. Numerous cost of illness studies have attempted to map the linkages across several disease burdens including malaria, tuberculosis, HIV/AIDS and diabetes (Chuma J et al, 2006; Ayé R, 2010; Kirigia J et al, 2008).

Against the backdrop of a growing focus on climate change, the potentially adverse consequences of climate change on food security have projected the topic of malnutrition to the forefront of public health debates (Sheraan J, 2008). Child malnutrition, which may be considered as an indication of poverty across several regions remains one leading and underlying cause of deaths among children under the age of five years across Sub-Saharan Africa and Asia (UNICEF, 2005).

In recent years, the volume of literature focusing on the consequences of malnutrition has increased. Simultaneously, over the past ten years the number of cost of illness studies conducted in low-income countries has grown in volume. However, despite the increase in the volume of literature on the subject of cost of illness, much of the studies remain biased towards investigating the cost of illness of diseases such as malaria and tuberculosis. Similarly, despite the growth in literature on the consequences of malnutrition, much of the studies have focused on clinical consequences and long term intergenerational effects.

Given the expansive volume of literature on malnutrition as well as literature from cost of illness studies such as malaria, the aim of this literature review is to:

- (i) Review the child nutrition policies in Zimbabwe
- (ii) Define malnutrition and review evidence detailing the economic consequences of the illness.
- (iii) Analyse and review studies that have investigated the economic costs of illness from the perspective of the household. The focus of the analysis and review is to review studies that have estimated costs of illness studies in low-to-middle income countries settings and lastly;
- (iv) To explore the linkages between the economic consequences of illness and household economic welfare.

2.2. ZIMBABWE NUTRITION POLICY

Since independence in 1980, child nutrition has been a key priority for the Zimbabwean government. Noting the high levels of child malnutrition in the early 1980's, the government introduced the Child Supplementary feeding programme, (CSFP). The objective of the programme was to reduce the prevalence of malnutrition in the country. The policies set three main objectives, namely; to provide short term relief, influence agriculture practice and provide long term nutritional education (National Health Strategy for Zimbabwe, 2010).

Under CSFP programme, government aims to reduce malnutrition by providing children aged between 6 -59 months with a nutritious meal that meets 40% of daily energy requirements and 88% of daily protein needs. The policy is targeted towards children who reside in drought prone areas.

An evaluation of the policy coverage by (Bijlsma M et al, 1997) alludes to the success of the program, within the limitations of access coverage. Their research observations highlighted weight improvements in 83% of children who attended the programme regularly. They emphasise that while the policy impact is positive, it is dependent on underlying co-morbidities that may exist in children.

While the CSFP results in positive clinical outcomes, a study conducted by (Munro L, 2002) highlights the nationwide policy impact on nutritional status is marginal. Their research finds little evidence to support that highly vulnerable children get preferential access to supplementary feeding. The authors conclude that the low programme coverage resulted in many children being excluded from the supplementary feeding programmes.

In addition to low programme coverage, poor procurement of food has adversely impacted the success of the programme. As primary consequence of centralised food procurement, some provinces were unable to supply food to vulnerable households for several months (UNICEF, 1997).

Following the rising trends in malnutrition during the mid-2000's the government introduced Community Based Management of Acute Malnutrition to combat child malnutrition. The main policy objectives were to; increase access to treatment and reduce the number of cases that require hospital care. The policy aims to treat cases of acute child malnutrition are treated in the community. For severely malnourished children, patients are referred to hospitals for inpatient treatment (MOHCW,2008).

Community Based Management of Acute Malnutrition has been shown to be highly cost-effective (Willford R et al, 2011), however coverage of the programme across Zimbabwe remains low.

Although the Ministry of Health and Child Welfare prioritises nutrition through nationwide policies such as the CSFP and CMAM, coverage across the country remains highly limited owing to limited resources.

2.3. MALNUTRITION AND THE CONSEQUENCES OF THE DISORDER

Definition of malnutrition

Malnutrition is a disease that culminates from the complex interaction of social, political, medical, nutrition deficiencies and public health factors (MOHCW, 2008). In clinical terms, malnutrition broadly describes nutrition disorders that are caused by an insufficient intake of food and nutrients (WHO, 2011). Malnutrition can manifest itself in two broad forms namely; under-nutrition and over-nutrition. The former is characterised as the insufficient intake of food and nutrients, whilst the latter is described as the overconsumption of food and nutrients.

Under-nutrition is the most common manifestation of malnutrition in children under the age of five years across several low-to-middle income countries (World Bank, 2010). There are two types of under-nutrition namely chronic and acute malnutrition as illustrated in Figure 6.

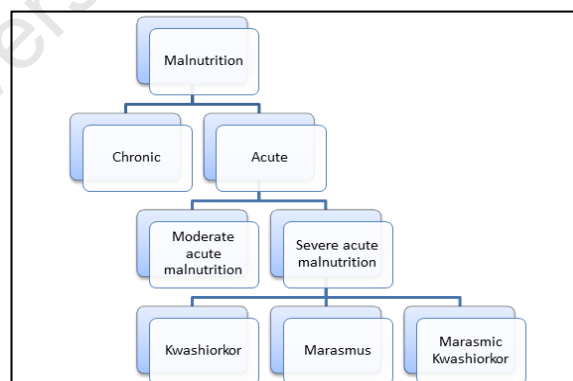


FIGURE 6: TYPES OF MALNUTRITION (UNDER-NUTRITION)

Chronic malnutrition is defined as the failure of children to grow to their genetic potential owing to a persistent inadequate intake of nutrition over extended periods (FANTA, 2011). It is frequently diagnosed using WHO normal growth standards which infer diagnosis of chronic malnutrition when the calculated height-for-age ratio of a child falls below 2 standard deviations from the median height-for-age ratio of what is considered to be the reference of healthy population (WHO, 2006).

Acute malnutrition is defined as recent and severe weight loss owing to acute food shortages or onset of illness (Save the children, 2006). There are three forms of acute malnutrition, namely; marasmus, kwashiorkor and marasmic-kwashiorkor (UNICEF, 2009). All three forms of acute malnutrition are a form of severe protein energy malnutrition (PEM) and are commonly referred to in literature as severe acute malnutrition (SAM). Clinically, severe acute malnutrition is identified in children with a weight-for-height ratio which is less than international reference value or WHO normal growth standards value by more than three standard deviations (WHO, 2010).

The onset of marasmus is precipitated by a severe energy deficit, which is characterized by symptoms of severe weight loss and muscle breakdown. In response to the energy deficit, the body of a child who is suffering from marasmus reduces the functioning of internal body process like the immune system, which consequently increases the chance of mortality if the condition is untreated. Contrast to marasmus, the onset of kwashiorkor is incited by a severe protein deficit in diet. Kwashiorkor is commonly identified by the presence of bilateral oedema or swelling of the body.

The final manifestation of acute malnutrition is Marasmic-kwashiorkor. Marasmic-kwashiorkor is a combination of marasmus and kwashiorkor (UNICEF, 2009). Most hospitalised cases of malnutrition can be attributed to cases of severe acute malnutrition.

Consequences of malnutrition: Micro and Macro dimensions

Malnutrition has both micro and macro consequences on individuals, institutions and households. On a microeconomic level, the consequences of malnutrition in children include mortality and extended periods of morbidity (Behrman J, 2004). In addition to poor clinical outcomes, it is argued that at a micro level, such as a household level, that malnutrition leads to low productivity which consequently translates into poor socio-economic outcomes over the long run.

Child malnutrition is acknowledged to have short term clinical consequences that impede optimal development of human capital and thus initiate a lifetime of adverse economic consequences including sub-optimal lifetime earnings (Vorster H, 2010). In the short run, it is observed that child malnutrition lowers the immune system's ability to resist infection, thereby increasing the likelihood of developing co-morbidities such as diarrhoea, respiratory tract infections, measles and malaria (Filoll F, 2009; Collins S et al, 2006; HPN, 2006).

In addition to the development of co-morbidities, child malnutrition additionally impairs the development of mental capabilities (Strauss J et al, 2008). If the development of mental capacity is stunted as a result of malnutrition, it is argued that the effects will extend over the lifetime of the child in the form of reduced human capital formation (Alderman H et al, 2006). Poor human capital formation has been shown to reduce productivity in school and in the workplace. It is estimated that effects of underdeveloped human capital formation lead to a 10% reduction in lifetime earnings (Action Against Hunger, 2009).

In their research study conducted in rural Zimbabwe, (Alderman H et al, 2006) used longitudinal data to econometrically investigate the effects of pre-school malnutrition on subsequent poor human capital formation. Their econometric model reveals that over the long run, malnourished children achieved a shorter height and completed 0.7 years less of schooling compared to children who were not malnourished.

While (Maluccio J et al, 2008) reached a similar conclusion about malnutrition leading to reduced productivity as in the study by (Alderman H et al, 2006), their approach relied on a quasi-panel data. They obtained economic data of Guatemalans in the age range 25- 46 years who had been enrolled in a nutrition intervention when they were between 0-7 years. Unlike (Alderman H, et al, 2006) who examined the relationship between malnutrition and poor human capital formation by observing educational outcomes of malnourished children over the years of development, the study by (Maluccio J et al, 2008) examined the linkages by evaluating the hourly wages of participants in adulthood. In both studies, a major weakness stems from the large loss to follow up from early childhood years to adult hood however, despite this limitation; their conclusion mirrors theoretical propositions in literature.

On a macro level, it is purported that the cumulative effects of low productivity accrue at a macro-economic level in the form of slower macroeconomic growth (World Bank, 2006). In Peru, it was estimated that losses in gross domestic product (GDP) owing to under nutrition in the population were equivalent to 1.8% of Peru's GDP. The losses in GDP were largely attributable to early mortality and lower productivity, which stems from a large proportion of population possessing below optimal human capital (ELAC et al, 2005)

In summary, much of the published literature on the consequences of malnutrition tends to focus on investigating the long term intergenerational effects as well as the short term clinical outcomes. Of the literature reviewed, there were no studies that have investigated the short term consequences of malnutrition on household's economic status.

While it is acknowledged that illnesses can exert an immediate economic burden on the household, it follows that malnutrition like any other illnesses also exerts an immediate economic burden. However, across the universe of published literature reviewed there have been no studies that have attempted to estimate the economic cost of malnutrition. One method to estimate the economic burden on households is through cost of illness studies.

2.4. THEORETICAL LITERATURE

This next section of the review uses theoretical literature to define the components of cost of illness studies, review and critique common methodologies applied across studies; as well as summarise the key findings from literature.

2.4.1. HOUSEHOLD COST OF ILLNESS

Direct cost of illness

Direct cost of illness is defined as the cost of treating or preventing a particular illness (Segal J, 2006). It is typically defined as the out-of-pocket payments or the financial payments that are incurred during the course of seeking treatment for an illness. Several researchers including (Russell S, 2004) categorise direct costs into two main groups namely; *direct medical costs* and *direct non-medical health costs*.

Direct medical costs are inclusive of payments made in respect of consultation, prescription, over-the counter medication, diagnostic tests as well as hospital bed costs. Whilst, direct non-medical costs are inclusive of payments made in respect of transportation costs to the hospital, additional costs of lodging for the accompanying caretaker, and additional expenditure on special food or changes to diet (Segal J, 2006).

Until the advent of HIV, funeral costs as a component of direct non-medical costs had been excluded in the calculation of direct costs (McIntyre D et al, 2003). However, a growing number of studies including (Bollinger L et al, 1999; UNDP 2006; Wyss et al, 2004) have included the cost associated with funerals in the estimation of direct costs.

Estimating direct costs of illness is generally perceived to be a simple exercise, given that the cost components are easily quantified in monetary terms. Conceptually, to estimate the direct medical costs of treatment, one of three methods can be applied. The three methods include; the bottom-up the approach, top down approach or econometric estimation (Segal J, 2006).

The bottom up approach estimates direct medical costs such as drugs by multiplying the unit cost by the quantity consumed. While the top-down approach estimates the cost of illness by multiplying total health care expenditures by the proportion of health care services used by the

disease group (Sam K et al, 2009). Lastly, the econometric approach estimates the direct cost of illness as the cost differential between treatment costs for a cohort with a particular difference from cohort that is not suffering from that particular illness (Segal J, 2006).

Although direct medical costs can be estimated using any one of the three methods cited in literature, the bottom-up approach to estimating cost of illness is most appropriate for estimating direct medical costs from the perspective of a household (Segal J, 2006). Studies that estimate the cost of illness using the bottom up approach determine the quantity of health inputs from health surveillance data, including information disseminated by governments, patient medical charts as well as interviews with health staff and patients.

To estimate the direct non-medical costs such as transport and accommodation costs, several cost of illness studies frequently collate information on utilisation and unit cost by employing the method of structured interview questionnaires (Sam K et al, 2009).

Indirect cost of illness

Indirect costs of illness are defined as the value of lost economic productivity owing to an episode of illness (Segal J, 2006). Indirect costs include losses to productivity incurred by the patient as well as the caretakers. These costs are inclusive of the opportunity cost of time incurred whilst travelling to the hospital, waiting for medical assistance at the healthcare facility, and caring for the ill patient (McIntyre D et al, 2003).

Contrast to the relatively simple methods applied in measuring direct costs of illness, the measurement of indirect cost of illness is much more challenging and contentious, as there are several differing economic approaches, each with differing merits and demerits. The three main economic approaches to estimating indirect costs are (i) the human capital approach, (ii) the willingness to pay approach and (iii) the friction cost method (Phillip A et al, 2009).

(i) Human capital approach

To measure the value of lost productivity due to illness the human capital approach was initially applied in health care in Mushkin's 1962 paper titled *Health as an Investment*. (Muskin S, 1962) rationalized that wages and salaries paid to employees are a measure of direct compensation for productive services. Therefore, the value of lost productivity due to illness can be measured by the amount of forgone wages. It follows that the value of productivity is often estimated as the time absent from work multiplied by the average wage rate (Sauerborn R et al, 1996a).

An implicit assumption embedded in the human capital approach is the existence of a perfectly competitive market exchange where workers supply their labour in return for compensation in the form of wages that directly reflect their level of productivity (Malaney J, 2003). Several economists have heavily criticised the human capital approach in the valuation of indirect costs. They argue that the assumption of perfect competition is highly abstract from reality given that empirical evidence illustrates that labour markets are imperfect. Secondly, this approach is considered redundant in countries with high unemployment or large informal labour market because the 'formal' wage quoted to reflect the value of productivity is not reflective of the true value of productivity (Drummond F, 2002). However, despite being heavily criticised, it remains the frequently employed approach in estimating indirect cost, possibly as it is least cumbersome approach to apply as data is easily obtainable contrast to the willingness to pay and friction cost method.

(ii) Willingness to pay

Contrast to the human capital approach some cost of illness studies employ the willingness-to-pay approach in estimating the indirect costs of illness (Segal J, 2006). The willingness to pay approach argues that the value of lost production can be derived by analysing household preferences to risk. Using survey methods, a researcher can determine the monetary value that households attach to a product in order to avoid illness (i.e. Willingness to pay) or the value they attach if they are to accept the risk of illness(i.e. Willingness to accept).

(iii) Friction cost method

A third approach to measuring indirect costs associated with illness is the friction cost method. The friction cost method measures the value of lost productivity as the value of time that lapses while attempting to find another employee to replace the economic work activities of the sick employee or alternatively the time taken to restore firm production to normal operating levels. This approach implicitly estimates the cost of illness from the perspective of firm or government (Segal J, 2006).

Of the three different methods used in estimating the indirect cost of illness, the human capital approach is the most popular approach, while the willingness to pay approach and friction cost method are least popular (Segal J, 2006; Sam K et al, 2009).

Between the human capital approach and the willingness to pay approach, the choice of methodology to estimate the indirect costs of illness can significantly influence the results of a study. Estimates that are generated by the willingness to pay approach are argued to be larger than estimates generated by the human capital approach (Sam K et al, 2009).

Although human capital approach is criticised for some of its abstract assumptions such as the assumption of full employment and competitive labour markets, it is relatively simple to apply particularly the absence of individual preferences. Therefore, because of the relative simplicity and less onerous data requirements, this research will rely on the human capital approach to estimate the value of lost production.

Intangible cost of illness

Intangible costs of illness are costs that are associated with loss of quality of life, pain and emotional grief (Suhrcke M et al, 2005). Unlike direct and indirect cost of illness, measurement of intangible costs presents a formidable challenge to economists as they are not easily quantified. In spite of the difficulty associated with measuring these costs, some economists have recommended using the willingness to pay approach (CDC, 2009).

Total cost of illness

The total economic costs of illness comprises of the three above costs mentioned above and is depicted in Equation 10 below.

$$\text{Cost of illness} = \sum \text{Direct cost} + \text{Indirect cost} + \text{intangible cost}$$

EQUATION 10: MODEL EQUATION TO ESTIMATE COST OF ILLNESS

While seeking healthcare, patients can be concurrently be treated for co-morbid conditions. Theoretically, the additional cost of co-morbidities constitutes a component in the total cost of illness. It follows that the total cost of illness can further be estimated as a summation of direct, indirect, intangible costs and the additional cost of treating co-morbid conditions as illustrated in Equation 11 (Segal J, 2006).

$$\text{Cost of illness} = \sum \text{Directcost} + \text{Indirect cost} + \text{intangible cost} + \text{cost of comorbidities}$$

EQUATION 11: MODEL EQUATION TO ESTIMATE COST OF ILLNESS

2.4.2. COPING WITH THE ECONOMIC CONSEQUENCES OF ILLNESS

When faced with the economic consequences of ill health, households adopt a set of actions with the objective to raise money for payment of direct costs as well as to minimize the adverse impact of time lost to production (Sauerborn R, 1996; Mutangadura G, 2002). To cope with the direct cost burdens, households may reduce household consumption, sell assets or borrow money from their social networks (Sauerbon R, 1996; Alagmir N et al, 2010). To cope with the burden of lost production time, households may hire additional labour, allocate tasks to healthier members of the household or alter their income generating activities (Russell S, 2004; McIntyre D and Thiede M, 2003).

2.4.3. HOUSEHOLD WELFARE IMPACT AND THE SUBSEQUENT VICIOUS CYCLE OF ILLNESS AND POVERTY

Household welfare refers to the normal standard of living. When households expend a large proportion of their financial resources to pay for seeking treatment for illness, the extent or the level of the financial burden may threaten household economic welfare either in the short term or the long term. In the short run households may alter consumption patterns by sacrificing the quantity of household food consumption or, by accumulating debt or selling off assets used in income generation to meet the demands imposed by the economic burden. While in the long run they may be forced to accumulate more debt to repay debts incurred in the past or cut household consumption (Shi W et al, 2011).

Although periodically, households will incur economic burden imposed by health impairments, these burdens do not necessarily result in a decline in household welfare level. The literature contends that it is the magnitude of the burden in addition to the household's asset portfolio and initial poverty status that determine whether a household will experience a decline in economic welfare when faced with the economic burden of illness (Shi Wet al, 2011; Chuma J et al, 2006).

The magnitude of the economic burden, in particular the magnitude of health care payments significantly influences the likelihood of a household being impoverished. The bigger the economic burden as a share of household income, the higher the likelihood that a household will be impoverished, holding other factors constant.

While there is no unanimous prescription as to the exact threshold level of what constitutes an economic burden that leads to impoverishment, there are some prescribed guidelines in literature. Often fixed threshold levels are used in determining levels of economic burdens that lead to impoverishment (Xu F et al, 2003, Bonu S et al, 2009). Some studies propose that health care expenditures in excess of 40% of non-subsistence household expenditure leads to impoverishment (Xu F, et al ,2003), while others contend that health care expenditures in excess of 10% lead to impoverishment (Wagstaff A, 2003; Waters H et al, 2004).

While fixed threshold levels are easy to compute, literature highlights that this methodology underestimates the distribution of impoverishment between socio-economic groups (Onoka C et al, 2011; Ataguba J, 2011). These studies propose the use of variable threshold levels that can be determined through a statistical approach.

Using either the fixed threshold approach or variable threshold approach, if the economic burdens of ill health lead to impoverishment, they can initiate a vicious cycle between ill health and poverty. Ill health can force a household into poverty and equally, household poverty can lead to ill health (Whitehead G & Bird P, 2006).

The economic costs associated with illness can act as a catalyst that pushes households into poverty. In particular the (UNICEF, 1990) theoretical framework suggests that economic cost of illness in the form of reduced capacity earnings capacity may force households to live in environments that have inadequate sanitation, poor access to clean water and limited access to adequate nutrition (WHO, 2011). It is in these environments that illnesses develop or continue to thrive.

2.5. EMPIRICAL LITERATURE

2.5.1. HOUSEHOLD COST OF ILLNESS

Direct costs

Empirical evidence across household cost of illness studies reveals that direct cost estimations vary widely owing to the nature of illness, variation in methods used in measurement as well as differences in situational contexts which include seasonality of the disease and epidemiology profile of the illness (Sauerbon R, 1996; Chuma J et al, 2006).

In a cross-sectional study review of household cost of illness studies conducted in low-middle income countries, it was found that direct costs of illness tend to constitute less than 10% of a household's expenditure outlay (McIntyre D and Thiede M, 2003). In contrast, one household cost of illness study of childhood pneumonia in Bangladesh estimated that households largely comprising urban dwellers, earning an average income above the national household income spent over 10% of per capita income on seeking healthcare services despite the free health care policy (Alagamir N et al, 2010).

Although households identified in the Bangladeshi study earned an average income above the national average, the cost of treating pneumonia accounted for more than 50% of monthly household expenditure. Given that the direct cost estimates generated in this study are substantially high contrast to those estimates identified in the review conducted by (McIntyre D et al, 2003) it suggests that the derived estimates maybe subject to bias owing to unique contextual factors such as the epidemiology profile and seasonality of the disease; which were not accounted for in estimation. Furthermore estimates were derived from one study location thus possibly suggesting that the direct cost of pneumonia estimated in this paper may not be

truly reflective of the direct cost burden across Bangladesh and other regions similar to Bangladesh.

A study that attempted to account for differences in seasonality of a disease burden was a study conducted by (Sauerbon R et al, 1996). In their study they found that rural households with a household member suffering from malaria incurred higher direct cost burdens in dry seasons compared to rainy seasons when seeking treatment from the healthcare system. The authors argue that changes in treatment seeking behaviour across seasons influenced the magnitude of direct cost burdens.

Similarly, (Chuma J et al, 2006) found that the household cost of malaria for poor households engaging in small scale farming and unskilled labour was higher in wet season (5% of monthly expenditure), contrast to the dry season (3.7% of monthly expenditure). In the (Chuma J et al, 2006) study, direct cost burden of treating malaria in adults were argued to be higher owing to households seeking treatment from private clinics in order to minimise production losses which is contrary to (Sauerbon R et al, 1996) who contend that costs are lower in the wet season as households opt to ignore the symptoms of illness presented in adults. During the wet season, the trade-off between forgoing work for seeking treatment is higher for adults who predominantly generate their income through farming and unskilled labour activities.

Although malaria is more endemic in the wet season, (Sauerbon R et al, 1996) and (Chuma J et al, 2006) find that the cost of malaria is higher during the dry seasons, contrast to the findings of (Ewing V et al, 2011) who find that direct costs of malaria among children in Malawi were higher in the wet season. In the case of (Ewing V et al, 2011), households frequently sought treatment for malaria in children in the wet season than the dry season because households were aware that transmission of malaria in children is higher in the wet season and thus promptly sought healthcare services on the onset of fever.

A review of literature on household cost of illness study reveals that nature of the illness plays a critical role in determining the magnitude of the cost (McIntyre D and Thiede M, 2003). The more severe and the longer the period of illness, the greater the portion of direct costs incurred by household. For instance, (Ngalula J et al, 2002) estimated that direct costs for HIV in Tanzania accounted for 64% per capita income. The higher direct costs associated with HIV were shown to owing from the longer duration of illness and inclusion of funeral cost in direct cost estimation. Contrast to (Ngalula J et al, 2002) the malaria cost of illness studies reviewed (Chuma J et al, 2006; Kemp J, et al, 2007 et al; Onwujekwe et al, 2000), did not consider funeral

costs which may suggest an underestimation in the cost of malaria, particularly in cases where mortality was the outcome of seeking healthcare services.

Severe illnesses that require hospitalisation and specialised care substantially increase the total direct costs of illness (Russell, S, 2004). In India, parents of children under the age of five years suffering from diarrhoea spent 5.8% of their annual household income at referral hospitals contrast to 2.2% which was expended when a child was treated at a community hospital (Mendelsohn A, et al, 2008). The inclusion of laboratory tests at referral hospital and higher facility costs were identified as the primary driver for higher total cost.

Direct medical costs

The extent of the direct medical burden is influenced by several factors which include the existence of government sponsored health insurance, user fees and drug charge policies (Russell S, 2004). Each of these factors affects components that constitute the total direct medical costs and it follows that disaggregated analysis of medical costs is useful in understanding the differences that exist in cost burdens across countries and regions. However, empirical studies rarely disaggregate total direct medical costs into the core cost drivers such as; user charges, consultation fees, diagnostic tests or drugs (Russell S, 2004).

From the few studies that have presented their cost of illness results in a disaggregated format it can be inferred that the share of each medical cost component varies across countries and regional contexts. Differences in health systems, epidemiological profiles, the degree of severity of the illness and the country's economic and political context are argued to contribute towards the variation of cost components influence in driving total direct medical costs (Russell S, 2004).

In a household cost study of tuberculosis, (Kemp J et al, 2007) finds that the identified urban households do not incur any direct medical costs in seeking treatment for tuberculosis as the services are offered free of charge to all Malawians after a confirmed diagnosis. However, prior to a confirmed diagnosis and enrolment into the tuberculosis treatment program, households incurred a significant amount in direct medical costs equivalent to 244% of monthly income for poor households and 129% of monthly income for non-poor households. Additionally, it was observed that women from non-poor households incurred higher direct medical costs contrast to women from poor households. Furthermore, although it was found not to be statistically significant, the costs incurred prior to diagnosis were higher among men compared to females. A similar tuberculosis cost of illness study conducted in Tanzania found that

households incurred a lower bound estimate of 32.4 US\$ for treatment of tuberculosis (Wyss K, 2001), which is a higher amount in absolute terms.

While (Wyss K, 2001) find that Tanzanians spend more on the direct costs of treatment than Malawians, their methodological choice of extrapolating the cost and medical input data over the expected period of treatment instead of measuring the unit costs for the entire treatment may not truly reflect cost of tuberculosis. During the treatment of tuberculosis, there may be periods when direct medical inputs are high and periods when medical inputs are low. Thus using input quantises and cost data obtained using at a particular point in time to project the total cost over time series where inputs may vary might suggest that the costs estimated are not reflective of the true cost of tuberculosis.

(i) *User charges and unofficial charges*

User charges can account for a large proportion of household out of pocket expenditure. For instance caretakers of Kenyan children admitted for paediatric care of pneumonia, meningitis spent a lower bound expenditure of 5.45 US\$ at a district hospital, 61.81 US\$ at a missionary hospital and 28.94 US\$ at a national referral hospital (Ayieko P et al, 2009). The high user charges observed in Kenya was argued to be an outcome of households delaying treatment in order to raise funds to meet the financial obligation of seeking care. The delay in treatment thus increases the number of days the infant is hospitalised; thereby further increasing households' expenditure on user and consultation fees.

Similarly, average user charges incurred by households in Papua New Guinea while seeking treatment for malaria in children under the age of 3 years were US\$ 0.78; which is equivalent to 39% of total household out of pocket expenditures on treatment. While user charges can account for a large proportion of direct costs of medical treatment, there are instances where households do not incur any user charges. For instance in Malawi, once adults are enrolled in the tuberculosis treatment program, they do not incur any charges relating to user charges owing to the government's free health care services for tuberculosis (Kemp J et al, 2007).

In some empirical observations it is found that in addition to official user charges that patients may be coerced into paying unofficial user fees. This practise is most prevalent in decentralised health care systems. Several health systems including those in Bulgaria and Bangladesh have been observed to levy 'unofficial' user charges. Households in those countries incurred 'unofficial' user charges, which were estimated to be 12 times greater than the original user fees (McIntyre D and Thiede M, 2003).

(ii) *Drugs*

Empirical evidence across studies suggests that the cost of drugs contribute a significant share to direct medical costs (McIntyre D & Thiede M, 2003). In Ghana, drugs used to treat mild malaria accounted for 64.8% of total treatment costs and similarly households in Mozambique spent 40% of the total direct cost expenditure on drugs (Castillo-Riquelm, 2008).

Contrast to the findings derived from the study conducted by (Castillo-Riquelm, 2008), Kenyan households seeking treatment for childhood malaria did not incur any costs related to drugs (Ayieko P et al, 2009), however they incurred a significant amount of user fees. Although it is not clearly stipulated in the study, it is possible that Kenyan households did not incur any additional charges on drugs, owing to the fact that the high user charges may already incorporate the cost of drugs, thus altering Kenya's composition of total direct medical costs by reducing the contribution of drug costs as share total direct medical costs as illustrated in Table 13.

| Cost of illness studies research | | | | | | |
|----------------------------------|---------------------------|-------------|--|-------------|----------------------|-------------|
| Author | Castillo-Riquelm, 2008 | | Ayieko P, 2009 | | Sicuri E et al, 2011 | |
| Country | Mozambique | | Kenya | | Papua New Guinea | |
| Disease | <i>Malaria</i> | | <i>Inpatient paediatric care (meningitis, pneumonia & Malaria)</i> | | <i>Malaria</i> | |
| | US\$ | % | US\$ | % | US\$ | % |
| User charges | 0.18 | 3% | 41.33 | 72% | 4.47 | 37% |
| Transport | 3.61 | 57% | 13.29 | 23% | 1.94 | 16% |
| Diagnostic test | 0.05 | 1% | | 0% | | 0% |
| Food | | 0% | | 0% | 3.88 | 32% |
| Drugs | 2.53 | 40% | | 0% | | 0% |
| Other/ preadmission cost | | | 2.69 | 5% | 1.94 | 16% |
| Total direct costs | 6.37 | 100% | 57.31 | 100% | 12.23 | 100% |

TABLE 13: COMPONENTS OF DIRECT COSTS FROM RECENT COST OF ILLNESS STUDIES

Despite the share composition differences and changes in direct medical cost burdens, reviews of cost of illness studies by researchers including (Russell S, 2004), have found some similarities across studies. For instance, (Russell S, 2001) found that the combined cost of drugs and consultation fees roughly accounted for 33% of the total direct costs. This finding remains congruent with a recent study conducted by (Sicuri E et al, 2011) who estimate the proportion cost of drug and consultation fees to total direct cost as 37%.

In addition to differences in policies relating to user fees and drug charges, the extent of direct medical cost of illness estimates are influenced by preference for private providers, and by whether the illness results in hospitalisation or outpatient care (Russell S, 2004). For example,

in Papua New Guinea estimates of drugs and user charges for patients that received treatment in the outpatient wards accounted for a smaller share of total direct costs compared to inpatient hospital treatment (Sicuri E et al, 2011).

Direct non-medical costs

There are only a few examples in literature that comprehensively estimate direct non-medical costs of illness. Studies commonly concentrate on estimating transport costs to the healthcare facility however. However, in their estimation they frequently ignore the costs of nutritious food for the sick and the cost of accommodation and food for the accompanying caretaker (McIntyre D & Thiede M, 2003).

(i) Transport

Empirical observations reveal that a large proportion of expenditure is usually allocated to transport costs, especially in regions where households have to travel a substantial distance to reach the healthcare facility. For instance, Ghanaian households allocated 14% of total direct expenditure to transport costs in seeking treatment for malaria (Asenso-Okyere O & Dzator J, 1997). The transport costs of visiting the health care facility accounted for a large proportion of costs, when compared to transport costs incurred when travelling to buy medication; possibly as households had to travel longer distances to reach a well-equipped health care facility.

For illness that extend over several months like tuberculosis, the allocation of expenditure to transport costs can be as large as 25% of total direct costs as patients may have to frequently visit the health care facility before they start tuberculosis treatment as was observed in Tajikistan (Ayé R et al, 2010). However in the case of Tajikistan, the relatively high transport costs are possibly influenced by the fact that 15% of the study population were migrant workers who had contracted the disease while working in Russia and thus incurred large transport costs to travel back to their native Tajikistan.

Transport costs incurred by households are influenced by travelling distance to the healthcare facility. In Kenya, (Ayieko P et al, 2009) find that households incurred additional transport costs when the child was referred to a district hospital contrast to a mission hospital. Furthermore, the study highlighted that transport costs were marginally higher when treating pneumonia than when treating malaria. While the study by (Ayieko P et al, 2009) attempts to reflect the total travelling costs, the transport costs reflected in this study may be underestimated as the study only enquired households transport expenditures prospectively from date of hospital admission. It is highly likely that caretakers and other household

members incurred additional transport costs while the child was in hospital and before the child was admitted to the hospital which were not reflected in this study.

(ii) *Food*

In Thailand, it was estimated that households increased their expenditures on food on the onset of a household member suffering from HIV/AIDS. It was observed that households spent 39.6% of total out of pocket expenditures on food. The increase in food consumption in this instance was argued to be as a result of households selling off their land and thus consequently having to rely on buying food for consumption instead of relying on subsistence farming (Kamolratanakul P, 1999).

Contrast to the observations in Thailand, in some countries including Zambia and Tajikistan, communities living in these countries may carry the belief that some foods such as certain animal fat or orange drinks may possess healing properties. It follows that in these communities, households incur additional food expenditure as part of treating the illness. Such an example was illustrated in Zambia, where it was estimated that households allocated 44% of total direct cost expenditure towards the procurement of food for the patient (Russell S, 2004). While households affected by tuberculosis in Tajikistan spent US\$ 113 or an equivalent of 29% of direct costs on special foods, with the bulk of expenditure distributed during the intensive treatment stage of tuberculosis.

Relying on household responses to determine the amount of food expended may result in inaccurate levels of expenditure level owing to recall bias. This is particularly true for several studies where households were requested to recall their food expenditure over extended time periods (Russell S, 2004).

(iii) *Accommodation*

In childhood illness where children are hospitalised or in instances where patients are referred to a tertiary health care facility that is far from the residence, caretakers may incur expenditures on accommodation. The studies reviewed for the purpose of this literature review omitted the estimation of accommodation.

Indirect cost of illness

Indirect costs of illness reflect the monetary value of productive time lost as a consequence of illness. Indirect costs often impose an additional cost burden on households at times when household financial expenditure is rising. Indirect costs seem to reduce the capacity to earn

income at a time when households need additional income to meet the direct cost burden of illness (Russell S, 2004).

A significant volume of empirical studies conducted in the years preceding 2005, excluded the estimation of lost productive hours in the total cost burden of illness on households (McIntyre D et al, 2003). Numerous methodological challenges such as attaching a monetary value to lost productive hours is among one of the major reasons that researchers excluded the indirect cost in calculating the total cost of illness. However, in recent years a moderate number of studies have attempted to incorporate indirect costs in the cost of illness estimation studies.

i. Methodological issues in estimating indirect costs of illness

Across household cost of illness studies, it can be observed that researchers prefer to use the human capital approach in estimating the value of lost production. For instance, (Sicuri E et al, 2011) estimate the value of lost production as multiplication of the reported time the primary caretaker spent while taking care of the child suffering from malaria by the reported salary or minimum wage. While several researchers typically use the average wage rate, researchers including (Onwujekwe O et al, 2000) and (Ewing V et al, 2011) monetized the value of lost production owing to malaria by using the minimum wage. In the study by (Onwujekwe O et al, 2000) the researchers advocate their choice of using a minimum wage instead of an average wage by arguing that the minimum wage averages out differences in earnings power across cases.

While in the study by (Ewing V et al, 2011) the authors did not provide explicit justification for using the minimum wage. The study was set in a poor rural background and thus the use of a minimum wage of a rural individual with no professional training suggests that their approach accurately mirrors the minimum contextual situation of the Malawian rural population.

To monetise the value of lost production, indirect costs are frequently estimated using the average wage rate, given the simplicity and relative ease of computation. However, despite its frequent use by researchers, this approach has several limitations. For instance, using an average wage to monetize the value of lost production across a population can disguise the effect of wage differential that may exist between gender, occupation and age.

While average wage multiplied by average time lost approach is relatively simple to apply, there are other methodological issues associated with the basic arithmetic calculation. For instance, the (Sicuri E et al, 2011) study relied on reported salary figures that may reflect an over-inflation of income earned by the respondent, thus may result in an overestimation of indirect costs. Furthermore, relying on the minimum wage data where no salary was reported may have

underestimated the value of forgone production. Lastly, in the context of Papua New Guinea where the labour market is below full employment, application of the human capital approach may be inappropriate given that one of the underlying assumptions of this approach requires that the economy is operating at full employment (Segal J, 2006).

While the application of the human capital approach is widespread across literature in spite of its theoretical weaknesses, very few researchers have attempted to circumvent these theoretical challenges by applying the willingness to pay approach.

Whether a study applies the human capital approach or the willingness to pay approach to estimate indirect costs of illness, a potential source of overestimation arises in the calculation of indirect cost of illness if researchers fail to account for intra-household labour substitution. Intra-household labour substitution involves reallocation of tasks that would have been performed by the ill patient to healthier members of the household (Russell S, 2004).

ii. Indirect cost of illness : empirical results

In several cost of illness studies, it has been observed that the indirect cost of illness are greater than 50% of total costs of illness (Asenso-Okyere W, 2003; Ewing V et al, 2011; Sicuri E et al, 2011). However, there are notable exception including (Chuma J et al, 2006) and (Onwujekwe O et al, 2000) where indirect costs account for less than 50% of total direct costs.

When illness is most prevalent in adult working patients, households may lose multiple sources of income, i.e. income lost by the patient as well as caretakers (Onwujekwe O et al, 2000). For instance in Nigeria, patients lost an average of 4 days of production while caretakers lost an average of 5 days in Ugwogo, a region in Nigeria. Although (Onwujekwe et al, 2000) take care to model indirect costs by including losses incurred by the caretaker, their study is limited as it does not consider the effect of the lost income on household structure. Given that the average household size in Ugwogo is comprised of 11 household members, the loss in income by the patient and caretaker could exert a significant strain on household expenditure, particularly if the household is largely comprised of children unable to participate in the workforce – a possible outcome that was not explored by the authors.

Indirect costs have been noted to account for a significant share of total household expenditure particularly in poorer households. For example the poorest Kenyan households incurred indirect costs equivalent to 8.1% of monthly expenditure contrast to 1.6% of monthly income in the least poor households (Chuma J et al, 2006).

As highlighted in the section on methodological problems associated in measuring indirect costs above, failure to account for intra-labour substitution can result in inflated value of lost production. For instance, households affected by malaria in rural villages of Burkina Faso responded to problem of lost productive time incurred by the ill household member by reallocating activities to healthier members of the household (Sauerborn R, 1996). It follows that in such instances a crude estimation, such as the total number of days the ill patient was absent from productive labour may overestimate the indirect costs.

Although (Chuma J et al, 2010) acknowledge that intra-household labour substitution during an episode of malaria may be highly prevalent in some of the communities in the Gucha and Makueni districts situated in Kenya, their study is limited as no efforts were made to estimate the value of lost labour that was recovered owing to intra-household substitution. In the context of this study where 77.1% of the adults worked in agriculture, intra-labour substitution could be high particularly if household size is relatively high.

Similar to direct costs, indirect costs of illness vary according to seasonality of the disease. In the cost of malaria study by (Chuma J et al 2006) the indirect cost burden was found to be higher in the wet season (5.4% of monthly household income), compared to the dry season (2.1% of household income) as value of lost production is higher in the wet season in agrarian households when households are most busy working in the fields. In addition to seasonality, geographical location was shown to have an effect on the magnitude of indirect costs. (Chuma J et al, 2010) illustrated that children belonging to households residing in low malaria transmission areas had higher days of absenteeism from school, contrast to children in high transmission areas.

The absolute and relative magnitude of indirect cost of illness varies substantially across disease burdens and study context also (McIntyre D & Thiede M, 2003). Indirect costs of illness tend to escalate in magnitude as the duration of illness increases. For shorter recurring illnesses like malaria, households may lose an average 1-5 days of production as was observed in treatment of malaria in Kenya (Chuma J et al, 2006), contrast to illnesses that extend over long periods such as HIV where households can lose 297 days of productive work over a year (Russell S, 2004).

When a child falls ill, losses in production accrue to the caretakers or the healthier members of the household. Frequently studies will estimate these losses to production, however there are instances where researchers may contend that no indirect costs are incurred. In a study by (Mendelsohn A et al, 2008), it was estimated that households did not incur any indirect losses

owing to an episode of diarrhoea in children under the age of five years. The authors argue that as the household was reliant on the breadwinners salary, households did not lose any time to production as the breadwinner was not absent from work. Although the argument presented in this study may have some aspects of merit, from a theoretical standpoint the study fails to capture the economic cost of non-remunerated activities which may include home production or the time lost to leisure.

The indirect cost burden is higher when females are ill, as women tend to work longer hours than men (McIntyre D & Thiede M, 2003). Evidence of this reasoning is highlighted through a gender comparison analysis of the total number of lost productive days lost as a consequence of HIV in Tanzania. The study finds that females lost an average of 429 days, which is considerably higher when compared 297 days lost by men over a period of eighteen months (Rugalema G, 1998)

The burden of indirect costs disproportionately falls on caretakers as was illustrated by (Onwujekwe O et al, 2000) in their cost study of malaria. Although school attending children may lose productive days from school owing to illness, thus incurring patient indirect costs, there remain cases of children below the age of school enrolment where the indirect cost burden falls entirely on the caretakers. (Sicuri E et al, 2011) recognise in their study that indirect costs of malaria in children are to a large extent borne by primary caretaker. In their methodology they account for the concentrated indirect cost burden by limiting the estimation of indirect cost to the primary caretaker. Their results illustrate that caretakers from the Mandang region in Papua New Guinea incurred indirect costs equivalent to US\$ 15.88. Furthermore, their study reveals that indirect costs are disproportionately borne by females as 88% of the individuals who assumed the caretaker role were women.

Total cost of illness

Household cost of illness studies conducted across low income countries estimate the economic costs as a summation of direct and indirect costs, while excluding intangible costs. Of the literature reviewed, studies did not attempt to estimate the value attached to intangible costs. Although (Kirigia J et al, 2009) acknowledge the existence of intangible costs associated with diabetes their study excluded these costs in estimation as data used was obtained from secondary sources.

Total cost of illness burdens vary across studies, study setting and disease. For instance, in Vietnam, (Morel C, 2008) estimate the total household cost of malaria to be 11.79 US\$, while

in Sri Lanka households incurred 7 US\$ (Attanayake N et al,2000). Numerous factors including methodology, contextual setting may play a role in the variation of estimates.

2.5.2. HOUSEHOLD RESPONSES TO ILLNESS

(i) *Household Responses to cost of illness*

When faced with a health shock, households have been observed to implement a series of actions that aim in part to raise financial resources to meet the direct cost implications of illness as well as to minimise the potential loss of income generation. For instance, in response to the economic costs imposed by childhood pneumonia, only 16% of households in Bangladesh were observed as being able to meet the financial obligations of seeking healthcare services, while the remainder of the households were dependant on loans, and selling household assets including land and jewellery (Alagamir N, 2010).

As highlighted in the (Alagamir N, 2010) study and similar to findings in Burkina Faso (Sauerborn R, 1996), only a small proportion of households were able to respond to the financial obligations using readily available cash. The ability to use readily available cash to settle direct costs of illness is limited; particularly in low income settings where the cost of healthcare can be exceed the household income as found in 50% of households in Bangladesh (Alagamir N, 2010).

In the study by (Alagamir N, 2010), the researchers further investigated the effects of the coping strategies over an extended period of time, an exercise that is rarely conducted across literature. Their results revealed that while a loan enabled households to cope with the immediate cost burdens; findings revealed that over an extended period of time these households were more likely to be impoverished. They found that 10% of households who had taken out a loan for the financial costs of pneumonia were forced to take out an additional load to repay the first loan, while 13% disposed of household assets and 50% of households reduced their food consumption.

While loans were a common means of coping with direct costs in Bangladesh, similarly (Chuma J et al, 2006) found that borrowing from informal sources was a common coping strategy in Kenya. However, in the study by (Chuma J et al, 2006), the study was limited as it did not investigate the effects of the borrowing over the long term, despite discussing the potentially adverse effects of borrowing to finance healthcare.

In addition to borrowing, (Chuma J et al, 2006) observed that households relied on gifts and sale of assets. While the sale of assets can help households generate cash inflows, asset disposal was a less commonly observed household response because the sale of assets were less liquid.

Contrast to (Chuma J et al, 2006), asset disposal was a more common response in Burkina Faso (Sauerbon R et al, 1996) given that 52% of households relied on asset disposal to fulfil the financial obligations of healthcare. The variation in findings suggests that the choice of household response is dependent on the context, i.e. if the market for selling livestock is illiquid; households are less likely to respond to direct cost of illness by selling assets.

(ii) *Household responses to indirect costs of illness*

(Sauerborn R et al 1996) illustrated that households may respond to indirect costs by allocating tasks to the healthier members of the household, hiring additional labour or relying on free community labour. On the onset of malaria in Burkina Faso, the reallocation of tasks to healthier member of the household was most prevalent as observed in 24 out of 27 households. These households relied on the healthier members of the household to perform predominantly agricultural farming tasks (Sauerborn R et al, 1996). As noted in this study, the size of the household is important in determining whether households can substitute labour. A polygamous household with 23 members was more able to compensate for reduced production.

Beyond the investigation of household responses to indirect costs conducted by (Sauerborn R et al, 1996), there remain few household cost of illness studies that extend beyond the cost estimation into investigating the household responses. In a review of household responses HIV in Sub-Sahara Africa, (Mutangadura G, 2002) observed that households relied on intra-household labour substitution which included withdrawing children from school in addition to changing the household production of crops in order to cope with indirect cost of illness.

2.5.3. IMPACT OF ILLNESS ON HOUSEHOLD WELFARE

In a paper by (Chuma J et al, 2006), the authors of the paper highlighted the complex relationship that exists between the economic costs of malaria and the household welfare indicator using the poverty status. They observe that economic costs of illness in isolation do not necessarily result in impoverishment and propose that additional factors relating to socio-economic status play an influential role as well. Irrespective of the magnitude of the cost of illness, (Chuma J et al, 2006) observed that households with a low socio-economic status were impoverished by the cost of treating malaria. However households considered to have a good socio-economic standing were not necessarily impoverished by the costs of illness.

The study by (Chuma J et al, 2006) develops a unique perspective on analysing the link between cost of illness and the impact on household impoverishment. In the (Chuma J et al, 2006) study, the authors were able trace in detail the linkages between the costs of ill health and outcome on poverty status because it incorporated qualitative research methods and observed participant over a progression of time.

Unlike the study by (Chuma J et al, 2006), many studies rely on threshold levels to imply whether the economic costs of illness lead to impoverishment. In the recent cross-sectional quantitative study by (Onwujekwe O et al, 2010), it was found that the direct cost burden, i.e. the direct cost expenditure as a share of household income for treatment of malaria were impoverishing. For the very poor households identified in the study health care expenditures exceeded the 10% annual household income threshold, and were thus considered to be catastrophic to economic livelihood. Furthermore, the cost burdens were identified as being regressive in nature as the less poor households had cost burdens below the threshold level of 10%, contrast to the very poor households, whose burdens exceeded the threshold level.

The study by (Onoka C et al, 2011) further highlights the regressive nature of impoverishing economic burdens. By examining levels of economic burden across socio-economic status, they find that at a threshold of 5% of total consumption, the very poor households are tipped into poverty, while the least poor households would have to spend approximately 30% of total consumption on health before they become impoverished by expenses

Contrary to the assumption that free antiretroviral treatment reduces the incidence of impoverishing economic burdens. A study conducted in south-east Nigeria by (Onwujekwe O, et al, 2009) concludes that the economic cost of free or subsidised antiretroviral treatments are impoverishing and inequitable. The magnitude of laboratory expense and supportive drugs exerted impoverishing effects on households' eroded household income by 19.5% of household income.

Although threshold levels are methodologically simpler to apply in studies and do not require extensive data collection, they do not necessarily provide a robust pathway linking economic burden and outcome on poverty.

As highlighted by (Onako C et al, 2007; Ataguba J, 2009) economic costs of treatments across sub-Saharan Africa lead to impoverishment, with an inequitable level of impoverishment across socioeconomic status.

2.6. KEY LESSONS FROM LITERATURE

The following key lessons were observed from the review.

1. Severe acute malnutrition is a major child killer that poses a significant health and economic burden in low income countries. Literature on child malnutrition has extensively investigated the short term clinical outcomes and the inter-generational effects of early childhood malnutrition on economic productivity.
2. There are numerous household cost of illness studies that investigate the economic consequences of malaria, pneumonia, diarrhoea, HIV and tuberculosis. A disproportionately large volume of published literature estimates household cost of illness in adults or a mixed sample including children and adults. Although there are some studies that have investigated the economic consequences of childhood illness, when comparing the volume of literature available of adult household cost of illness to child household cost of illness, there remain fewer studies that have focused entirely on estimating the childhood household cost of illness,
3. Household cost of illness are estimated using the human capital approach and typically exclude the cost of intangible costs as well as the associated co-morbidities
4. When faced with the economic consequences of illness, households use available cash resources. When the resources are insufficient to fulfil the financial obligation, households may, reduce household consumption, borrow from social networks, sell assets. How households respond varies across differing contexts.
5. The economic consequences may lead to household impoverishment given a set of preconditions including the household's initial probability of entering a poverty status, and the household asset portfolio. Furthermore, household out of pocket payments which exceed 10% of the household expenditure outlay are likely to force a household welfare decline, although some researchers may contend that outlays in excess of 40% lead to impoverishment.

Primary gaps identified in literature

- Limited investigations on household economic cost of severe acute malnutrition in children.
- Although co-morbidities have an influential effect on treatment costs, most empirical studies avoid measuring the effect of co-morbidities

2.7. A CONCEPTUAL FRAMEWORK OF MALNUTRITION AND HOUSEHOLD WELFARE

The conceptual framework applied in this research is adapted from the work of (McIntyre D and Thiede M, 2003; Whitehead M, 2001) and is informed by the literature on costs of illness and consequences of illness on welfare that were reviewed. Figure 7 depicts the pathways that link the relationship of severe acute malnutrition in children towards the impoverishment of the household.

It is proposed that upon the onset of illness in a child, the households are faced with the decision of either seeking health care services or forgoing treatment. The treatment seeking behaviour thus informs the type of costs that the household unit will incur.

If households choose to ignore the symptoms of child malnutrition by forgoing formal healthcare services, the household will only incur the indirect costs of forgone labour of the primary caretaker. If on the first instance of illness households seek formal healthcare, they will incur in indirect cost of forgone productivity of the primary caretaker households in addition to direct cost of treatment. Direct costs of treatment include cost of travelling to the health care facility, drugs, user fees and diagnostic tests.

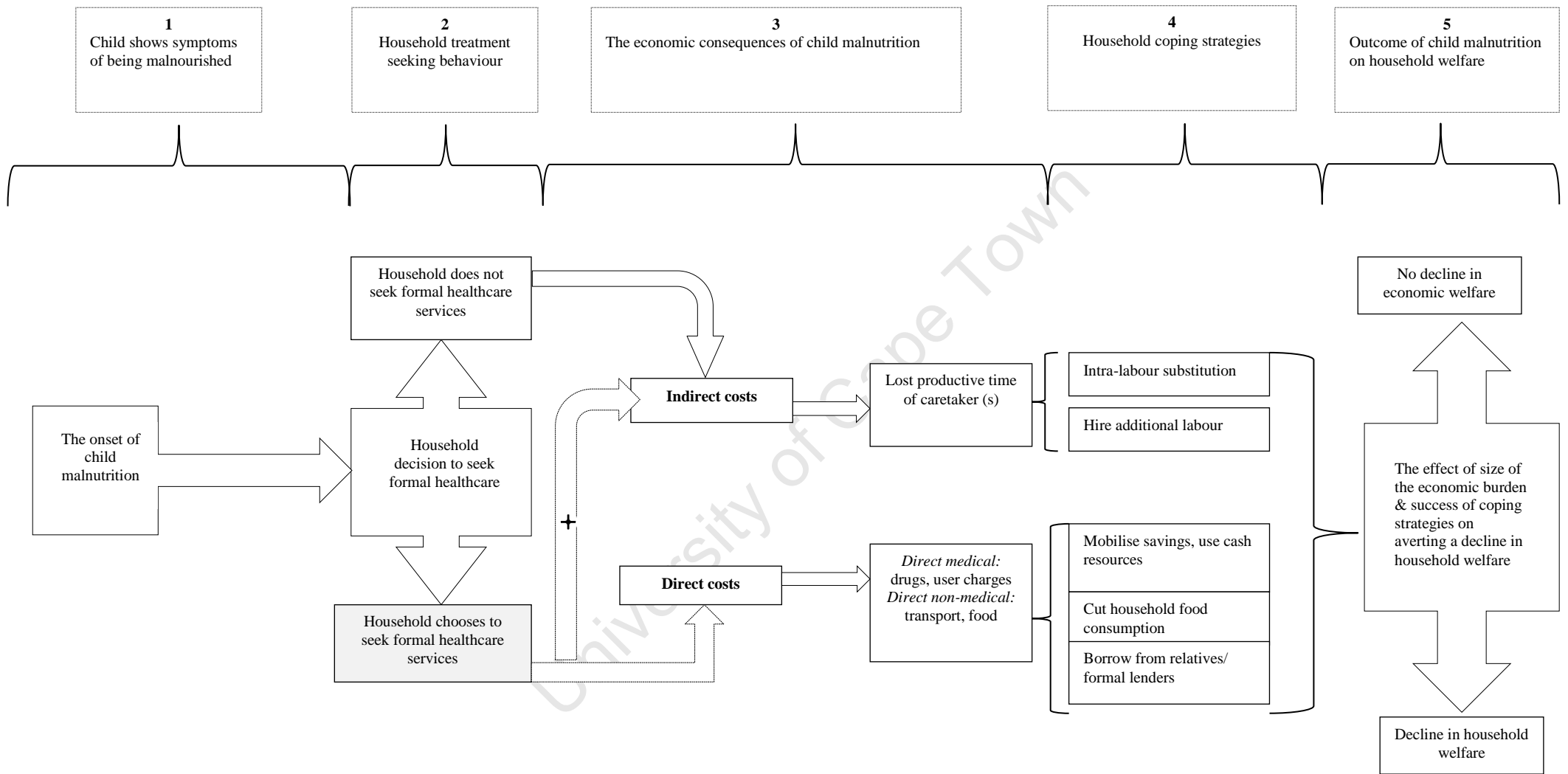
When faced with the economic consequences of child illness (i.e. direct and indirect costs), households will respond to these costs using various coping strategies. Depending on the initial household status and the different coping mechanisms used, the consequences of the coping mechanism may include undesirable outcomes that reduce the household asset portfolio through the depletion of physical, financial and social capital. Erosion of the household asset portfolio may additionally lead to more undesirable outcomes which include reduced food consumption. It follows that the erosion of the household asset portfolio owing to the adoption of coping mechanisms leads to a reduction in household wealth status.

Lastly, the combined effect of the coping strategies and the magnitude of the economic burden of malnutrition will result in a decline in household welfare. If the economic burden is significantly large, it may push households into a poverty status.

As depicted in Figure 7, if households are unable to recover from the cost of malnutrition in the first instance, their new impoverished poverty status may reduce the households' ability to withstand further health shocks, thus households may be trapped in a cycle between malnutrition and impoverishment.

In the next section, this research will estimate the household cost of illness as summation of direct and indirect costs. The direct costs will be estimated using the bottom up approach while the human capital approach will be used to estimate indirect cost of illness. In addition to the household cost of malnutrition, the research will attempt to investigate the effect of co-morbidities on the household cost of illness.

FIGURE 7: THE STUDY CONCEPTUAL FRAMEWORK



2.8. REFERENCES

1. Adamba, C., Owusu, A. (2011). Burden of Buruli Ulcer: How affected households in a Ghanaian district cope.: African Study Monographs, **32** (1): 1-23
2. Alderman H. (2005) Linkages between poverty reduction strategies and child nutrition: An Asian perspective *Economic and political weekly* 40(46) 4837-4842
3. Alderman H., Kinsey B., Hoddinot J. (2006) Long term consequences of early childhood malnutrition *Oxford economic papers* 58(3) 450-474
4. Asenso-Okyere, W. K., & Dzator, J. A. (1997). Household cost of seeking malaria care. A retrospective study of two districts in Ghana. *Social Science and Medicine*, **45**(5), 659–667.
5. Attanayake, N., Fox-Rushby, J., & Mills, A. (2000). Household costs of 'malaria' morbidity: A study in Matale district, Sri Lanka. *Tropical Medicine and International Health*, **5**(9), 595–606.
6. Ataguba J. (2011). Reassessing Catastrophic Health Care Payments with a Nigerian Case Study. *Health Economics, Policy and Law*, **3**(7), 309 -326.
7. Aye R, Wyss K., Abdualimova H., Saidaliev S. (2010) Household costs of illness during different phases of tuberculosis treatment in Central Asia: a patient survey in Tajikistan *BMC Public Health* 18(1).
8. Ayieko, P., Akumi, A., Griffiths, U., English, M. (2009). The economic burden of inpatient paediatric care in Kenya: household and provider costs for treatment of pneumonia, malaria and meningitis. *Cost Effectiveness and Resource Allocation* 2009, **7**(3)
9. AVERT. (2011). *AIDS Orphans*. Available at <http://www.avert.org/aids-orphans.htm> retrieved [3 February 2011]
10. Alagmir, N., Naheed, A., Luby, S. (2010). Coping strategies for financial burdens in families with childhood pneumonia in Bangladesh. *BMC Public health* **10**(622)
11. Behrman J, A. H. (2004). Hunger and malnutrition. *Copenhagen Consensus - Challenges and opportunities*. Copenhagen.
12. Bijlsma M, Mclean D. (1997) Assessment of a take home child supplementary feeding programme in a high density suburb of Mutare City, Zimbabwe. *Central African Journal of Medicine* 43(1):16-20.
13. Bonu, S., Bhusha, I., Rani, M., Anderson, I. (2009) Incidence and correlates of 'catastrophic' maternal health care expenditure in India. *Healthy Policy Plan* **24**(6), 445-446.
14. Chuma, J., Thiede, M., Molyneux C. (2006) Rethinking the economic costs of malaria at the household level: Evidence from applying a new analytical framework in Kenya. *Malaria journal* , **5** (76)
15. Chuma, J., Okungu V., Molyneux C. (2010) The economic costs of malaria in four Kenyan districts: do household costs differ by disease endemicity *Malaria Journal* 9(149)
16. Chuma J., Gilson L., Molyneux C. (2007) treatment seeking behaviour, cost burdens and coping strategies among rural and urban households in Coastal Kenya: an equity analysis *Tropical Medicine and international health* 12(5) 673-686
17. Ezeoke, O., Onwujekwe, O., Uzochukwu, B. (2012) *American Journal of Tropical Medicine and Hygiene* **86**(1) 52 -57
18. Grant U (2005). Health and poverty linkages: Perspective of the chronically poor. Background paper for chronic poverty report 2008-2009. Chronic poverty Research Centre
19. Food, Agriculture, and Natural Resources Policy Analysis Network (FARPAN). (2006). *Silent Hunger*. Harare: Food, Agriculture, and Natural Resources Policy Analysis Network (FARPAN)
20. Fillol F, S. J. (2009). Impact of child malnutrition on the specific anti-Plasmodium falciparum antibody response. *Malaria* , **8**, 116.
21. Goudge, J. and Govender, V. (2000). A review of experience concerning households' ability to cope with the resource demand of ill health and health care utilization. Equinet policy series no.3
22. Hansen, K., Woelk, G., & Jackson, H. (1998). The cost of home-based care for HIV/AIDS patients in Zimbabwe. *AIDS Care*, **10**(6), 751–759.
23. Konradsen, F., Hoek, V.H. Amerasinghe, F. and Fonseka, K. (1997). Household responses to malaria and their costs: a study from rural Sri Lanka. *Transaction of the Royal Society of Tropical Medicine and Hygiene* **91**: 127-130.
24. Kamolratanakul, P., Sawert, H., Kongsin, S., Lertmaharit, S., Sriwongsa, J., Na-Songkhla, S., Wangmanee, S., Jittimane, S., Payanandana, V. (1999) Economic impact of Tuberculosis at the household level. *international journal Tuberculosis lung disease* , **3**(7), 596-602
25. Kirigia J., Sambo H., Sambo L., Barry S. (2008) Economic burden of diabetes mellitus in the WHO African region *BMC International health and human rights* 9(6)
26. Kemp, J., Mann G., Simwaka, N., Salaniponi, F., Squire, B. (2007). *Bulletin of the World health Organisation* **85**(8)
27. Larson, B., Amin, A., Noor, A., Zurovac, D., Snow, R. (2006). The cost of uncomplicated childhood fevers to Kenyan households: implications for reaching international access targets. *BMC Public health*, **6**(314)
28. Maluccio J., Hoddinot J., Berhman J., Flores R., Martorell R. (2008) effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults *Lancet*
29. McIntyre, D., Thiede, M., Dahlgren, G. and Whitehead, M. (2006). What are the economic consequences for household's illness and of paying for health care in low and middle-income country contexts? *Social Science and Medicine* **62**(4): 858-865.
30. McIntyre, D., and Thiede, M. (2003). A review of studies dealing with the economic and social sequences of high medical expenditure with a special focus on the medical poverty trap. Health Economics Unit, University of Cape Town, Cape Town.
31. Ministry of Health and Child Welfare (2008). Guidelines for management of acute malnutrition through Community-based Therapeutic Care (CTC). Harare. Ministry of Health and Child Welfare
32. Ministry of Health and Child Welfare (2009). The National Health strategy for Zimbabwe 2009 -2013. Harare. Ministry of Health and Child Welfare
33. Munro L. (2002) Zimbabwe's Child Supplementary Feeding Programme: A Re-assessment Using Household Survey Data. *Disasters* **26**(3) 242 -261
34. Mutangadura, G., Mukurazita, D., & Jackson, H. (1999). A review of household and community responses to the HIV/AIDS epidemic in the rural areas of sub-Saharan Africa. Geneva: UNAIDS best practice collection.

35. Morel, C., Thang, N., Xa, N., Hung, L., Mills, A., D'Allesandro, U. (2008). The economic burden of malaria on the household in south-central Vietnam. *7*(166).
36. Onwujekwe, O., Hanson, K., Uzochukwu, B., Ichoku, H., Ike, E., Onwughalu, B. (2010). Are malaria treatment expenditures catastrophic to different socio-economic and geographic groups and how do they cope with payment? A study in southeast Nigeria. *Tropical medicine and International health*. **15**(1), 18-25
37. Onwujekwe, O., Uzochukwu, B., Chikwuka, C., Onyedum, C., Onoka, C., Ichoku, H. (2009) Examining catastrophic health expenditures at variable thresholds using consumption expenditure diaries **16**(10) 1334-1341
38. Onoka, C., Onwujekwe, O., Uzochukwu, B. (2012) towards universal coverage: examining cost of illness, payment, coping strategies to different population groups in southeast Nigeria. *American journal of Tropical medicine and Hygiene* **86**(1) 52-57
39. Poulos C., Riepaibon A., Stewart J., Clemens J., Guh S., Agtini M., Anh D., Baiqung D., Bhutta Z., Sur D., Whittington D., SOMI typhoid COI study group. (2011) Cost of illness due to typhoid fever in five Asian countries *Tropical medicine and international health* **16**(3) 314-323
40. Rice D. (1967) Estimating the cost of illness *American Journal of Public Health* **57**(3) 424-440
41. Russell, S. (2003). The economic burden of illness for households: A review of costs of illness and coping strategies focusing on malaria, tuberculosis and HIV/AIDS. A review of studies for the DCPD workshop in Johannesburg, South Africa.
42. Russell, S., (2004). The economic burden of illness for households in developing countries. A review of studies focusing on Malaria, Tuberculosis and HIV/AIDS. *American Journal of Tropical Medicine and Hygiene* **71**(2): 147-155.
43. Sauerborn, R., Adams A, Hien M (1996a). Household strategies to cope with the economic costs of illness. *Social Science and Medicine* **43**(3): 291-301.
44. Segal, J. (2006). *Cost of illness Studies - Primer*. RTI International.
45. Strauss J., Thomas D. (1998) Health nutrition and economic development *Journal of economic literature* **36**(2) 766-817
46. Somi M, B. J. (2007). Economic burden of malaria in rural Tanzania: variations in socioeconomic status and season. *Tropical Medicine and International Health*, **12** (10), 1139-1147.
47. Sundar, S., Arora, R., Singh S., Boelaert, M., Vaarghese B. (2010). Household cost of illness of visceral leishmaniasis in Bihar, India. *Tropical Medicine and International Health* **2**(15), 50-54
48. Temple B., Griffiths U., Mulholland E., Ratu F., Tikoduadua., Russell F. (2012) The cost of outpatient pneumonia in children < 5 years of age in Fiji *Tropical medicine and international health* **17**(2) 197-203
49. United Nations World Food Programme (WFP). (2008). HIV/AIDS Analysis: Integrating HIV/AIDS in Food Security . Rome: United Nations World Food Programme .
50. UNICEF (1990). A UNICEF policy review: strategy for improved nutrition of children and women in developing countries, UNICEF New York
51. UNICEF (2001) Child malnutrition, UNICEF, United Nations special session on children, New York
52. Wagstaff, A., Van Doorslaer, E. (2003). Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993-98. *Health Economics*, **12**: 921-934
53. Whitehead, M. Dahlgren, G. Evans, T. (2001). Equity and health sector reforms: can low-income countries escape the medical poverty trap? *The Lancet* **358**: 833-836.
54. Wagstaff, A., & van Doorslaer, E. (2001). Paying for health care: Quantifying fairness, catastrophe and impoverishment with applications to Vietnam 1993-98. World Bank Policy Research Working Paper No. 2715. Washington, DC: World Bank. World Bank(2006). *Repositioning Nutrition as Central to Development*, World Bank, Washington DC.
55. Wilford R., Golden K., Walker D. (2011) Cost-effectiveness of community based management of acute malnutrition in Malawi. *Health policy and Planning*. 1-11
56. WHO, (2010). *Severe acute malnutrition* [online] Available at <http://www.who.int/nutrition/topics/malnutrition/en/index.html> [accessed 27 November 2010].
57. WHO (2009) WHO guide to identifying the economic consequences of disease and injury, WHO Geneva Switzerland
58. Xu, K., Evans, B. Kawabata, K. (2003). Household catastrophic health expenditure: a multi-country analysis. *Lancet* **362**: 111-117
59. Zimbabwe Ministry of health and child welfare (2010) [online] http://www.mohcw.gov.zw/index.php?option=com_content&view=article&id=26&Itemid=68 [accessed 16 October 2010].

3. JOURNAL ARTICLE

Research article

The economic burden and welfare impact of in-patient care of child malnutrition in Zimbabwe: A household perspective

Rufaro Masiwa¹Address:¹ School of Public Health and Family Medicine, University of Cape Town, Faculty of health sciences, Observatory, Cape Town 7925; Email: Rufaro.masiwa@uct.ac.za

Abstract

Background: It is widely recognised that costs incurred by households whilst seeking treatment for an illness can impose a significant economic burden. If these illness-related expenditures are significant as proportion of household income they can precipitate a decline into household impoverishment. To date, there has been a dearth in studies that have investigated the economic burden of child malnutrition on household poverty status in Zimbabwe. This article aims to quantify the economic burden of severe acute malnutrition (SAM) in children by estimating the direct and indirect costs incurred by households during a period of in-patient treatment at a tertiary hospital.

Methods: To estimate the direct medical costs associated with in-patient care of severe acute malnutrition, resource utilisation data was collated through a retrospective and prospective review of patient medical records of under-fives admitted to Harare hospital malnutrition bay. The estimates for medical cost prices were derived using the UNICEF and WHO 2009 publication on prices of selected medicines for children. A structured household questionnaire was administered to the primary caretaker to estimate the indirect and the direct non-medical costs incurred by the households, as well as determine the coping strategies used by households. Data from the prospective arm of the research was collated during May 2011 while data from the retrospective arm of the research was collated for periods ranging from April 2008 to July 2008 and April 2009 to July 2009.

Results: Without explicitly accounting for the presence of comorbidities, the average hospital stay for children recruited in the prospective arm of the study was estimated to be 12 days. During the period of hospitalisation, households incurred direct costs amounting to 36.75 US\$, which is equivalent to 24% of average household monthly income. The primary caretaker lost an average of 11 days of productive labour time which is equivalent to a monetary value of 47.13 US\$. In total, the total household economic burden of malnutrition without accounting for the presence of comorbidities was estimated to be 83.89US\$ which roughly accounts for 56% of monthly household income.

The direct cost of SAM in the absence of any co-morbidities was estimated to be 29.69 US\$. The presence of comorbidities had an incremental effect on the total direct costs of SAM. The direct costs of treating SAM in the presence of pneumonia and fever; and SAM in the presence of diarrhoea is 31.55 US\$ and 30.94 US\$ respectively. To cope with the additional expenditure related to direct costs of illness, 65% of households reduced household food consumption. To cope with the time lost to production, 58% of households relied on intra-household labour substitution.

Conclusions: The direct costs of SAM without accounting for the presence of co-morbidities disrupt the household's standard of living through increasing household monthly expenditure by 24% as well as altering the household consumption patterns. While the cost of treating severe acute malnutrition in the absence of co-morbidities is relatively high as a proportion of monthly household income, the presence of multiple co-morbidities further increases the household cost burden. The household's primary coping strategy of reducing food consumption, so as to absorb the additional cost burden on household income implies an increased likelihood of reoccurrence of the illness. It thus follows, if mitigation strategies such as early treatment of uncomplicated cases (i.e. treating SAM in the absence of co-morbidities) of severe acute malnutrition through community-based management of acute malnutrition programmes are not expanded to increase coverage across the county, the cycle between malnutrition and household impoverishment could possibly be perpetuated.

Keywords: cost of illness; severe acute malnutrition; direct costs; household economic welfare

3.0. BACKGROUND

Severe acute malnutrition and the distribution of the disease burden

The fourth Millennium Development Goal is to reduce the mortality rate of children under the age of five years by two-thirds from the levels estimated in 1990 within fifteen years beginning from year 2000 [1]. Zimbabwe is currently off track in achieving its target owing to an increase in child mortality since 1990. It is estimated that the under-five mortality rate increased by 12.5% in the years between 1990 and 2009 [2]. Several health and development institutions have argued that the persistence of severe acute malnutrition is among one of the primary and underlying causes for the high case fatality rates in common child killers such as diarrheal diseases, HIV and pneumonia [3].

Severe acute malnutrition is defined by the World Health Organisation (WHO) as a condition that is caused as a consequence of poor nutritional intake which subsequently results in physiological outcomes which include visible signs of severe wasting, presence of nutritional oedema or being severely underweight for age [4]. In addition to the external physiological outcomes, severe acute malnutrition weakens the immune system's ability to resist infection and thus consequently increases the probability of children developing opportunistic infections or prolonging existing co-morbid medical conditions [5].

Severe acute malnutrition is a leading underlying cause of child mortality across the world. The disorder is highly prevalent in low income countries where poverty is pervasive. It is estimated that nearly 20 million children under the age of five years suffer from this condition and that between one million to two million deaths in children under the age of five years can be attributed to severe acute malnutrition [3].

Severe acute malnutrition exerts a considerable economic burden on a country's health resources, particularly in countries where treatment is primarily offered through inpatient hospital care [5]. Although, severe acute malnutrition is a global challenge and a concern for many international development agencies, the health burden disproportionately falls on countries in the southern parts of Asia and Sub-Saharan Africa [3].

In Sub-Saharan Africa, the rates of severe acute malnutrition since 1993 have remained relatively unchanged at 9%, however the increase in population over the past twenty years implies that the number of fatalities attributable to severe acute malnutrition have increased [3].

In comparison, to the high prevalence rates observed in countries situated in Sub-Saharan Africa the prevalence of severe acute malnutrition in Zimbabwe is relatively low. Furthermore within the regional context, Zimbabwe's prevalence rate of 2.4% is comparatively low and well below national emergency standards of 10% [6].

Although the prevalence of severe acute malnutrition in Zimbabwe is considered to be low in comparison to other countries in the same geographical region, the implication on the Zimbabwean public health system in absolute terms represents a significant number of approximately twelve thousand child lives that are at risk of mortality owing to the disorder annually [7]. In the context of a country with poor health infrastructure, a significant shortfall of financial resources needed to invest in health infrastructure and scarce sources of health financing, the burden of an easily preventable illness like severe acute malnutrition will likely constrain the health budget, thereby possibly further limiting the available quantity of resources needed to scale up much needed health interventions such as prevention of mother-to-child transmission programs (PMTCT).

Furthermore, against the background of Zimbabwe's fragile macroeconomic climate, the current prevalence of severe acute malnutrition exerts an avoidable burden on the financially constrained national treasury which due to its high external debt levels and low levels of revenue collection currently allocates a moderate 9.5% of annual fiscal expenditure to health care [8].

The prevalence of severe acute malnutrition exerts a significant burden on the health system and is disproportionately distributed within Zimbabwe. For instance, the prevalence of severe acute malnutrition is higher in rural areas (2.4%) compared to urban areas where the prevalence is 2.1% [6]. Within the urban areas of Zimbabwe, the economic burden of treatment falls disproportionately on health care providers situated in the poverty stricken, high-density suburbs of Harare where access to clean safe water is a challenge due to old and failing infrastructure. Clinics situated in these high density suburbs in Harare frequently encounter and treat a large number of severely malnourished children. For instance in 2006 a clinic situated in Epworth, which is a high density suburb reported weekly average treatment of 50 new cases of severe acute malnutrition [9]

The intergenerational implications of malnutrition on income poverty and economic growth

While malnutrition is a consequence of poor nutrition intake, the causal relationship between poor nutrition and malnutrition is a much more complex relationship. Several factors including

fundamentally weak and unjust economic systems and poor political structures lead to a deprivation of health, education and financial resources necessary to ensure an adequate provision of nutritious food [10].

The consequences of malnutrition include undesirable intergenerational outcomes such as lower income earnings that accrue at a microeconomic level as illustrated in Figure 8. Theoretical discussions argue that at a microeconomic level, maternal malnutrition and poor child nutrition in the early stages of life leads to lifetime consequences that include underdevelopment of human capital which leads to reduced productivity and consequently results in low income earnings [12].

Empirical evidence from Zimbabwe suggests that the process that initiates the suboptimal formation of human capital begins as early as primary school enrolment where children who were malnourished in their early years of life leading up to their second birthday were found to delay school enrolment and were more likely to drop out from school as they progressed through the education system [11].

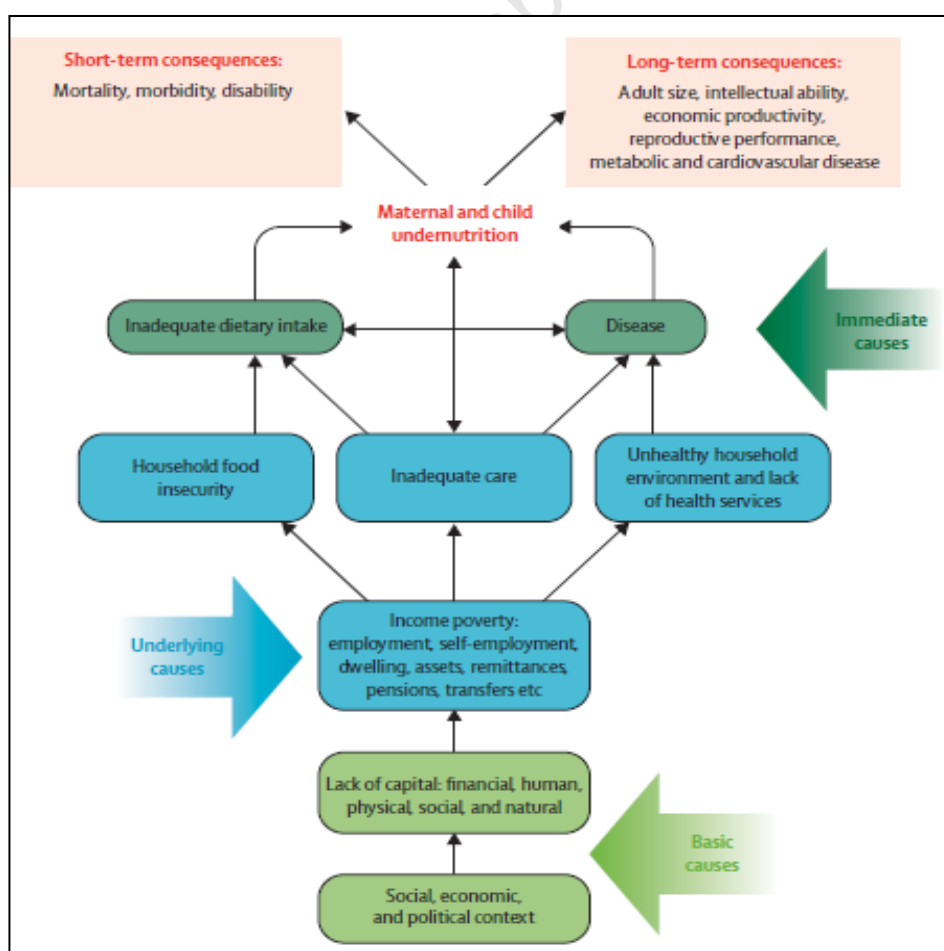


FIGURE 8: THE CAUSES AND CONSEQUENCES OF MALNUTRITION
SOURCE: BLACK R ET AL, 2008

Later on in adulthood, the consequences of poorly developed human capital can be observed in the form of reduced worker productivity. Following from the human capital theory that assumes that wage earnings reflect human productivity, it is argued that the effects of reduced worker productivity are translated into low income earnings in the labour market [12].

The cumulative effect of reduced worker productivity when aggregated across households translates into heavy macroeconomic losses to production. Malnutrition is estimated to cost poor countries economic losses that are estimated to be 3% of the national gross domestic product [13].

While the long-term vicious cycle between income poverty and malnutrition and the long term economic consequences have been widely investigated by several researchers [14;15]; across the universe of literature reviewed, there is a dearth in literature on the short term economic consequences of malnutrition on households. Severe acute malnutrition, like many diseases such as malaria, tuberculosis and HIV is expected to contribute to the impoverishment of households through an intricate network of relationships that link the cost burden of ill health and the extent of the household's asset portfolio to household poverty status.

Given the dearth of literature on the short term household economic consequences of malnutrition, the main objective of this article is to adapt the conceptual framework developed by [19] towards exploring the relationship between the costs associated with inpatient treatment of child severe acute malnutrition and poverty. In applying this framework, this article aims to (i) estimate the in-patient economic burden of child severe acute malnutrition from the perspective of a household, (ii) describe the household responses to the illness-related costs and (iii) evaluate the potential effect of the cost burdens on household economic welfare (i.e. household poverty status).

3.1. STUDY CONCEPTUAL FRAMEWORK

The potential pathway between child malnutrition and household economic welfare

Applying the adapted conceptual framework illustrated in Figure 9 requires clarification on what constitutes a household economic welfare. Household economic welfare is the level of prosperity which is reflected through several indicators including income, level of education, and access to health care. The level of household economic welfare can fall in times of illness owing to out of pocket health care expenditure which can be catastrophic [16]. Although the exact level of health care expenditure that is considered to be catastrophic is not uniform

across literature, it is generally argued that expenditures between 10% of household income and 40% of non-food income can precipitate a decline in household welfare [17]

In this framework and this study, a decline in household welfare is determined to be a decline in monthly income that is greater than 10% due to health care expenditure.

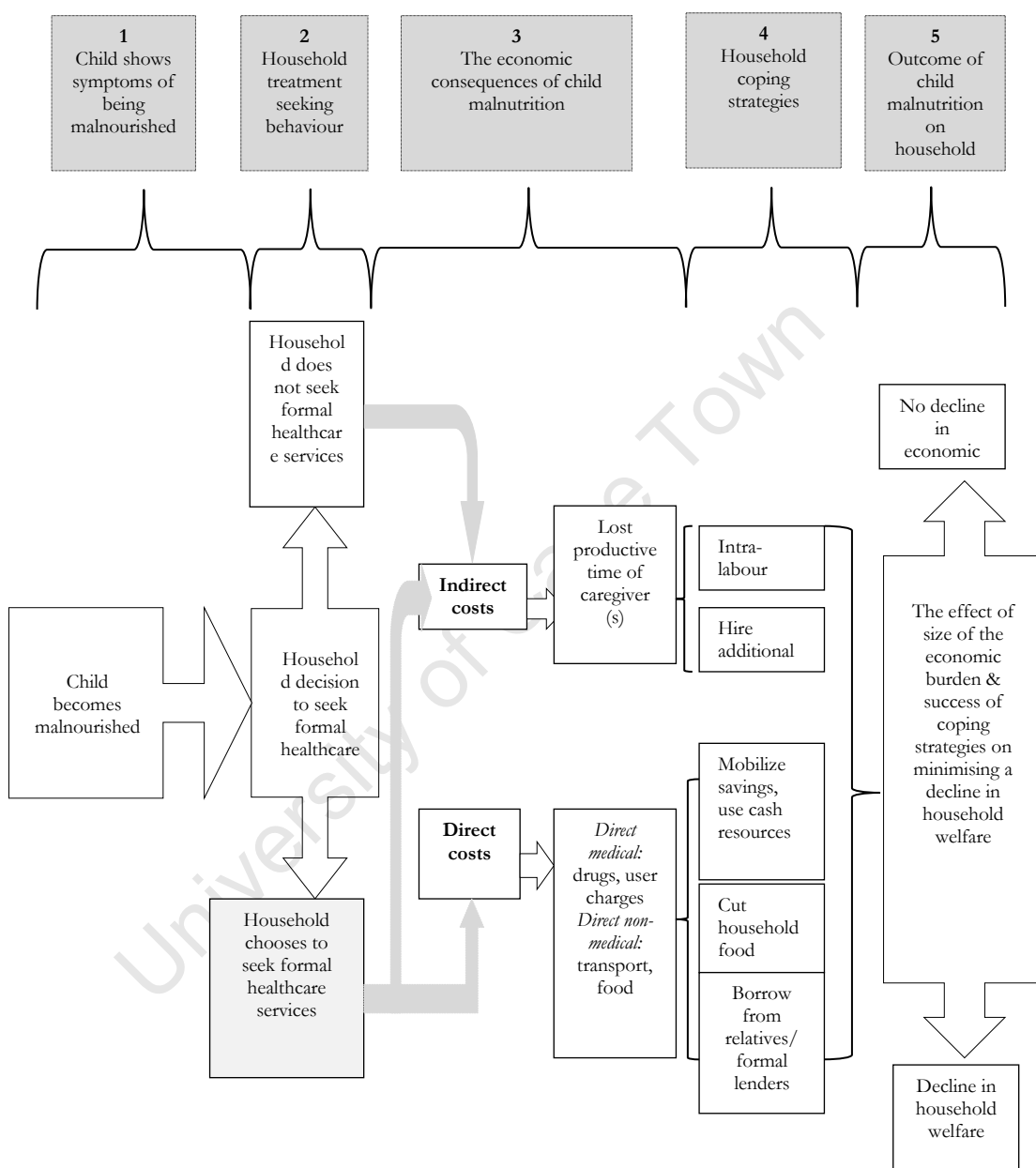


FIGURE 9: THE CONCEPTUAL FRAMEWORK DESCRIBING THE POTENTIAL PATHWAYS BETWEEN CHILD MALNUTRITION HOUSEHOLD ECONOMIC WELFARE

Adapted from (McIntyre D et al, 2006)

In exploring the potential pathway between child malnutrition and household welfare, the conceptual framework (Figure 9) depicts the two possible household welfare outcomes that are dependent on the household's treatment seeking behaviour, the total economic consequences of illness and the household coping strategies. Figure 9 depicts the sequential pathway, starting

from the (i) onset of illness, (ii) Treatment seeking behaviour and economic consequences of illness, (iii) Household responses to economic consequences of illness, and (iv) outcome of household coping strategies and implications on economic welfare

(i) *The onset of illness*

Figure 9 depicts the pathways that illustrate the potential associations between the cost of illness and their consequent influence on household economic welfare. As illustrated in Figure 9, an external health shock is introduced into a household system when the health of a child in a household becomes impaired. Following the health impairment owing to malnutrition, the adult members of the household must choose between two alternatives of either seeking immediate treatment in the formal health care sector or forgoing treatment. In this article formal health care services include treatment at hospitals and clinics.

(ii) *Treatment seeking behaviour and economic consequences of illness*

In the case of childhood illness, households tend to immediately seek treatment from the formal health care sector, particularly when health care services are provided free of charge as is the case and health policy in Zimbabwe[18]. However, if the costs associated with seeking formal health care is too high for a household; the adult members may delay or forgo formal health care treatment.

It follows that when households choose to seek treatment from the formal health sector, they incur illness-related costs in the form of direct and indirect costs as a consequence of their treatment seeking behaviour. These illness-related costs imposed on households tend to have rapid and immediate diminishing effects on household budget and household income. If the diminishing effects are sufficiently large, it is argued that the probability of household economic decline into poverty rises. Although there is little consensus as to the exact level of health expenditure that significantly diminishes economic welfare, it is widely accepted that direct cost expenditure in excess of 10% of household income can accelerate a household's decline into economic poverty status [16].

(iii) *Household responses to economic consequences of illness*

In the short run, households make a set of decisions to minimise the diminishing effects of illness-related costs on household economic welfare. These decisions are known as coping strategies.

Households frequently attempt to minimize economic welfare losses associated with the illness-related costs by using cash reserves and mobilizing savings [19]. However, this response

mechanism is rarely sufficient to cope with or avert the adverse effects of illness-related costs on economic welfare. Empirical studies have shown that in addition to withdrawal of savings, households may respond to the burden of illness-related costs through several other strategies which include sale of household assets, obtaining a loan from social networks or formal lender, hiring labour, reallocation of work, reducing food consumption and working longer hours [20, 21].

While each coping strategy has unique benefits and drawbacks that affect household economic welfare over the short term and long horizon. The overall influence of each strategy on household economic welfare will vary according to the following factors; the level of household's asset portfolio prior to the illness, the extent of social networks and the magnitude of the economic burden [22]. Poor households with limited household portfolios and weak social networks are more unlikely to be able to use extensive coping mechanisms.

(iv) Outcome of household coping strategies and implications on economic welfare

If coping strategies are not sufficient to minimise a decline in economic status or if the consequences of coping strategies are substantially adverse, a household can fall into income poverty. Income poverty is one of the underlying causes that lead to reductions in household food consumption and consequently household malnutrition. It follows from literature that the lack of adequate nutrition leads to a weakening of the immune system which consequently increases the likelihood of developing infections and ill health [4].

Over extended time horizons, it can be expected that a household will be trapped in vicious cycle that is initiated by ill health caused by malnutrition, which leads to households incurring heavy financial burdens that consequently reduce household economic resources. As household resources are depleted by financial burdens of illness and economic welfare declines, this increases the probability that the household will fall into poverty. The cycle into economic decline is further progressed by the failure of coping strategies to minimise economic welfare losses which subsequently pushes households further into economic decline. However this causality will not be tested in this paper.

3.2. METHODS AND MEASUREMENTS

Study Setting

Contrast to improvements in health care systems across several Sub-Saharan countries, Zimbabwe's health care delivery system collapsed at the peak of the hyperinflationary episode in 2008 [23]. During this hyperinflationary era, the majority of public health care facilities did not have adequate access to basic services including access to clean water and sanitation

services. Furthermore, health care facilities across the country experienced severe drug shortages and a significant exodus of health care professionals [23].

The study was conducted against the backdrop of a recovering economic environment where households are adapting to a new dollarized economy with higher levels of unemployment, higher cost of living and rising poverty levels. It is estimated that 78% of Zimbabweans live under the food poverty line [2].

Resource utilisation data was collected from medical records of patients who were admitted to the malnutrition bay in the paediatric ward at Harare Central Hospital. The hospital is one of two referral hospitals situated in the capital city of Zimbabwe. As a tertiary health care facility, Harare central hospital is designated to provide health care services to patients who have been referred by local clinics and hospitals in catchment area extending beyond the capital city. Given its proximity to high density peri-urban communities located in southern region of Harare as illustrated in Figure 10, the hospital predominantly provides health care services to these low income household communities. The hospital mainly treats medical cases relating to malnutrition, HIV/AIDS and chronic illnesses [24]

Harare Central hospital was purposefully selected for this study from the facility list of the Ministry of health and Child welfare given that it provides inpatient tertiary care to children suffering from severe acute malnutrition.

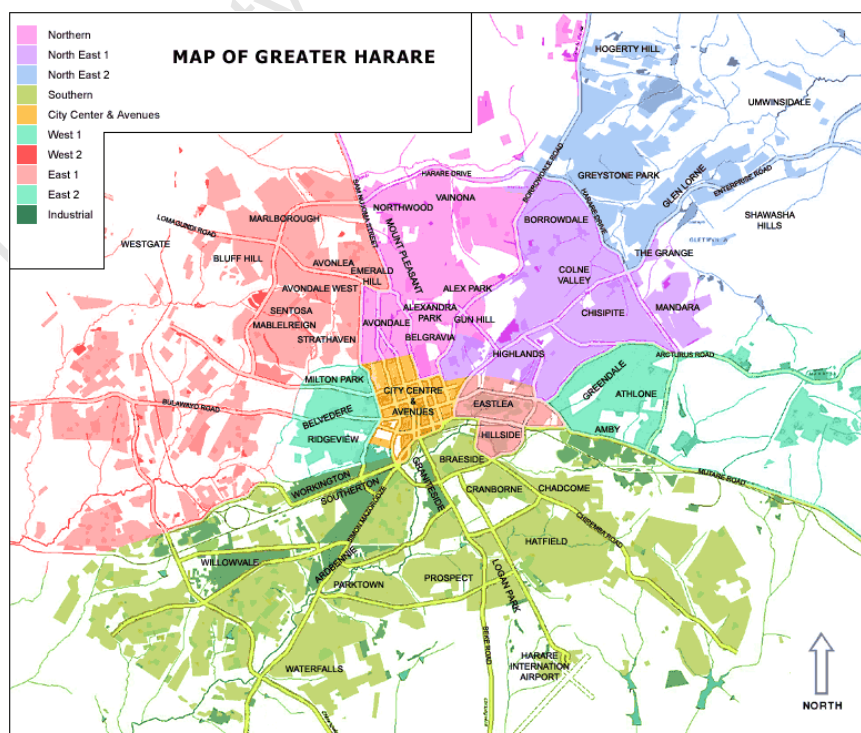


FIGURE 10: MAP OF HARARE
SOURCE: [HTTP://WWW.KENNANPROPERTIES.CO.ZW/MAP.CFM](http://www.kennanproperties.co.zw/map.cfm)

Data collection

Data was collected in two phases. The first phase of data collection focused on collating resource utilisation data by retrospectively reviewing patient medical records of under five patients with a clinical diagnosis of malnutrition. The second phase of data collection collated resource utilisation by prospectively reviewing patient medical records of under-five admitted to the malnutrition bay. In addition, a structured questionnaire was administered to caretakers accompanying the under-five patient recruited into the prospective arm of the research in order to elicit information to calculate the indirect cost of malnutrition.

Retrospective data collection

Data was collated retrospectively to complement data that was collated in the prospective study. The prevalence of severe acute malnutrition was higher between 2005- 2008 contrast to 2011 (2.1%) [2; 25], therefore by observing the number of cases admitted in 2008, the retrospective study aimed to collate additional information at a time where the prevalence is high, thus increase the ability to generalise the results to situations of high severe acute malnutrition.

Furthermore, it is acknowledged that the economic costs of illness can vary by endemicity, seasons and geographical location [22;35], therefore by collating retrospective data at a time where the prevalence of severe acute malnutrition was high, the study aimed to derive estimates that could possibly assess whether the economic cost of severe acute malnutrition differs according to endemicity.

Using a standardised medical record capture form, data relating to patient diagnosis, medical tests, medication prescribed, duration of hospital stay and the outcome of treatment were collected from a review of all patient admissions of under-five with a clinical diagnosis of severe acute malnutrition between 1 April 2008 to 31 July 2008 and from 1 April 2009 to 31 July 2009 were reviewed.

The time period of medical review from 1 April 2008 – 31 July 2008 was purposely selected because the time period coincided with a higher incidence of cases of severe acute malnutrition cases as well as the period of hyperinflation coupled with commodity shortages. The high incidence of cases was precipitated by high food insecurity and the negative economic growth, and deterioration of social services including sanitation. During this time, it was estimated that nearly fifteen new cases of child malnutrition per day were admitted to the hospital's malnutrition wards were suffering from severe acute malnutrition [7].

Data collated during this time period was incomplete. For the period from June 2008 and July 2008, the hospital did not maintain detailed records of all patients admitted to the hospital owing to a shortage in administrative records

The second time period selected in reviewing patient medical charts was 1 April 2009 – 31 July 2009. The purpose of collating data during this period was to compensate for loss of observation owing to incomplete record maintenance of patients admitted in 2008.

Overall, data collated from the retrospective arm of study through reviewing patient medical records had several weaknesses owing to several factors such as incomplete entry of medical history and treatment outcome.

Prospective medical review

The second phase of data collection involved a prospective medical review of patient records of under-fives admitted during May 2011 with a clinical diagnosis of severe acute malnutrition. The study population for the prospective medical review and questionnaire included all admissions of children under the age of five years with a clinical diagnosis of severe acute malnutrition. Based on a prevalence rate of 2.1% and a 95% confidence interval, 40 participants were recruited for daily observation for this study.

Every morning during the data collection period, a nurse used the admissions register to enrol new participants into the study. Following the identification of new admissions, the nurse requested written consent from the caretaker to recruit the under-five patient into the study. Once consent was obtained, the nurse measured the weight and length of the child as the starting anthropometric measurements. Using the medical notes written by the attending physician, the nurse recorded information relating to primary diagnosis, co-morbidities, medical history of the patient, the planned treatment drug schedule and prescribed medical tests. Once a child was recruited for the study, the nurse reviewed the medical records every morning to record new information relating to drugs prescribed, and the progression of treatment until the child was discharged from hospital.

35 out of 40 children were discharged during the period of data collection.

Structured Questionnaire

In order to collate data on demographics, socioeconomic status of the households, indirect and non-medical direct cost incurred by households and household responses to illness, a structured questionnaire was administered to the caretakers accompanying the child patient.

For the purposes of this research, a caretaker was considered to be an individual who was primarily tasked to feed the child, bathe the child and who accompanied the child to the hospital.

Analytical model

To estimate the total household cost of illness for households with a child suffering from severe acute malnutrition the study estimated total costs of illness using the algebraic formulae illustrated in Equation 12. The formula is as an aggregation of direct and indirect costs.

$$\text{Total cost of severe acute malnutrition} = \sum \text{Direct costs} + \sum \text{Indirect costs}$$

EQUATION 12

Direct costs

The financial expenditures incurred by households as a result of seeking treatment are defined as the direct costs of illness [26]. Equation 13 estimates the total direct costs of illness as the aggregation of direct medical costs and direct non-medical costs. Direct medical costs are the expenditures that are directly associated with the provision of medical treatment and it includes expenditure on drugs, diagnostic tests and hospital bed fees. Direct non-medical encompasses the costs that are indirectly associated with seeking treatment and include the cost of transportation to the health care facility and expenditure on special food.

$$\text{Direct costs} = \sum \text{Direct medical costs} + \sum \text{direct non-medical costs}$$

EQUATION 13

Direct medical costs

Direct medical costs were estimated as the aggregation of cost of prescribed medication, the monetary value of hospital user fees and the expenditure on hospital bed costs (Equation 14).

$$\text{Direct medical costs} = \sum \text{Drugs} + \sum \text{User \& consultation fees} + \sum \text{Hospital bed costs}$$

EQUATION 14

(i) Drugs

The household expenditure on drugs per single period of malnutrition was estimated using the following formula:

$$\text{Drug expenditure} = \text{WG} \times \text{Q} \times \text{P}$$

EQUATION 15

Where:

WG represents the number of recommended days the drug should be administered as per WHO guidelines which is multiplied by Q which represent the prescribed dosage per day and

further multiplied by P which represents the unit cost of medication as per UNICEF and WHO Sources and Prices of Selected Medicines for Children .

(ii) *User fees*

User fees are the costs related to the out of pocket payments incurred when seeking treatment from the health care system. In this study these are the financial expenses that are paid upon consultation for the use of the facilities. These costs are usually charged upon presentation to the health care facility.

The government policy in Zimbabwe advocates that health care services are provided free to children under the age of five years; however some health authorities charge user fees. To estimate the cost of user fees the study relied on the responses provided by patients.

Direct Non-Medical Costs

Equation 16 was used to estimate direct non-medical costs. The equation estimates direct non-medical costs of child malnutrition as a summation of transport costs, expenditure on special foods for the sick child as well as expenditure on accommodation and food for the accompanying caretaker.

$$\text{Direct non-medical costs} = \sum \text{Food} + \sum \text{Transport} + \sum \text{Accommodation}$$

EQUATION 16

(i) *Transportation to the health care facility*

To estimate the expenditure on transport to the health care facility, the average cost for a round trip was multiplied by the average number of days the caretaker travelled to the hospital to visit the ill child.

In addition to the travel costs incurred by the main caretaker, transport costs of some of the household members were estimated as the number of visits to the hospital multiplied by the cost of 1 round-trip in US dollars.

(ii) *Cost of additional food*

The expenditure of additional or special food was estimated as the average days a child was admitted in hospital multiplied by the average price of meal from the hospital cafeteria.

(iii) *Cost of accommodation*

The expenditure on accommodation was estimated by multiplying the number of average days the child was admitted in hospital by the average hospital bed cost in Harare.

Indirect cost of illness

The human capital approach was used to estimate the indirect costs associated with caring for a child with ill health. Implicit in the human capital approach is the assumption that changes in health status of household members can be reflected by losses in productivity, and subsequently losses in income generation [27]. Therefore, the value of lost income can be estimated using the prevailing wage rate for the patient or main caretaker. However, the income loss is associated to the primary caregiver in the case of ill children. It follows that the value of indirect cost is borne by the productive members of the household. To estimate the loss of productivity, the indirect cost of illness was estimated using the following formula:

$$\text{Indirect cost} = \text{Time spent away from productive activities} \times \text{average daily income}$$

EQUATION 17

Where:

$$\begin{aligned} &\text{Time spent away from productive activities in hours} \\ &= \text{Waiting time} + \text{time spent caregiving} \times \text{average hospital days stay} \end{aligned}$$

To estimate the time spent away from productive activities, the duration of waiting time before the child received assistance from a health care professional and the time spent caring for the ill child during the illness was estimated using the structured questionnaire. To estimate the value of lost income, the primary caretakers were asked to provide details about their occupation. Using caretaker responses about occupation provided in the household survey, the monetary value attached to lost income was derived from the 2009 minimum wage data published by Zimbabwe Congress of Trade Union (ZCTU). Table 14 depicts an extract of wage data derived from ZCTU and a list of assumptions used to value lost production.

| Wage rate assumptions | | |
|--|---|-------------------------|
| Occupation | Assumptions | Hourly wage rate (US\$) |
| Unemployed | Value of lost production equivalent to wage earned by urban farmer | 0.51 |
| Informal traders | | 0.63 |
| Public servants | Monthly wage = 200 US\$ | 1.25 |
| White collar (i.e. office work including clerks, managers) | Value of lost production equivalent to wage earned in commercial industry | 0.94 |
| Blue collar (i.e. factory / industry worker) | Value of lost production equivalent to wage earned by domestic workers | 0.19 |

TABLE 14: WAGE RATE ASSUMPTIONS

In response to high level of unemployment owing to negative economic growth, a significant number of households have engaged in urban agriculture as a mechanism to provide household food[28]. It follows that in the case where caretakers informally employed, unemployed or

engaged in home production it was assumed that the value of production is equivalent to that of an urban farmer.

It was additionally assumed that for every 7 days in a week that the primary caretaker effectively performed work activities for 6 of the days, therefore if a child was hospitalised for T days, the caretaker lost T-1 days of production.

The cost of co-morbidities

Pneumonia and diarrhoea are among two of the top 3 child killers in Zimbabwe [2]. The study used prospective data to analyse the effect of pneumonia and diarrhoea as co-morbidities on the cost of malnutrition. To estimate the incremental cost of co-morbidities, three treatment scenarios were estimated. The first scenario: a base case treatment scenario was established to determine the cost of treating cases with only a severe acute malnutrition diagnosis and without any co-morbidities. The second scenario estimated the cost of treating cases with severe acute malnutrition and pneumonia. The third scenario estimated the cost of treating cases of severe acute malnutrition and diarrhoea.

Sensitivity analysis

As highlighted in literature, the estimation of indirect costs poses a methodological challenge, owing to effects of intra-household labour substitution and application of the prevailing wage rate [22]. Failure to account for intra-household labour substitution and using an inflated market wage rate may result in an overestimation of indirect costs.

The study sought to determine whether the estimated total economic burden was sensitive to variations in wage rate and intra-household labour substitution assumptions. Single variable (i.e. one way) sensitivity analysis was performed on the wage rate by varying the assumed wage rate within a range of -10% to 10%.

To determine if total cost of severe acute malnutrition was highly sensitive to assumption of; *no intra-household labour substitution*, total quantity of lost labour time was reduced by the quantity of labour that households were able to reallocate to healthier members. For instance, when households could reallocate 5% of the caretaker's activities to other household members, the total time lost to production is thus reduced by 5%.

3.3. DESCRIPTIVE DATA ANALYSIS

Prospective data analysis

(i) Sample characteristics

In total, 40 children under the age of 5 years were enrolled into the study following the attending physician's confirmed clinical diagnosis of a severe acute malnutrition. Twenty-one of the participants were female and the remaining nineteen participants were male. The average age of enrolled participants was 18.6 months. Of the 40 children admitted to the malnutrition ward, 18 children were diagnosed as suffering from Kwashiorkor, 11 were underweight, and 11 were suffering from marasmic-kwashiorkor. During the course of data collection, no participant deaths were observed.

Upon hospital admission, 25 caretakers reported that seven days prior to hospital admission the child patient had suffered from diarrhoea. In addition and independently to diarrhoea, 19 children presented to the hospital with a cough, which had been recurrent for average period of less than 7 days. Other underlying diseases that children presented upon admission include pneumonia, swelling of the body and vomiting as illustrated in Table 15 and in the matrix of co-morbidities in Table 16.

| Reported co-morbidity | Number of reported cases** | % of reported cases | Reported average number of days caretakers observed comorbidity in child patient [standard deviation] |
|-----------------------|----------------------------|---------------------|---|
| Diarrhoea | 25 | 62.50% | 7 [3.55] |
| Pneumonia | 4 | 10.00% | |
| Vomiting | 19 | 47.50% | 4.5 [4.10] |
| Cough | 19 | 47.50% | 4 [10.09] |
| Fever | 12 | 30.00% | 2.5 [4.33] |
| Oedema | 11 | 27.50% | |

* Duration caretakers observed symptoms of pneumonia & oedema co-morbidities upon hospital was not recorded

** Although the symptoms presented in table 2 are independent, they are not mutually exclusive, i.e. some children presented with multiple symptoms

TABLE 15: COMMON SYMPTOMS OF ILLNESS PRESENTED BY UNDER-FIVES RECRUITED IN THE PROSPECTIVE ARM OF THE RESEARCH UPON HOSPITAL ADMISSION

| Co-morbidity disease matrix for patients recruited in the prospective study* | | | | | | |
|--|-----------|-----------|----------|-------|-------|--------|
| | Diarrhoea | Pneumonia | Vomiting | Cough | Fever | Oedema |
| Diarrhoea | 25 | | | | | |
| Pneumonia | 0 | 4 | | | | |
| Vomiting | 16 | 1 | 19 | | | |
| Cough | 10 | 3 | 9 | 19 | | |
| Fever | 7 | 1 | 9 | 7 | 12 | |
| Oedema | 5 | 1 | 2 | 4 | 0 | 11 |

* The number highlighted on the diagonal represents the total number of reported cases of a particular co-morbidity. i.e. in total 25 patients reported a case of diarrhoea in addition to severe acute malnutrition

TABLE 16: A DISEASE MATRIX OF CO-MORBIDITIES REPORTED BY CARETAKERS OF CHILDREN RECRUITED IN THE PROSPECTIVE ARM OF THE RESEARCH

On the onset of the child falling ill, 90% of households promptly sought treatment from the formal healthcare centres such as the local clinic while 3% sought treatment from traditional healers and 8% first visited the pharmacy (Figure 11).

Health care personnel working in the local clinics referred the majority of patients admitted to the hospital from the local clinics. In total 35 admissions were referrals from the primary levels of healthcare. 11 out of 40 hospital admissions had previously been admitted to the malnutrition ward.

As the majority of households enrolled in the study resided in Harare, it was observed that 31 caretakers did not incur additional expenditure on accommodation. Caretakers heavily relied on public transport to travel to the hospital on a daily basis for the duration the child was admitted to the hospital. Caretakers spent the entire day at the hospital. While nurses at the hospital prepared therapeutic formula and meals for children, it was observed that caretakers were responsible for administering some of the medicines and feeding the child at three hour intervals.

While it was observed that the average hospital duration was 12 days, some child patients were admitted in the ward for days ranging from a minimum of 4 days to a maximum of 27 days.

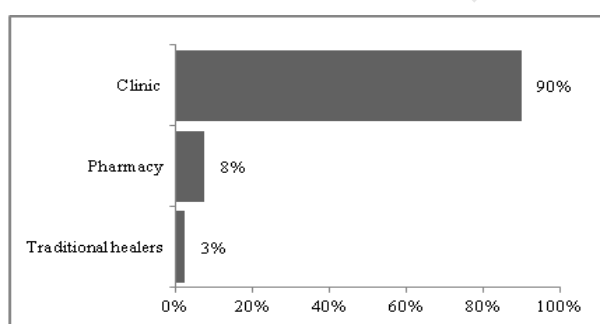


FIGURE 11: HOUSEHOLD TREATMENT SEEKING BEHAVIOUR ON ONSET OF CHILD ILLNESS – PROSPECTIVE PARTICIPANTS

Retrospective data analysis

(i) Sample characteristics

In total 102 medical records of under-five children with a diagnosis of severe acute malnutrition were reviewed. Forty one (40.20%) of the 102 cases of severe acute malnutrition was female and the remaining fifty nine cases (57.84%) were male. The age distribution of hospital admissions was positively skewed with the majority of admissions in the 6-24 months age group. The average age of admitted patients was 21 months. Once admitted to the ward, patients were received into the in-patient treatment from the hospital for an average of 11.6 days - similar length of hospital stay as observed among participant recruited in the prospective arm of the research.

Upon hospital admission, 76% of children showed symptoms of diarrhoea. In addition to and independently of diarrhoea, common symptoms in child patients included oedema, vomiting,

oral sores and repository tract infections as summarised in Table 17. Medical records reviewed revealed that caretakers of patients reported that on average the children had suffered from the symptoms for an average of 7 days prior to hospital admission, with the exception of oral sores which were symptomatic for a longer period before the child was admitted to the hospital.

During the periods under review, 75% of hospital admissions had a primary diagnosis of Kwashiorkor, 15% of admissions had Marasmus, 9% of admissions had Marasmic kwashiorkor and the remaining 2% of admissions had a diagnosis of malnutrition.

Of the 102 admissions, 18.63% of children were repeat admission to the ward. Patients who were admitted to the hospital were often treated simultaneously for co-morbid illness. The common co-morbidities treated included illnesses such as pneumonia, tuberculosis, HIV/AIDS and gastrointestinal disorders. Table 18 illustrates that HIV and pneumonia were the most common co-morbid conditions in hospital admissions. Furthermore, patients who were identified as being HIV positive spent more days in hospital.

On average, inpatient treatment of severe acute malnutrition yielded positive outcomes. Of the 102 cases of severe acute malnutrition, 91% of admissions were discharged from the hospital. Upon discharge, patients received a supply of Ready-to-use therapeutic food. During the period under review, 8.33% cases of malnutrition cases admitted to the hospital resulted in mortality.

| Co-morbidity reported by caretaker & recorded by attending physician | Number of reported cases <i>n</i> = 102 (%) | Duration of hospital stay in days [standard deviation] |
|--|--|---|
| Diarrhoea | 63 (62%) | 10 [5.30] |
| Oedema | 51 (50%) | 11 [7.63] |
| Vomiting | 52 (51%) | 8 [5.52] |
| Cough | 46 (45%) | 10 [4.34] |
| Fever | 17 (17%) | 11 [5.04] |
| Refusal to eat | 17 (17%) | 10 [4.17] |
| Oral sores | 36* (35%) | 10.5 [6.30] |

TABLE 17: COMMON SYMPTOMS PRESENT UPON HOSPITAL ADMISSION FOR PATIENTS RECRUITED IN THE RETROSPECTIVE PATENTS

| Co-Morbid diseases confirmed & recorded by attending physician* | % | Hospital stay (average days) [standard deviation] |
|---|-------------|--|
| HIV/AIDS | 16 (15.69%) | 12 [6.82] |
| Pneumonia | 13 (12.75%) | 10 [3.7] |
| Gastrointestinal | 7 (6.86%) | 7 [3.5] |
| TB | 3 (2.94%) | 8 [2.65] |

* TABLE ONLY ILLUSTRATES THE NUMBER OF CASES WITH RECORDED CO-MORBID DISEASES

TABLE 18: THE PRESENCE OF CONFIRMED AND RECORDED COMMON CO-MORBIDITIES ON DURATION OF HOSPITAL STAY (RETROSPECTIVE PATIENTS)

3.4. RESULTS

The household cost of illness findings are organised into five sections. The first section reports on the socio-economic background of the households recruited in the prospective and retrospective arms of the study. The second section reports on the direct and indirect cost of illness incurred by households in the prospective arm of the study. In addition, this section reports on the direct cost of illness for households recruited in the retrospective arm of the research. However, given its retrospective nature, data collated from the retrospective arm of the research was deficient in its ability to elicit caretaker responses on household expenditure on food, accommodation and other additional charges not recorded in medical charts. Therefore, the direct cost estimates presented in this section for the retrospective arm of the research were extrapolated using direct cost inputs derived from the prospective arm of the research and summarised in Table 19. The third section, reports on the incremental effect of diarrhoea and pneumonia co-morbidities on the total direct costs of severe acute malnutrition. While the fourth section reports on the magnitude of economic burden of illness as well as the common coping mechanisms that were used by households in adjusting to the costs associated with treating malnutrition. In addition this section evaluates whether the economic cost of malnutrition resulted in household economic decline. Lastly, the fifth section summarises the sensitivity analysis results derived from varying labour market assumptions in estimating indirect costs of illness.

| Assumptions | Unit | Average | Source |
|--|-----------|---------|--|
| Households lost T -1 days of production as a consequence of illness (i.e. assume they spend 1 day resting per 7 day work week) | Days | 11 | |
| Main income source for primary caretaker is equivalent to the minimum wage of an urban farmer | US\$/hour | 0.5051 | ZCTU |
| Number of hours patients waited before receiving medical attention | Hours | 5 | Household questionnaire responses |
| Hours per day spent taking care/ visiting child patient during hospital admission | Hours | 12 | Household questionnaire responses |
| Drugs expenditure during hospital stay | US\$ | 6.98 | Household questionnaire responses |
| Drugs expenditure prior to hospital admission | US\$ | 16 | Household questionnaire responses |
| Transport (average single round-trip) | US\$ | 1.1 | Household questionnaire responses |
| Food (average price for 1 meal) | US\$ | 1.4 | Household questionnaire responses & hospital canteen |

TABLE 19: SUMMARY LIST OF UNIT INPUT DATA AND KEY ASSUMPTIONS

Socioeconomic background

i. Socio-economic background of prospective participants

The average household comprised of four individuals. Households were typically headed by a male figure who was concurrently considered to be the main breadwinner. Thirty-six (90%) of the enrolled households were male headed. Amongst the head of households, 75% had received a secondary education while 8% had at least a tertiary education. The remaining 8% of households were headed by individuals with less than a primary education (Table 20).

38 out of 40 (i.e. 95%) primary caretakers were female. Of the female caretakers who assumed the role of primary caretaker, 35 out of 38 females were the biological mother and 3 out of 38 were females from the extended family. Only 9 of the 38 female caretakers considered themselves to be the main breadwinners. It follows that, whilst the males in the household continued to assume their role as breadwinners, the role of care giving was assigned to females.

With a national unemployment rate of 90% (UNICEF, 2011), 68% of the income generated by households was derived from the informal labour market. Given that the poverty datum line was determined to be equal to 525.95 US\$ for a household consisting of 5 members (ZIMSTAT, 2011), households recruited in this study fell well below the poverty line as the reported average income earned was approximately 150.81 US\$. Despite living in absolute poverty, no households reported receiving food aid from supplementary feed schemes or NGO donations.

The disease burden was highly prevalent in poor suburbs. With one exception, the rest of the 40 participants resided in high-density suburbs situated in the southern part of Harare or farm quarters on the outskirts of Harare. High-density suburbs are densely populated areas, i.e. where the concentration of people residing in a particular area is high [29] Residents in high-density urban areas have limited access to adequate supply of clean water and regular sanitation services [31].

ii. Socio-economic background of retrospective participants

As the retrospective study focused on reviewing patient medical charts, not much information about the socio-economic background of the households included in the medical history could be derived. From the review of the medical chart histories, the incidence of SAM was higher in high density suburbs as illustrated in Figure 12. High density suburbs are characteristically densely populated areas and residents have low incomes [30]. Houses in these areas are made from bricks and asbestos roofing and many have pre-historically built and aging water and sanitation infrastructure. However since the economic downturn, investments into maintaining sewerage pipes and chemicals to treat water have been limited. High density suburbs have consequently experienced a disproportionate burden of disruptions in access to clean water and sanitation services by Zimbabwe National Water Authority(ZINWA) as a consequence of underinvestment into water and sanitation services [31].

Unemployment was high among women. Only 8% of medical records reviewed indicated that the mother of the child was employed, while 49% of fathers were reported to be employed.

| | Prospective study | Retrospective study |
|---|--|---------------------|
| Socio-economic background | | |
| Household size (number of persons) | 4 [min = 3; max = 11] | - |
| % of children with living father | 98% (39) | 76% (78) |
| % of children with living mother | 95% (38) | 84% (86) |
| Average household income (in US\$) | 150.81 [min = 50; average = 150; max = 600] | - |
| Average food consumption (in US\$) | 47.59 [min = 10; average 50; max = 150] | - |
| Place of residence | | |
| High density | 88% (35) | 86% (88) |
| Low density | 3% (1) | 4% (4) |
| Rural/ farm | 10% (4) | 10% (10) |
| Unemployment ^{1,2} | | |
| Female unemployment | 83% (33) | 74% (75) |
| Male unemployment | 43% (17) | 28% (29) |
| Male headed households | 90% (36) | |
| Education attainment head of household | | |
| Primary | 8% (3) | - |
| Secondary | 75% (30) | - |
| Tertiary | 8% (3) | - |
| Employment profile | | |
| Breadwinner | | |
| Unemployed | 3% (1) | |
| Informal traders | 68% (27) | |
| Public servants | 5% (2) | |
| White collar (i.e. office work) | 3% (1) | |
| Blue collar (i.e. labourer/ factory work) | 23% (9) | |
| Caretaker | | |
| Unemployed | 45% (18) | |
| Informal traders | 40% (16) | |
| Public servants | - | |
| White collar (i.e. office work) | - | |
| Blue collar (i.e. labourer/ factory work) | 15% (6) | |

* () Figures in parenthesis represents the number of participants

1 = Female employment status not disclosed = 18 % ; 2 = Male employment status not disclosed = 23%

TABLE 20: SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLDS RECRUITED IN PROSPECTIVE & RETROSPECTIVE STUDY

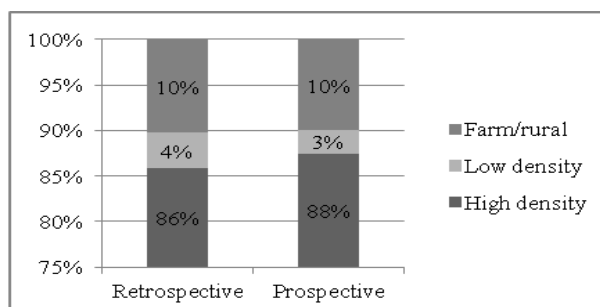


FIGURE 12: DESCRIPTIVE ANALYSIS OF HOUSEHOLDS BY RESIDENCE

The cost of severe acute malnutrition without accounting for the presence of co-morbidities

Direct costs

Subsequent to hospital admission into the malnutrition ward, child patients recruited in the *prospective* arm of the research spent an average of 12 days in hospital. During the period of hospitalisation, households incurred an average of 36.75 US\$ on out of pocket payments made towards food, transport and drug expenses. Households recruited in the prospective arm of the research that sought alternative treatment prior to hospital admission, incurred proportionally higher out of pocket payments. For households that sought treatment from the pharmacy and traditional healers, the total direct cost without explicitly accounting for the presence of comorbidities was 52.92 US\$ (Table 21b).

| Table 21a: Direct cost of severe acute malnutrition in children per episode of treatment (excluding drug related expenses incurred prior to hospital admission & without explicitly accounting for the presence of comorbidities) | | | | | | |
|---|----------------|-----------------------------|---|------------------------------|-----------------------------|---|
| | Prospective | | | Retrospective ^{1,3} | | |
| | Amount in US\$ | % of out of pocket payments | Out of pocket payments as % of household income | Amount in US\$ | % of out of pocket payments | Out of pocket payments as % of household income |
| <i>Direct medical costs</i> | | | | | | |
| Drugs | 6.98 | 19% | 5% | 6.98 | 19% | 5% |
| <i>Direct non-medical costs</i> | | | | | | |
| Transport | 13.20 | 36% | 9% | 13.03 | 36% | 9% |
| Food | 16.58 | 45% | 11% | 16.36 | 45% | 11% |
| Accommodation | 0.00 | 0% | 0% | 0 | 0% ² | |
| Total direct cost of illness | 36.75 | | 24% | 36.37 | | 24% |

| Table 21b: Direct cost of severe acute malnutrition in children per episode of treatment (including drug related expenses incurred prior to hospital admission & without explicitly accounting for the presence of comorbidities) | | | | | | |
|---|----------------|-----------------------------|---|------------------------------|-----------------------------|---|
| | Prospective | | | Retrospective ^{1,3} | | |
| | Amount in US\$ | % of out of pocket payments | Out of pocket payments as % of household income | Amount in US\$ | % of out of pocket payments | Out of pocket payments as % of household income |
| <i>Direct medical costs</i> | | | | | | |
| Drug expenditure prior to hospital admission | 16.00 | 31% | 11% | 16.00 | 31% | 11% |
| Drug expenditure after admission | 6.98 | 13% | 5% | 6.98 | 13% | 5% |
| <i>Direct non-medical costs</i> | | | | | | |
| Transport | 13.20 | 25% | 9% | 13.03 | 25% | 9% |
| Food | 16.58 | 31% | 11% | 16.36 | 31% | 11% |
| Accommodation | 0.00 | 0% | | 0 | 0% ³ | |
| Total direct cost of illness | 52.92 | | 35% | 52.54 | | 35% |

¹Direct costs for the retrospective arm of the research were calculated using unit input cost data derived from the prospective arm of the research and summarised in **Table 19**

²Assumption: Households in the retrospective arm of the research did not incur accommodation related costs

³Assuming an average hospital stay is 11.6 days as derived from the retrospective medical review

TABLE 21: DIRECT COST OF SEVERE ACUTE MALNUTRITION WITHOUT EXPLICITLY ACCOUNTING FOR THE PRESENCE OF COMORBIDITIES

Only 4 out of 40 households in the prospective arm of study sought alternative treatment before seeking treatment from the public health system. Of the four households, 3 visited the pharmacy and purchased drugs and 1 household visited a traditional healer. While the traditional healer did not request monetary compensation, households that initially attempted

to treat the child's illness using drugs from the pharmacy incurred costs which were estimated at a minimum of 5 US\$ and a maximum of 30 US\$. The aggregated out of pocket payments made by these households were consequently larger reflecting the additional expenditure on drugs prior to hospital admission. The household cost of malnutrition was thus 52.92 US\$ which is equivalent to 35% of household income (Table 21b).

The *retrospective* total household cost estimated using extrapolated cost inputs derived from the prospective study was estimated to be 36.37 US\$ as shown in Table 21a. The total direct cost of child malnutrition exerted a financial burden on households is equivalent to 24% of monthly household income.

(i) *Direct medical costs*

Zimbabwe's health policy mandates for free healthcare for children under the age of 5 years receive free health care. As such, participants did not incur any direct costs relating to hospital admission or hospital bed costs. However, despite the free health care policy households incurred out of pocket expenditure when purchasing some the prescribed medication. Caretakers generally had to pay for the cost of multivitamins and some of the antibiotics that had been prescribed but not supplied by the hospital. On average, caretakers spent an average cost of 6.98 US\$ on the purchase of medication. For the minority of households that sought alternative treatment prior to hospital admission, the financial expenditure on herbal medication and formal drugs ranged from 5 US\$ to 30 US\$.

(ii) *Direct non-medical costs*

With the exception of one household, the remaining 39 households incurred transport costs. The average transport expenditure for the main caretaker was estimated to be 13.20 US dollars, assuming an average hospital stay of 12 days and an average round trip cost of 1.1 US dollar. 31 caretakers reported that other members of the household had visited the child patient; however, this study did not attempt to estimate the transport of costs incurred by relatives.

As caretakers spent the entire day at the hospital with the child, the majority of caretakers (28 out of 40) bought food at the hospital cafeteria which cost approximately 1.4 US\$ per meal. Caretakers that bought food at the hospital reported to have purchased one meal per day. Therefore, the estimated cost of additional food was estimated to be 16.58 US\$ per average hospital stay of 12 days.

Households did not incur any additional household cost on accommodation as the majority resided at home during the time was admitted in hospital. For the minority of the households

who did not reside at their primary residence during treatment, free hospital accommodation was provided.

Indirect costs

Without explicitly accounting for the presence of comorbidities, the indirect cost of illness incurred over an average hospital stay of 12 days was estimated to be 47.13 US\$ as depicted in Table 22. Given that the majority of caretakers were not employed in the formal sector, the value of their home production activities which includes urban agriculture was estimated to be 80.81 US dollars per month. Therefore the value of a lost productive hour, assuming a 20 day work month and 8 hour work day was 0.51 US\$ per hour.

| | Lost productive time in hours per day [standard deviation] | Total number of lost productive days [standard deviation] | Average hourly wage (in US\$) | Monetary value of lost production |
|-----------------------------|--|---|----------------------------------|---|
| Waiting time | 5 [4.02] | 1[0.00] | 0.51 | 2.69 |
| Caretaking/visiting | 8[2.77] | 11[3.48] | 0.51 | 44.45 |
| Total Indirect costs | | | | 47.13 US\$ |

¹ Assuming that for a 7 day week, households were absent for income producing activities for 1 day of rest. Therefore for an average hospital stay of 12 days, households lost 11 days of actual production related days.

² Indirect costs estimated without explicitly accounting for co-morbidities

³ Indirect costs are estimated per episode of illness

TABLE 22: TOTAL INDIRECT COST OF ILLNESS FOR HOUSEHOLDS IN THE PROSPECTIVE ARM OF THE RESEARCH

Caretakers recalled that upon their initial hospital visit, they spent an average of 5 hours waiting time to receive any medical attention from a health care professional. Caretakers of children admitted into malnutrition bay were advised to spend the entire day with the child. Therefore, caretakers spent an average of 12 hours per day at the hospital over the period the child was hospitalised.

63% of households reported that they received help from friends and family in performing their household activities. The remaining 37% of households reported that they did not receive any assistance in performing their duties while they were at the hospital taking care of the sick child.

Total cost of illness

| | Total cost of illness <i>including</i> health-related expenses incurred prior to hospitalisation (per episode of illness) | | | Total cost of illness <i>excluding</i> health-related expenses incurred before hospitalisation (per episode of illness) | | |
|---|---|-----------------------|-----------------|---|-----------------------|-----------------|
| | Amount in US Dollars | % of household income | % of total cost | Amount in US Dollars | % of household income | % of total cost |
| Direct Costs | \$52.92 | 35% | 53% | \$36.75 | 24% | 44% |
| Indirect costs | \$47.13 | 31% | 47% | \$47.13 | 31% | 56% |
| Total cost of SAM | \$100.05 | | | \$83.89 | | |
| Total cost of SAM as % of monthly household income | | 66% | | | 56% | |

¹ Monthly household income = 150.81US\$

TABLE 23: TOTAL COST OF SEVERE ACUTE MALNUTRITION IN CHILDREN INCURRED BY HOUSEHOLDS RECRUITED IN THE PROSPECTIVE ARM OF THE RESEARCH (WITHOUT EXPLICITLY ACCOUNTING FOR THE PRESENCE OF COMORBIDITIES)

While not explicitly accounting for the presence of co-morbidities, the total household cost per episode of treating severe acute malnutrition at a tertiary health care facility was 83.89 US\$ for households recruited in the *prospective* arm of the research. The total household economic burden of seeking treatment for severe acute malnutrition as a proportion of monthly household income is 56%. The total cost of illness is comprised of 56% of indirect costs and 44% of direct costs (Table 23).

For households that incurred additional treatment costs prior to hospital admission, the total cost of illness was estimated to be 100.05 US\$. In comparison to households that did not seek treatment from the pharmacy and traditional healers prior to the child being admitted, the total costs of illness was higher by 16.17 US\$. The additional pre-hospital admission treatment costs increased the share of direct costs of illness as a proportion of total costs. Table 23 summarises the total cost of illness for households.

The incremental effect of co-morbidities on the direct cost of severe acute malnutrition

| The incremental effect of diarrhoea and additional co-morbidities on the direct cost of severe acute malnutrition* | | | |
|--|-----------------|----------------|-----------------------------------|
| Co-morbidity | Number of cases | Cost (in US\$) | Length of hospital stay (in days) |
| None (SAM in the absence of any co-morbidities) | 1 | 29.69 | 13 |
| Diarrhoea with no additional comorbidities | 2 | 30.94 | 11 |
| Diarrhoea with fever, cough and vomiting | 4 | 35.44 | 11 |
| Diarrhoea with oedema | 3 | 39.69 | 13 |

| The incremental effect of pneumonia and additional co-morbidities on the direct cost of severe acute malnutrition* | | | |
|--|-----------------|----------------|-----------------------------------|
| Co-morbidity | Number of cases | Cost (in US\$) | Length of hospital stay (in days) |
| None (SAM in the absence of any co-morbidities) | 1 | 29.69 | 13 |
| Pneumonia with cough, fever and vomiting | 1 | 30.48 | 12 |
| Pneumonia with fever | 2 | 31.55 | 8 |
| Pneumonia with oedema | 1 | 34.86 | 9 |
| Diarrhoea with fever, cough and vomiting | 4 | 35.44 | 11 |
| Diarrhoea with oedema | 3 | 39.69 | 13 |

* Estimated costs for households recruited in the prospective arm of the research

**Costs are estimated per episode of treatment

TABLE 24: TOTAL DIRECT COST EXPLICITLY ACCOUNTING FOR THE INCREMENTAL EFFECT OF CO-MORBIDITIES ON THE DIRECT COST OF SEVERE ACUTE MALNUTRITION

Co-morbidities have an incremental effect on the household cost of illness. Table 24 illustrates the incremental effect by showing that the direct household cost of severe acute malnutrition without any co-morbid diseases is 29.69 US\$ while the cost of treating severe acute malnutrition increases with the addition of comorbid conditions. Table 24 illustrates that the direct household treating oedematous severe acute malnutrition in addition to diarrhoea is 39.69 US\$, while the household cost of treating oedematous severe acute malnutrition in addition to pneumonia is 34.86 US\$.

Although household expenditure on oedematous severe acute malnutrition is higher in the presence of diarrhoea contrast to pneumonia, the table highlights that patients with pneumonia spent an average of 9 days in hospital contrast to cases treated for diarrhoea that spent an average of 13 days. This suggests that the effective daily costs (total cost per treatment period divided by total number of days spent in hospital) are higher for patients with pneumonia as they expend an effective 3.87 US\$ daily on out of pocket payments over a short horizon, contrast to 3.05 US\$ spent by households with children suffering from diarrhoea in addition to an oedematous severe acute malnutrition.

Household expenditure and coping mechanisms

Households did not have a diverse household asset portfolio as implied by the limited range of coping strategies that were used to finance out of pocket expenditures. Although direct costs exerted a significant burden on household expenditure, none of the households financed the expenditure using loans or savings. Instead, 65% of households reported a reduction in food consumption as the main coping mechanism used in order to finance the out of pocket

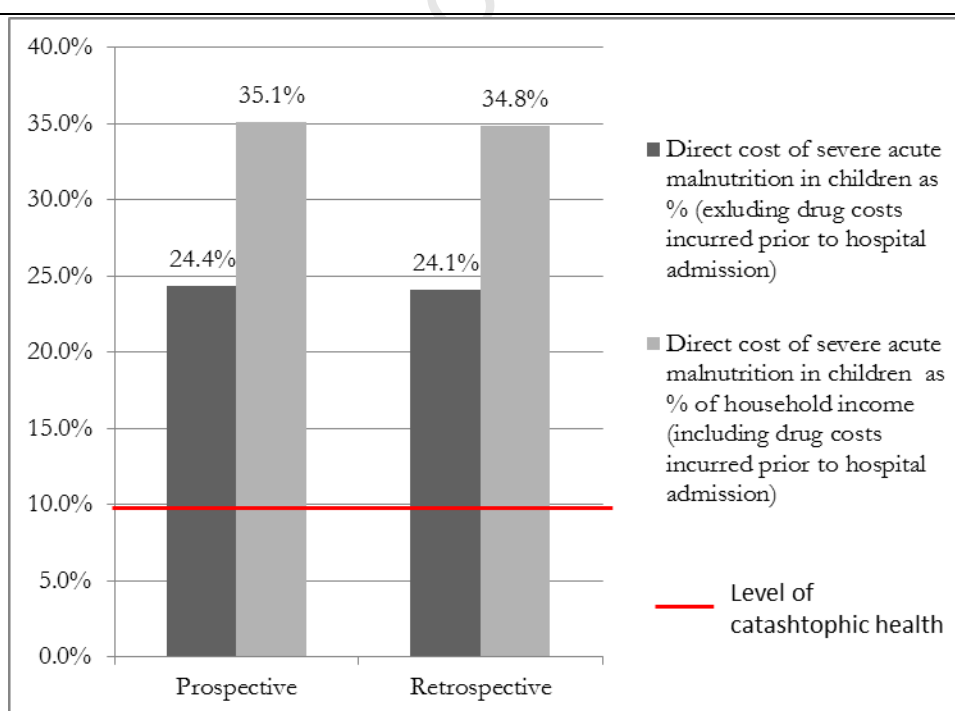
expenditure. These households reported a decrease in the quality and quantity in food consumed by the household since the child showed symptoms of illness.

To cope with the indirect cost of illness, 58 % of households relied on a social network of friends, immediate and extended family members, to assist in household activities. 5% of households reported that they had relied on pre-existing hired labour to assist in household activities. 38 % of the households reported that they did not have anyone to assist in home production activities.

The economic burden of malnutrition and the decline in economic welfare

Households incurred a significant amount of direct costs in seeking treatment for the child.

Without accounting for the cost of co-morbidities, households recruited in the prospective arm of the research expended 24.4% of their monthly household income on direct costs – a level of expenditure that is considered to be catastrophic on household welfare and can lead to household impoverishment. Figure 13 depicts the magnitude of the direct cost economic burden. Both the prospective and retrospective economic burden of illness was above the threshold level of health care expenditure considered to be catastrophic and impoverishing household economic status.



* Monthly household income for prospective households = 150.81US\$

** Monthly household income for retrospective households is assumed to be 150.81 US\$

FIGURE 13: HOUSEHOLD DIRECT COST OF ILLNESS BURDEN AS A % OF MONTHLY HOUSEHOLD INCOME

Sensitivity analysis on the prospective cost of malnutrition

Although the study assumed that the value of lost production for the primary caretaker could be equated to that of an urban farmer, there is a high degree of uncertainty as actual value derived from production by the primary caretakers who are not formally employed. Furthermore, there is a high degree of uncertainty as to the actual amount of productive labour lost by the primary caretaker while the child was in hospital. For the 63% of caretakers who received assistance with home production from extended family members or hired help, there remains uncertainty as to total quantity of lost productive time that was possibly reduced through intra-household labour substitution. A sensitivity analysis was thus necessary to evaluate whether the simplifying assumptions used in the study significantly affect the estimates generated in estimating the household economic burden.

Results (Table 26) from the sensitivity analysis illustrates that indirect cost of illness are highly sensitive to assumptions of intra-household labour substitution. Assuming that the study overestimated the value of lost production by 25%, i.e. as a result of child malnutrition the caretaker lost 75% of productive time as 25% of the tasks were successfully reallocated to other household members, the effect of reallocation of tasks on the indirect cost of illness estimates would result in an overestimation of 11.11 US\$. Taking a milder assumption that households were only able to successfully reallocate 5% of the caretakers daily activities the effect on total indirect cost is thus overestimated by 2.22 US\$ over the hospitalisation period.

Compared to intra-household labour substitution, indirect costs are not highly sensitive to variations in wage rate assumptions within the ranges 0 – 10% around the base case estimates. Assuming the wage rate is 5% higher (i.e. 0.53 US\$ per hour contrast to 0.51 US\$ per hour) than the base case estimate, indirect costs are underestimated by 1.65 US\$ which underestimates the total cost burden by 1.98% (Table 25)

| | | | Direct costs (US\$) | Indirect costs (US\$) | Total cost of SAM (US\$) | % Over/under estimated of total cost burden ¹ |
|-----------------------|---|--------------------|---------------------|-----------------------|--------------------------|--|
| Base estimate | | 0.51 US\$ per hour | 36.75 | 47.13 | 83.88 | |
| Wage rate assumptions | Wage rate is 10% lower than base estimate | 0.45 US\$ per hour | 36.75 | 41.82 | 78.57 | 6.33% |
| | Wage rate is 5% lower than base estimate | 0.48 US\$ per hour | 36.75 | 44.14 | 80.89 | 3.56% |
| | Wage rate is 5% higher than base estimate | 0.53 US\$ per hour | 36.75 | 48.79 | 85.54 | -1.98% |
| | Wage rate is 5% higher than base estimate | 0.56 US\$ per hour | 36.75 | 51.11 | 87.86 | -4.74% |

¹ % over or underestimated of total cost burden is total cost of SAM under specific wage rate assumption divided by total cost of SAM under base case estimate scenario

² Sensitivity analysis conducted on data collated in the prospective arm of the research

TABLE 25: SENSITIVITY ANALYSIS OF TOTAL COST OF SEVERE ACUTE MALNUTRITION IN CHILDREN UNDER VARYING WAGE RATE ASSUMPTIONS (EXCLUDING DRUG COSTS INCURRED PRIOR TO HOSPITAL ADMISSION & WITHOUT EXPLICITLY ACCOUNTING FOR THE PRESENCE OF CO-MORBIDITIES)

Sensitivity analysis results: effect of varying assumptions of intra-household labour substitution on indirect costs

| Assumption: Households were able to successfully reallocate 50% of the caretakers daily activities to other members | | | | |
|---|---------------------------------------|----------------|--------------------|-----------------------------------|
| | Lost productive time in hours per day | Number of days | Median hourly wage | Monetary value of lost production |
| Waiting time | 4 | 1 | US\$ 0.51 | US\$ 2.02 |
| Caretaking/visiting | 8 | 11 | US\$ 0.51 | US\$ 44.45 |
| Intra-household labour Substitution | -4 | 11 | US\$ 0.51 | US\$ -22.22 |
| Total indirect costs | | | | 24.24 |
| Assumption: Households were able to successfully reallocate 25% of the caretakers daily activities to other members | | | | |
| | Lost productive time in hours per day | Number of days | Median hourly wage | Monetary value of lost production |
| Waiting time | 4 | 1 | US\$ 0.51 | US\$ 2.02 |
| Caretaking/visiting | 8 | 11 | US\$ 0.51 | US\$ 44.45 |
| Intra-household labour Substitution | -2 | 11 | US\$ 0.51 | US\$ -11.11 |
| Total indirect costs | | | | 35.35 |
| Assumption: Households were able to successfully reallocate 15% of the caretakers daily activities to other members | | | | |
| | Lost productive time in hours per day | Number of days | Median hourly wage | Monetary value of lost production |
| Waiting time | 4 | 1 | US\$ 0.51 | US\$ 2.02 |
| Caretaking/visiting | 8 | 11 | US\$ 0.51 | US\$ 44.45 |
| Intra-household labour Substitution | -1 | 11 | US\$ 0.51 | US\$ -6.67 |
| Total indirect costs | | | | 39.80 |
| Assumption: Households were able to successfully reallocate 10% of the caretakers daily activities to other members | | | | |
| | Lost productive time in hours per day | Number of days | Median hourly wage | Monetary value of lost production |
| Waiting time | 4 | 1 | US\$ 0.51 | US\$ 2.02 |
| Caretaking/visiting | 8 | 11 | US\$ 0.51 | US\$ 44.45 |
| Intra-household labour Substitution | -1 | 11 | US\$ 0.51 | US\$ -4.44 |
| Total indirect costs | | | | 42.02 |
| Assumption: Households were able to successfully reallocate 5% of the caretakers daily activities to other members | | | | |
| | Lost productive time in hours per day | Number of days | Median hourly wage | Monetary value of lost production |
| Waiting time | 4 | 1 | US\$ 0.51 | US\$ 2.02 |
| Caretaking/visiting | 8 | 11 | US\$ 0.51 | US\$ 44.45 |
| Intra-household labour Substitution | -0.4 | 11 | US\$ 0.51 | US\$ -2.22 |
| Total indirect costs | | | | 44.24 |

* Sensitivity analysis conducted on data collated in the prospective arm of the research

TABLE 26: SENSITIVITY ANALYSIS OF INDIRECT COST OF SEVERE ACUTE MALNUTRITION IN CHILDREN UNDER VARYING ASSUMPTIONS ON INTRA-HOUSEHOLD LABOUR SUBSTITUTION (EXCLUDING DRUG COSTS INCURRED PRIOR TO HOSPITAL ADMISSION & WITHOUT EXPLICITLY ACCOUNTING FOR THE PRESENCE OF CO-MORBIDITIES)

3.5. DISCUSSION

Severe acute malnutrition is a major underlying cause of child mortality in Zimbabwe. The persistence of the disorder in Zimbabwe has been partially driven by macro-economic instability, whose effects have trickled down to the microeconomic levels in the form of rising income poverty among households and under-funded primary and tertiary health care facilities. If severe acute malnutrition is not addressed at primary levels of health care, it can worsen the outcomes of medical treatment of co-morbidities such as pneumonia, respiratory infections and HIV/AIDS [3]. In-patient treatment of severe acute malnutrition with complications can be critical in reducing child mortality, but as illustrated in this study, the financial and indirect costs of seeking treatment exert a significant burden on households.

This study drew upon existing literature and frameworks to trace the relationship between child malnutrition, the costs associated with seeking treatment and the subsequent household responses to the economic cost of treating malnutrition. Based on the size of the economic burden, the study evaluated whether the economic costs of seeking healthcare services for child malnutrition could lead to a decline in household welfare. The results derived from this study contribute to existing cost of illness literature conducted from the perspective of households across low income countries. In the following section, findings on the economic costs, the household responses to these economic costs and the subsequent outcome of the economic burden on household welfare are discussed.

The economic burden of child malnutrition on households

Without explicitly accounting for the presence of co-morbidities direct and indirect costs of severe acute malnutrition per episode of illness were estimated to be 36.75 US\$ and 47.13 US\$ respectively. In total, the household cost of illness associated with seeking treatment for severe acute malnutrition was estimated as 83.89 US\$ for households recruited in the prospective arm of the research.

The total economic burden was shown to exhibit impoverishing effects on households. For an average household, child malnutrition exerted an economic burden greater than fifty per cent of a typical household's monthly income. Households incurred a total cost burden equivalent to 56% on monthly household income. This finding mirrors results from a study in Bangladesh which found that households spent over 50% of their monthly income on treatment of pneumonia in under-fives [32]. Similar to households in Bangladesh, this level of out of pocket expenditures incurred by households is highly impoverishing particularly on the poorer households. This level of out of pocket expenditure has a likely adverse implication on

household behaviour, which may include a reduction of household consumption on essential goods such as food as was observed in 65% of households in this study who reported a decline in household food quality and consumption.

Direct cost burden and the effects of treatment seeking behaviour and co-morbidities

On the onset of childhood illness, 90% of households sought treatment from the formal health care facilities, contrast to the Malawian context where less than a third of households initially sought formal healthcare treatment for malaria in under-fives [18]. The results in the study complements findings from the Malawian context, where majority households who initially sought treatment from informal healthcare sources expended proportionally higher out of pocket payments compared to households that sought formal health care initially. This study finds that for the minority of households who initially consulted the local pharmacy and traditional healer that the total economic burden was proportionally greater by 16.17 US\$.

Although the number of cases of severe acute malnutrition observed in the retrospective arm of the research were taken in a period where the prevalence of severe acute malnutrition was high, the retrospective household cost of illness is similar to the prospective cost of illness, possibly suggesting that the economic cost of severe acute malnutrition is not dependent on endemicity or economic climate. This finding is contrary to [35;20] who find that the economic cost of malaria varies according to endemicity, and production season. Comparing the economic cost of child malnutrition in 2008 when the economy had negative GDP growth to that of 2011 where the economy had returned to positive GDP economic growth, there is no difference in economic cost. However, this result should be interpreted with extreme caution as some of the cost components used to estimate direct costs for participant recruited in the retrospective arm of the research was extrapolated from household responses derived in the prospect arm of the research and reflect the cost inputs relevant to the 2011 context.

The study further revealed that that the economic burden of malnutrition is higher in children who are concurrently suffering from multiple co-morbidities. The presence of multiple co-morbidities increased the household expenditure on direct costs. Children who were suffering from oedematous severe acute malnutrition with diarrhoea spent 10 US\$ more compared to children who were only suffering from severe acute malnutrition. Similarly, children suffering from oedematous severe acute malnutrition in addition to pneumonia spent 5.27US\$ more on treatment contrast to child suffering from severe acute malnutrition with no additional co-morbidities.

While households with children suffering from oedematous severe acute malnutrition and diarrhoea incurred the largest incremental costs, the higher costs are an indication of longer hospital stay, contrast to those who were suffering from oedematous severe acute malnutrition with pneumonia.

The differential expenditure between cases of pneumonia and diarrhoea reflects the higher transport costs incurred as a result of differences in length of hospital stay. The longer duration in hospital stay found in this study possibly reflects patient's unresponsiveness to treatment within the standard recovery period of 4 days as per WHO 10 Steps guidelines [33]

Although the government of Zimbabwe provides free health care services to children under the age of 5 years, the direct cost estimates generated in this study remained relatively high. The transport costs associated with seeking treatment at a tertiary healthcare facility was 13.20US\$ which accounted for over a third of direct out of pocket expenditures. This result agrees with studies conducted in Zambia and Malawi [22; 18]. In the case of Zambian households, transport costs accounted for a large share of out of pocket payments owing to a longer period of illness contrast to this study where the high cost of living is influencing the magnitude of transport costs. It follows that the high costs associated with seeking treatment continue to act as access barriers, thereby decreasing the affordability of free health care services. The implication of decreased affordability in accessing healthcare poses a significant challenge towards the achievement of The Millennium Development Goals.

Indirect cost burden

While monthly household expenditure on healthcare increased by 24%, households further incurred indirect cost of malnutrition equivalent to 31% of monthly income. Contrast to the relatively low losses in productive income experienced by Bangladeshi households while treating diarrhoea [34], caretakers in this study lost a significant amount of income per episode of malnutrition. Households in Bangladesh lost production equivalent to 3.99 US\$ over 15 days, contrast households in Zimbabwe who lost 47.13 US\$ over an average period of 12 days. Despite the substantially higher absolute indirect costs, the result that indirect costs outweigh direct costs complements evidence from several studies across low income countries [19; 20; 35].

In this study, the role of caretaking was predominantly assigned to females who lost between 6 to 14 hours per day over an average hospital stay of 12 days. Although the majority of females were unemployed, this result suggests that as economic recovery progresses and Zimbabwe moves towards full employment, gender inequities in the labour market will persist. Furthermore, in the current context where the labour market is highly informal and where households rely extensively on urban agriculture for food security, absenteeism of the caretaker from home production activities such as agriculture will increase food insecurity and possibly exacerbate household malnutrition.

Households can incur cost associated in seeking treatment of child malnutrition over three distinct phases; the period before hospitalisation, the period of weight stabilisation in the hospital and the

follow up period characterised by treatment of acute malnutrition in out-patient and in the community. This study estimated the household cost of malnutrition over the time period extending from the onset of illness prior to hospitalisation and the hospitalisation period. Given that this study did not estimate the cost incurred post hospitalisation, it is highly probable that the household economic burden is greater than estimated in this study.

Household responses to illness

How households finance the direct costs associated with illness is an important factor in determining the long-term household economic status. Although several empirical studies [20; 22] find evidence that a household's immediate response to finance direct costs is to liquidate savings this was not the case in Zimbabwe. The use of saving as a coping mechanism was not a viable coping strategy in Zimbabwe given the low savings incidence and that a large proportion of savings in Zimbabwe were eroded as a result of hyperinflation in 2008. It follows that 31 out of 40 households financed the direct costs through changes in food consumption a finding summarised in a cost of illness literature review conducted by (McIntyre D & Thiede M, 2006) and highlighted in a Zimbabwean study on household coping strategies used to cope with the burden of HIV/AIDS [36].

This study highlighted the importance of wide and strong social networks in potentially minimising losses to productivity. The study found that 63% of households were able to receive assistance with their daily activities while they were taking care of the ill child. Although this study did not attempt to estimate the exact level of productive losses recovered through intra-and inter household substitution, results from the sensitivity analysis conducted suggests that as caretakers are able to recover production losses, the magnitude of economic burden marginally declines.

The effect of household economic burden on household welfare

Results from the study revealed that households were living in income poverty with high levels of unemployment against a background of high living costs. The result mirrors the economic status of 78% of Zimbabwean households whose monthly incomes fall below the poverty datum line. For these low-income households living in Zimbabwe on a monthly income of 150.81 US\$ or less, the out of pocket payments imposed by additional expenditure on health care is equivalent to 24 % of the total household income. This level of expenditure is considered to be impoverishing given that it exceeds the 10% threshold level [17].

Limitations of the study

There are a number of limitations associated with this study. For instance, the tools used to collect data for the study were highly quantitative in nature, which limited the ability to comprehensively capture aspects of household socio-economic status. It is recommended that future

studies incorporate a qualitative aspect to more accurately capture the socio-economic status of the household. Other study limitations were owing to several factors including constraints in health surveillance in Zimbabwe, methodological issues and assumptions used in the estimation of the economic burden.

i. Missing medical records

During the period from mid-2008 to early 2009, Harare central hospital did not have administrative resources to maintain patient medical records of all admissions. Therefore the medical records analysed during this period do not necessarily reflect the true prevalence of malnutrition.

ii. Valuation of home production

In this study, it was assumed that all the caretakers engaged in some of home production which we valued using the minimum wage rate for a labourer involved in agriculture. Although the assumption that urban agriculture is the main form of home production is not too abstract given the widespread practice in Harare the implied wage may not truly approximate the value of home production. For caretakers that may be engaged in other forms of high income home production such as cross-border trading, the application of the agricultural wage may underestimate the value of lost production.

iii. Intra-labour substitution

Although results from the survey questionnaire revealed that over 60% of households were able to receive assistance with their economic activities, the estimates generated did not factor in the effect of minimised production losses as this information was not easily available using a quantitative questionnaire. Future research should attempt to use qualitative methods to derive a more accurate estimate of the quantity of lost production.

iv. The number of children included in the study was relatively small

Although the prevalence of severe acute malnutrition is low and the appropriate sample size was used in the study, the total number of participants remains relatively low thus restricting inferences across geographical areas. The study is limited in that the results may not be generalizable across Zimbabwe as data was collated from one study site. It follows that future research should aim to collate data from multiple health care facilities across different geographical locations.

3.6. CONCLUSIONS

This article highlights that the cost of child malnutrition exerts a significant burden on Zimbabwean households who are already living below the line of poverty. Given the financial burden of 24% of monthly income, it follows that these poor households will likely be trapped in a cycle of income poverty and malnutrition. In addition to the financial burden imposed by severe acute malnutrition, the opportunity cost associated with forgoing income activities to take care of the sick child implies possible increase in food insecurity owing to reduced income streams as well as reduced urban agriculture produce. Furthermore, although healthcare services ought to be free as prescribed by policy, households continue to subsidise the healthcare providers by financing some of the costs through payments of medicines.

3.7. COMPETING INTERESTS

The author declares that they have no competing interests

3.8. ACKNOWLEDGEMENTS

This study received financial support from SIDA (Swedish International Development Agency). SIDA was not involved in study conception, design, analysis, or writing of the manuscript. All results and interpretations are that of the author and not of SIDA.

3.9. REFERENCES

1. UNDP. (2010). 2010 Millennium Development Goals Status Report Zimbabwe. United Nations Development Program
2. UNICEF (2011). A Situation Analysis on the Status of Women's and Children's Rights in Zimbabwe, 2005 - 2010: A call for Reducing Disparities and Improving Equity. UNICEF
- [3] WHO, (2011) . Reducing child mortality [online] Available at:<<http://www.who.int/mediacentre/factsheet/fs178/en/index.html>>[accessed 28 November 2011]
- [4] Kauffman S., Schaible, U. (2007). Malnutrition and Infection: complex mechanism and global impacts. *PLoS Med* 4(5)
- [5] Collins S. (2007). Treating severe acute malnutrition seriously. *Arch Dis Child* 2(5) 453-46
- [6] Food and Nutrition Council (2010) Zimbabwe National Nutritional Survey, Harare, Zimbabwe
- [7] Mutseyekwa T., Singizi T (2008) Treating child malnutrition as Zimbabwe grapples with raging inflation [online] available at: http://unicef.org/inforbycountry/zimbabwe_46161.thml [accessed January 2011]
- [8] TARSC., MOHCW. (2011) Equity watch: Assessing progress towards equity in health in Zimbabwe, EQUINET t, Harare
- [9] IRIN (2006) Rising child malnutrition linked to Aids [online] Available at:<<http://www.irinnews.org/report/5898984/zimbabwe-rising-child-malnutrition-signal-impact-of-poverty--aids>> [access 2011]
- [10] UNICEF (1990). A UNICEF policy review: strategy for improved nutrition of children and women in developing countries, UNICEF New York
- [11] Behrman J, A. H. (2004).Hunger and malnutrition. Copenhagen Conesus - Challenges and opportunities. Copenhagen
- [12] Vorster, H. (2010)The link between poverty and malnutrition: A south African Perspective *Journal of Interdisciplinary Health Sciences* 15(2) 1-6
- [13] World Bank(2006). Repositioning Nutrition as Central to Development, World Bank, Washington DC.
- [14] Alderman H. (2005) Linkages between poverty reduction strategies and child nutrition: An Asian perspective *Economic and political weekly* 40(46) 4837-4842
- [15] Alderman H., Kinsey B., Hoddinot J. (2006) Long term consequences of early childhood malnutrition *Oxford economic papers* 58(3) 450-474
- [16] Xu K.,(2005). Distribution of health payments and catastrophic expenditures Methodology. World Health Organization Discussion Paper, , 2.
- [17] Xu, K., Evans, D.B., Carrin, G., Aguilar-Rivera, A.M., Musgrove, P. & Evans, T. (2007) Protecting households from catastrophic health spending *Health affairs* 26(4), 972-983.
- [18] Lara R., Kunkwenzu E., Lallo D.(2009) Health seeking behaviour after fever onset in malaria-endemic area of Malawi *American journal of tropical medicine and hygiene* 81(6) 935-943
- [19] McIntyre, D., and Thiede, M. (2003).A review of studies dealing with the economic and social sequences of high medical expenditure with a special focus on the medical poverty trap. Health Economics Unit, University of Cape Town, Cape Town.
- [20] Sauerbon R, A. A. (1996).Household Strategies to cope with the economic costs of illness. *Social Science and Medicine* , 43 (3), 291-301.
- [21] Mutangadura, G., Mukurazita, D., & Jackson, H. (1999).A review of household and community responses to the HIV/AIDS epidemic in the rural areas of sub-Saharan Africa. Geneva: UNAIDS best practice collection.
- [22] Russell, S. (2004). The economic burden of illness for households in developing countries: a review of studies focusing on Malaria, Tuberculosis and human immunodeficiency virus/ acquired immunodeficiency syndrome. *The American Society of Tropical Medicine and hygiene*, 71 (2), 147-155.
- [23] Meldrum A.(2008) Zimbabwe's health care struggles on *Lancet* 371 p.1059-1060

-
- [24] Direct Relief (2011) [online] available at:
<http://www.directrelief.org/wherewework/zimbabwe/hararecentralhospital.aspx> [accessed July 2011]
- [25] UNICEF (2006) UNICEF humanitarian action Zimbabwe summary for 2005
- [26] Segal, J. (2006). Cost of illness Studies - Primer. RTI International.
- [27] DeLeire T, Manning W (2004). Labour market cost of illness: prevalence matters *Health economics* 13 239-250
- [28] Toriro P (2009) The impact of the economic meltdown on urban agriculture in Harare, Urban agriculture 21 26-27
- [29] Dodman D (2009) United density and climate change *United Nations population fund*
- [30] Mutandwa E., Gadzirayi C., (2006) The role of maize sub-sector as a food security net for urban households in Bindura Town of Mashonaland Central Province in Zimbabwe. *Journal of Sustainable development in Africa* 8(1)
- [31] Combined Harare residents association (2008) ZINWA's house in absolute disarray, available http://www.kubatana.net/html/archive/localgov/081008chra.asp?sector=localgov&year=2008&range_start=1
- [32] Alagmir, N., Naheed, A., Luby, S. (2010). Coping strategies for financial burdens in families with childhood pneumonia in Bangladesh. *BMC Public health* 10(622)
- [33] World Health Organisation (1999) Management of severe acute malnutrition : a manual for physicians and other senior health workers, England
- [34] Anon. (n.d) Economic costs and determinants of diarrheal prevalence and duration in children of Dhaka city slums Bangladesh
- [35] Chuma, J., Okungu, V., Molyneux, C. (2010). The economic costs of Malaria in four Kenyan districts: do household costs differ by disease endemicity? *Malaria Journal*, 9
- [36] Mutangadura, G., Mukurazita, D., & Jackson, H. (1999). A review of household and community responses to the HIV/AIDS epidemic in the rural areas of sub-Saharan Africa. Geneva: UNAIDS best practice collection.

4. POLICY BRIEF

POLICY BRIEF

About the study:

This policy brief is based on the dissertation titled “Inpatient household economic burden of child malnutrition in Zimbabwe: a case study of Harare hospital”

The research presented in this paper was conducted by Rufaro Masiwa in partial fulfilment of the requirements for a MPH (health economics) from the University of Cape Town. The research was supervised by Dr Olufunke Alaba

Acknowledgement:

The study was funded by The Swedish International Development Agency (SIDA). SIDA does not necessarily share the views expressed in this material.

Responsibility for its content rests with the author.

For more information, please email:
Rufaro.masiwa@gmail.com

Inpatient household economic burden of child malnutrition in Zimbabwe: a case study of Harare hospital

INTRODUCTION



Severe acute malnutrition (SAM) is one of the leading causes of death in children under the age of five years worldwide. Nearly 50% of child deaths can be directly and indirectly attributable to SAM. An application of prevalence rates to the global population implies in

absolute terms that between 1 million to 2 million preventable deaths per year are attributed to this disorder. Additionally, it is estimated that nearly 20 million children under the age of five years are suffering from SAM¹.

In Sub-Sahara Africa, it is estimated that 9% of children are suffering from SAM and are at a higher risk of death from this condition while 2.1% of children in Zimbabwe are suffering from this disorder. While the disease burden of SAM in Zimbabwe is relatively low in comparison to Sub-Sahara Africa,

in absolute terms, it is estimated that up to 12 000 under-fives deaths are attributable to malnutrition².

To address the burden of SAM, Zimbabwe provides “free” inpatient health care services across limited health care facilities in the country. These services include the stabilisation of weight, treatment of underlying co-morbidities and the supply provision of ready to use therapeutic food upon discharge from the malnutrition ward or stabilisation centre.

¹ WHO, 2007

² UNICEF, 2011

However, as there are limited health care facilities with sufficient resources to provide these services at the primary health care level, caretakers of severely malnourished children are often referred to tertiary health care facilities. While children under the age of 5 years are not charged fees for using these health care services, households incur significant out of pocket payments while seeking and accessing these services.

The out of pocket payments incurred while seeking treatment can be devastating on a household's economic status. For the 78% of Zimbabwean households that live below the poverty datum line, the economic costs associated with seeking treatment for child malnutrition can exert impoverishing effects on the economic status of the household. In addition to the out of pocket payments incurred by households while seeking treatment for SAM, households can incur significant income losses owing to absenteeism from economic activities. As these income losses occur during a period where household expenditure is rising, it suggests that the effect of lost productive time can further contribute to the impoverishment of households.

For Zimbabwe to make meaningful strides towards achieving progress towards the fulfilment of health and poverty Millennium Development Goals there is a need to either reduce the incidence of severe acute malnutrition or improve the household economic status for the 78% of households living in absolute.

This policy brief draws on research conducted in Zimbabwe that evaluated the household economic cost of seeking treatment for severe acute malnutrition at inpatient malnutrition wards located in tertiary hospitals. The findings from the study will be useful in informing policy that seeks to improve household economic status by reducing the incidence of poverty and breaking the vicious cycle between malnutrition and poverty. By understanding the potential pathways between malnutrition and poverty, appropriate policy actions can be implemented to reduce the probability of households falling deeper into poverty.

RESEARCH OBJECTIVE

This research estimates the direct and indirect costs incurred by households while seeking treatment for SAM at Harare Central Hospital. It further examines how household responded to these costs burden and explores whether the direct cost burdens and household responses to these burdens had a significant effect in reducing household welfare.

METHODS

The study was conducted at Harare Central Hospital. The hospital is a tertiary level healthcare facility which offers inpatient treatment of SAM in especially dedicated malnutrition wards.

Direct medical costs were estimated as the quantity of medical inputs multiplied by the unit input price. Data on the quantity of medical inputs was collated through a retrospective and prospective review from patient medical charts of under-fives admitted to the malnutrition ward. A total of 40 medical charts were reviewed in the prospective arm of the research while 102 medical charts were reviewed for the retrospective arm of the research.

Direct medical input prices were derived from the UNICEF and WHO's 2009 publication of *Sources and prices of selected medicines for children*.

To estimate the household direct non-medical expenditures and indirect costs of SAM a household questionnaire was administered to 40 caretakers. In addition, the household questionnaire collated information on the household coping strategies to direct and indirect costs.

FINDINGS

| Treatment scenario | Cost (in US\$) | Household direct cost expenditures as % of average monthly household income |
|---|----------------|---|
| SAM with no co-morbidities | US\$ 29.69 | 20% |
| SAM & oedema & pneumonia | US\$ 34.86 | 23% |
| SAM without accounting for co-morbidities | US\$ 36.75 | 24% |
| SAM & oedema & diarrhoea | US\$ 39.69 | 26% |

Total direct cost of severe acute malnutrition from the perspective of households during an episode of illness (excluding drug costs incurred prior to hospital admission)

- Without explicitly accounting for the presence of co-morbidities, the total household financial cost of seeking treatment for SAM at a tertiary healthcare facility is 36.75 US\$ for an average hospital stay of 12 days. This total direct expenditure is equivalent to depleting the average household monthly income of 150.81 US\$ by 24%.
- 11 out of 40 children recruited in the prospective arm of the research were readmissions into the malnutrition ward
- Despite the National government's free health care policy for under-fives, households subsidized the healthcare provider through making financial payments towards expenditure of drugs that were prescribed for treatment and not provided by the health care facility.

These payments are equal to 6.98 US\$, which in context of generated monthly household income of 150.1US\$ accounts for a proportion share of 4.63% of monthly household income.

- For households that initially sought treatment from pharmacies and traditional healers before seeking treatment from the formal health care system, the financial costs incurred in accessing treatment for SAM were greater by amounts varying from as much as US\$5 to amounts closer to US\$30.

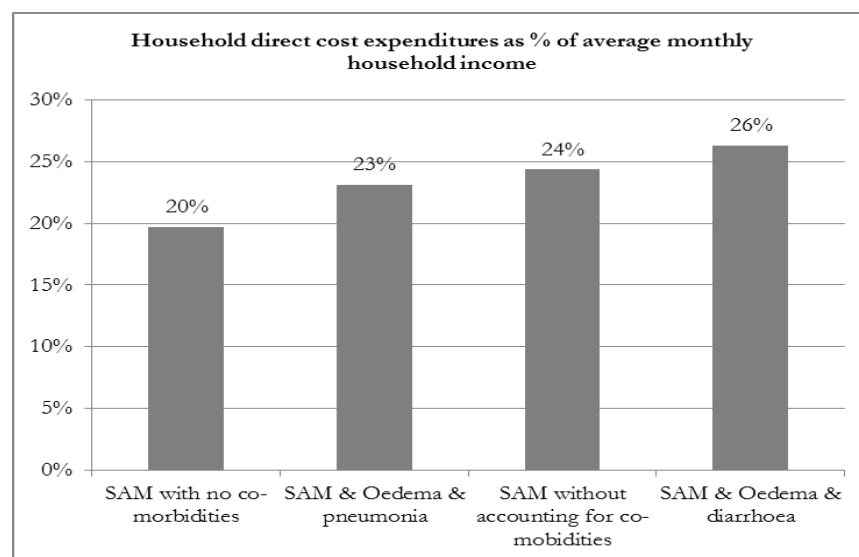
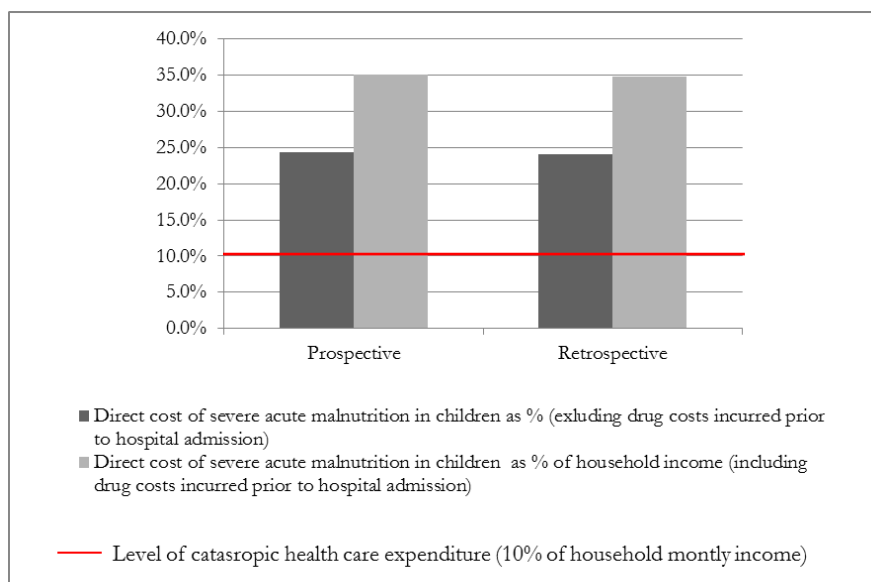


FIGURE 14: HOUSEHOLD DIRECT COST EXPENDITURES AS % OF AVERAGE MONTHLY HOUSEHOLD INCOME

- Child patients were often treated for SAM and additional co-morbid diseases including; pneumonia, diarrhoea, fever and gastrointestinal disorders
- When explicitly accounting for the presence of co-morbidities, the household cost of treating SAM in the absence of co-morbid diseases is 29.69US\$. The presence of co-morbidities in children suffering from SAM increases the household expenditure of seeking treatment.
- Women were assigned the role of primary care taker. While tending care to the ill child during inpatient phase of treatment, caretakers lost approximately 11 days of economic productivity. The approximate loss in economic productivity was equivalent to a loss of 31% of the average monthly household income.



*Direct costs that exceed 10% of monthly household income are considered to lead to a decline in household welfare
FIGURE 15: THE EFFECT OF HOUSEHOLD DIRECT COSTS OF SAM ON HOUSEHOLD WELFARE

- To cope with the financial cost of seeking treatment for SAM, 65% of households reported reducing the quantity and quality of household food consumed since the child showed symptoms of illness.
- Household expenditures on direct cost of treatment have an impoverishing effect on household welfare. Household expenditure on treatment exceed 10% of monthly household income – a maximum threshold level that is considered to constitute catastrophic health care expenditure

THE IMPLICATION OF THESE FINDINGS ON POLICY

- The cost of seeking treatment for households currently living in absolute poverty is likely impoverishing, as shown by the household's desperate adoption of a coping strategy that involves reducing household food consumption to meet the financial obligation of direct costs. While this strategy enabled household to cope with the cost of treatment, it additionally increased the probability reoccurrence. It follows that owing to the complex relationship between malnutrition, ill health and poverty, there is a need to reduce the size of economic burden that falls on the poor.
- The study illustrated that although health care services were available free of charge to households, the cost of seeking and accessing these services was burdensome on households. The high cost of living as reflected in the high transport and food costs is upwardly driving the out of pocket expenditures. As the estimated costs reflect the costs incurred by households that accessed health care services, it may be likely that the magnitude of these costs were deterrents of the ultra-poor in seeking treatment.

- Gender inequities in the labour market will likely persist, given that females are more likely to be absent from economic activities while engaging in care taking activities.

POLICY RECOMMENDATIONS

EXPAND THE SERVICE COVERAGE OF COMMUNITY-BASED MANAGEMENT OF ACUTE MALNUTRITION

- ⊕ To address the low coverage of SAM treatment at primary levels of health care and reduce the costs associated with seeking treatment at tertiary levels of health care, it is recommended to continue to support the scale up of community-based management of acute malnutrition programmes. In line with increasing service coverage, human resources capacity constraints should be address. Furthermore, human resources should be adequately trained to ensure effective and efficient delivery of treatment.

To complement the efforts of CMAM, it is recommended that current initiatives that aim to improve household access to clean water and provide improved sanitation services focus their efforts in areas where SAM and diarrhoeal prevalence rates are high.

INCREASE LEVEL OF FUNDING IN EXISTING CMAM PROGRAMMES

- ⊕ To reduce the household expenditure on medicines, it is recommended to increase the availability of medicines at clinic and hospital dispensaries. This means that within existing CMAM programmes, it is advised that levels of funding increase to support the policy of providing free health care services which includes the provision of all essential medicines.

ROLL OUT LARGE SCALE SUPPLEMENTARY FEEDING PROGRAMMES TO ADDRESS ACUTE MALNUTRITION IN ADDITION TO SUPPORTING THE PRACTICE OF URBAN AGRICULTURE

- ⊕ One way to increase reduce the incidence of SAM is to improve household food security. It is therefore recommended that Zimbabwe initiate robust supplementary feeding programme targeted towards reducing acute malnutrition.
- ⊕ Initiating a large scale supplementary feeding programme requires the support of a significant amount of resources including financial and human capacity. It is therefore recommended that while accumulating sufficient resources to roll out such a plan that, agricultural programmes or initiatives continue to encourage households to engage in urban agriculture. Initiatives should further encourage households to diversify their agricultural produce to promote a wider access of different food groups. In implementing these initiatives, it is recommended to address constraints including poor access to water for agricultural use.

CONCLUSION

Free health care services for treatment of SAM in under-fives have been shown to be expensive for poor households in Zimbabwe. Findings from this study show that SAM exerts a significant financial burden on households at a time where care takers are least productive economically. Changes in policy to increase the availability of SAM treatment services at primary levels of health care are likely to reduce the household economic burden. It follows that decreases in economic burden will increase affordability and access for the ultra-poor, thereby possibly reduce the number case fatalities that may arise when households choose to forgo accessing SAM treatment services because of the associated high economic burden.

University of Cape Town

5. APPENDICES

5.0. KEY DEFINITIONS

| | |
|-------------------------|--|
| Household | Individuals who dwell under the same roof and consume food from the same pot. |
| Ill health | a condition of inferior health in which some disease or impairment of function is present |
| Caretaker | Paid/ unpaid members of a household who engage in the caretaking of a child during the period of illness. Activities of caretaking include taking the child to the hospital, feeding, bathing and administering medication to the child. |
| Vulnerability | The exposure to contingencies (i.e. illness) and stress and difficulty in coping with them |
| Absolute poverty | Living on a household income below the national poverty datum line |

5.1. SAMPLE SIZE CALCULATION

$$n = \frac{t^2 \times p(1 - p)}{d^2}$$

Where n = calculated sample size;
t = level of confidence;
p = estimated prevalence;
d = margin of error.

$$n = \frac{1.96^2 \times 0.024(1 - 0.021)}{0.05^2} = 36$$

To account for non-responses, increase sample size participants by 10%

$$= 36 \times 1.1 = 40 \text{ participants}$$

—

**INFORMED CONSENT FORM
FOR PARENTAL CONSENT**

The economic burden of child malnutrition in Zimbabwe

Principal Investigator: Rufaro Masiwa, *Bcom Economics (Hons)*
Phone number: +27 72 165 1233 or +263 712 77 00 35
Email address: Rufaro.masiwa@uct.ac.za

What you should know about this research study:

- We give you this consent so that you may read about the purpose, risks, and benefits of this research study.
 - Routine care is based upon the best-known treatment and is provided with the main goal of helping the individual patient. The main goal of research studies is to gain knowledge that may help future patients.
 - We cannot promise that this research will benefit your child. Just like regular care, this research can have side effects that can be serious or minor.
 - You have the right to refuse to allow your child to take part, or agree for your child to take part now and change your mind later.
 - Whatever you decide, it will not affect your child's regular care.
 - Please review this consent form carefully. Ask any questions before you make a decision.
 - Your choice to allow your child to participate is voluntary.
-

PURPOSE

You are being asked to allow your child to participate in a research study of the economic burden of child malnutrition in Zimbabwe. The purpose of the study is to investigate the economic consequences that child malnutrition may impose on household budget and household activities. Your child was selected as a possible participant in this study because you have brought your child to seek treatment in the pediatric ward at this hospital. Your child is one of 40 children that have been selected to participate in the research. In total, approximately 40 children who are admitted into the pediatric ward of Harare Central hospital will be selected to participate in the research.

PROCEDURES AND DURATION

If you decide to allow your child to participate, your child will undergo;

1. One standard physical examination measuring the weight and height.
2. In addition, one of our researchers will track and rerecord your child's patient medical record from when your child is admitted to hospital and when your child is discharged from the hospital.

RISKS AND DISCOMFORTS

The process of measuring your child's weight and height will not bring severe discomfort to your child, however, if you feel uncomfortable about subjecting your child to being measured, you are welcome to refuse the offer to include your child in the participation of the study.

In addition to taking body measurements of your child, one of our researchers will keep a record of all the drugs, time spent in hospital and treatment given to your child. If you are not comfortable with one of our researchers in accessing this information, you are welcome to decline the participation of your child from the study.

BENEFITS AND/OR COMPENSATION

There are no direct benefits to you or your child for participating in this study

This project aims to understand the relationship between child malnutrition and the impact on households. This information will be valuable to a range of different people, including policies makers who can use this information in decision-making.

We cannot and do not guarantee or promise that your child will receive any benefits from this study.

CONFIDENTIALITY

If you indicate your willingness for your child to participate in this study by signing this document, we plan to disclose the research findings in an article to be reviewed by academic examiners at the University of Cape Town. Any information that is obtained in connection with this study that can be identified with your child will remain confidential and will be disclosed only with your, and when appropriate, your child's permission. Confidentiality will be maintained limiting the availability of the collected data to the main researcher, academic supervisor and field workers. Under some circumstances, the MRCZ and the local Institutional Review Board may need to review patient records for compliance audits.

ADDITIONAL COSTS

The research study does not anticipate that you will face additional costs as a consequence of allowing your child to participate in the research

IN THE EVENT OF INJURY

In the event of injury resulting from your child's participation in this study, treatment can be obtained at the Medical Hospitals. You should understand that the costs of such treatment will be your responsibility. Financial compensation is not available.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you decide not to allow your child to participate in this study, your decision will not affect you or your child's future relations with this institution, its personnel, and associated hospitals. If you decide to allow your child to participate, you and your child are free to withdraw your consent and assent and discontinue participation at any time without penalty.

OFFER TO ANSWER QUESTIONS

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

AUTHORIZATION

YOU ARE MAKING A DECISION WHETHER OR NOT TO ALLOW YOUR CHILD TO PARTICIPATE IN THIS STUDY. YOUR SIGNATURE INDICATES THAT YOU HAVE READ AND UNDERSTOOD THE INFORMATION PROVIDED ABOVE, HAVE HAD ALL YOUR QUESTIONS ANSWERED, AND HAVE DECIDED TO ALLOW YOUR CHILD TO PARTICIPATE.

The date you sign this document to enroll your child in this study, that is, today's date, **MUST** fall between the dates indicated on the approval stamp affixed to each page. These dates indicate that this form is valid when you enroll your child in the study but do not reflect how long your child may participate in the study. Each page of this Informed Consent Form is stamped to indicate the form's validity as approved by the MRCZ.

 Name of Parent (please print)

 Date

 Signature of Parent or legally authorized representative

 Time

 AM
 PM

 Relationship to the Subject

 Signature of Witness
(Optional)

 Signature of Research Staff

YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM TO KEEP.

If you have any questions concerning this study or consent form beyond those answered by the investigator, including questions about the research, your rights as a research subject or research-related injuries; or if you feel that you have been treated unfairly and would like to talk to someone other than a member of the research team, please feel free to contact the Medical Research Council of Zimbabwe on telephone 791792 or 791193 and University of Cape Town Faculty of Health Sciences Human Research Ethics Committee on telephone 021 406 6425.

INFORMED CONSENT FORM

The economic burden of child malnutrition on Zimbabwean households

Principal Investigator: Rufaro Masiwa, *Bcom Economics (Hons)*
Phone number: +27 72 165 1233 or +263 712 77 00 35
Email address: Rufaro.masiwa@uct.ac.za

What you should know about this research study:

- We give you this consent so that you may read about the purpose, risks, and benefits of this research study.
- Routine care is based upon the best known treatment and is provided with the main goal of helping the individual patient. The main goal of research studies is to gain knowledge that may help future patients.
- We cannot promise that this research will benefit you. Just like regular care, this research can have side effects that can be serious or minor.
- You have the right to refuse to take part, or agree to take part now and change your mind later.
- Whatever you decide, it will not affect your regular care.
- Please review this consent form carefully. Ask any questions before you make a decision.
- Your participation is voluntary.

PURPOSE

You are being asked to participate in a research study of *the economic burden of child malnutrition in Zimbabwe*. The purpose of the study is The purpose of the study is to investigate the economic consequences that child malnutrition may impose on household budget and household activities You were selected as a possible participant in this study because you have brought your child to seek treatment in the pediatric ward at this hospital. Your child is one of 40 children that have been selected to participate in the research. In total, approximately 40 children who are admitted into the pediatric ward of Harare Central hospital will be selected to participate in the research.

PROCEDURES AND DURATION

If you decide to participate, you will be asked to participate in a 30 minute questionnaire survey. The survey that will ask questions about your child's health as well ask questions relating to your household.

RISKS AND DISCOMFORTS

There are no medical risks in completing the questionnaire survey. However, as the survey will require that you spend 30 minutes answering questions you will experience some time inconvenience. Some of the questions ask questions that you may consider be of a personal nature.

If at any time, you do not want to respond to the ask question, you may refuse to answer the question.

BENEFITS AND/OR COMPENSATION

If you decide to participate you will receive no payment for participating in this study.

This project aims to understand the relationship between child malnutrition and the impact on households. This information will be valuable to a range of different people, including policies makers who can use this information in decision making.

We cannot and do not guarantee or promise that your will receive any benefits from this study.

CONFIDENTIALITY

If you indicate your willingness to participate in this study by signing this document, we plan to disclose the research findings in a article to be reviewed by academic examiners at the University of Cape Town. Any information that is obtained in connection with this study that can be identified with you will remain confidential and will be disclosed only with your permission. [Confidentiality will be maintained limiting the availability of the collected data to the main researcher, academic supervisor and field workers.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you decide not to participate in this study, your decision will not affect your future relations with the University of Cape Town, its personnel, and associated hospitals. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty.

University of Cape Town

OFFER TO ANSWER QUESTIONS

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

AUTHORIZATION

You are making a decision whether or not to participate in this study. Your signature indicates that you have read and understood the information provided above, have had all your questions answered, and have decided to participate.

The date you sign this document to enroll in this study, that is, today's date, **MUST** fall between the dates indicated on the approval stamp affixed to each page. These dates indicate that this form is valid when you enroll in the study but do not reflect how long you may participate in the study. Each page of this Informed Consent Form is stamped to indicate the form's validity as approved by the MRCZ.

 Name of Research Participant (please print)

 Date

 Signature of Participant or legally authorized representative

 Time

 AM
 PM

 Relationship to the Participant

 Signature of Witness
 Consent
(Optional)

 Signature of Staff Obtaining

YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM TO KEEP.

If you have any questions concerning this study or consent form beyond those answered by the investigator, including questions about the research, your rights as a research subject or research-related injuries; or if you feel that you have been treated unfairly and would like to talk to someone other than a member of the research team, please feel free to contact the Medical Research Council of Zimbabwe on telephone 791792 or 791193 and University of Cape Town Faculty of Health Sciences Human Research Ethics Committee on telephone 021 406 6425.

5.3. PATIENT MEDICAL RECORD CAPTURE FORM

Form Number

Date captured

Captured by: _____

Outpatient and inpatient capture data form

Part A

Section 1

| | | | Comments |
|--|--|---|----------|
| | Patient study folder number | <input type="text"/> | |
| | Date of Birth (Year, month, date) | <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> | |
| | Age | <input type="text"/> <input type="text"/> months <input type="text"/> <input type="text"/> years | |
| | Gender | <input type="checkbox"/> Male <input type="checkbox"/> Female | |
| | Total inpatient days | <input type="checkbox"/> hours <input type="checkbox"/> days | |
| | Date of hospital admission (YYMMDD) | <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> | |
| | Date of hospital discharge (YYMMDD) | <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> | |
| | Cured | <input type="checkbox"/> yes <input type="checkbox"/> No | |
| | Deceased | <input type="checkbox"/> Yes <input type="checkbox"/> No | |

Section 2: Medical History

| | Diagnoses | Key features | Comments |
|--|----------------------|----------------------|----------------------|
| | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Section 3: Physical examination

| | | | | Comments |
|--|---|--|--|----------|
| | Weight (To the nearest grams) | <input type="text"/> <input type="text"/> Kg <input type="text"/> <input type="text"/> grams | | |
| | Height (To the nearest millimetre) | <input type="text"/> <input type="text"/> <input type="text"/> cm <input type="text"/> <input type="text"/> mm | | |
| | Presence of oedema | <input type="checkbox"/> Yes <input type="checkbox"/> No | | |

Section 4: Classification of malnutrition according WHO growth standards and growth charts

| | | | | |
|--|------------------------------------|---|--|--|
| | Height-for-age (Stunting) | <input type="checkbox"/> Moderate <input type="checkbox"/> Severe | | |
| | Weight-for-age | <input type="checkbox"/> Moderate <input type="checkbox"/> Severe | | |
| | Weight-for-height (Wasting) | <input type="checkbox"/> Moderate <input type="checkbox"/> Severe | | |

Section 5: Medication

| Date | Type | Quantity | Purpose of treatment | Comments |
|------|------|----------|----------------------|----------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Section 6: Medical and surgical procedures

| Date | Type | Quantity | Purpose of treatment | Comments |
|------|------|----------|----------------------|----------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Section 7: Diagnostic tests

| Date | Type | Quantity | Purpose of treatment | Comments |
|------|------|----------|----------------------|----------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Section 8: Nutrition supplements and feeding formula

| Date | Time | Type of feed | Quantity | | Comments |
|------|------|--------------|----------|--|----------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

1. Section 9: Discharge medication/ formula

| | Type | Quantity | Purpose of treatment | Comments |
|--|------|----------|----------------------|----------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Section 10: Details of attending clinician

Name:

Position:

University of Cape Town

5.4. HOUSEHOLD QUESTIONNAIRE SURVEY

HOUSEHOLD SURVEY QUESTIONNAIRE

No: _____

Introduction

Hello. My name is _____ and I am a researcher from the University of Cape Town. We are conducting a study to investigate the cost of malnutrition disease on households. The purpose of this research is to collect information on the cost of treating child malnutrition. In addition, we would like to investigate how the cost of treating malnutrition affects the household decisions such as spending, employment and activities allocation around the house.

All the answers you provide will be kept confidential and will not be shared with anyone other than members in the research team. You do not have to participate in the survey, although we would greatly appreciate your answers to these questions since your views are important. If I ask you a question that you would not want to answer, please let me know and I go onto the next question. If at anytime during the interview, you feel uncomfortable and would like to stop the interview, please let me know and I will stop asking the questions.

If you need more information about the research, you may contact the person listed on the card that I will leave with you. Do you have any questions? May I begin the Interview?

Signature of interviewer _____ Date _____

(Proceed with the interview questions below if participant (caregiver) agrees to be interviewed.

Economic Burden of Child Malnutrition in Zimbabwe

Section 1: Background information and General Questions

| code | QNo. | | | Comments |
|--------|------|--|--|----------|
| rel | 1 | What is your relation to the child that you have accompanied to the hospital? 1 Parent 2 Grand parent 3 Uncle/aunt 4 Legal guardian 5 Neighbour/friend 6 I do not know 7 no response | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> | |
| city | 2 | Which city/town do you live in? | | |
| c | 3 | What is the name of Surbab you live in? | | |
| h20 | 4 | In your suburb, How often do you get clean water? 1 Everyday 2 2-3 times per week 3 Once a week 4 Once a month 5 Never 6 I do not know 7 no response | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> | |
| hnum | 5 | How many people including yourself live in your household? 1 0-4 people 2 >5 people 3 >10 people 4 I do not know 5 no response | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> | |
| hnumad | 6 | How many are adults over the age of 18? | | |
| hnumch | 7 | How many are children below the age of 18? | | |

| | | | | |
|-----|---|--|-----------------------|--|
| hoh | 8 | Who is the head of your household ? | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> |
| | | 1 | Father | |
| | | 2 | Mother | |
| | | 3 | Grandparent | |
| | | 4 | Other (specify) _____ | |
| | | 5 | I do not know | |
| | | 6 | no response | |

| | | | | |
|--------|---|---|---------------------|--|
| hohsch | 9 | What is the highest level of education of the head of household? | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> |
| | | 1 | No schooling | |
| | | 2 | Primary (Grade 7) | |
| | | 3 | Secondary (O level) | |
| | | 4 | Tertiary | |
| | | 5 | I do not know | |
| | | 6 | no response | |

Section 2 : Demographic information of child

| | | | | |
|-----|----|---|--------|--|
| sex | 10 | What is the sex (gender) of the child you have accompanied | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> |
| | | 1 | Male | |
| | | 2 | Female | |

| | | | | |
|-----|----|--|-----------|--|
| age | 11 | How old is the child you have accompanied to the hospital | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> |
| | | 1 | 0-1 year | |
| | | 2 | 2-3 years | |
| | | 3 | 4-5 years | |

Section 3 : Medical narrative

| | | | | | |
|-------|----|--|---------------------------------|--|---|
| hpurp | 12 | Why have brought child __ to the hospital (main reason?) | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> | NB: if interview response is 2, proceed to question 15. |
| | | 1 | Child has not been feeling well | | |
| | | 2 | Immunisation/routine check-up | | |
| | | 3 | Child had been refusing to eat | | |
| | | 4 | No response | | |
| | | 5 | Other (specify) _____ | | |

| | | | | |
|------|----|---|--|--|
| symp | 13 | In the last two weeks, has the child you have accompanied suffered illness from: | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> |
| | | 1 | Pneumonia | |
| | | 2 | Diarrhoea | |
| | | 3 | Respiratory infections (cough, flu, bronchitis) | |
| | | 4 | Malnutrition | |
| | | 5 | Other (Specify) _____ | |
| | | 6 | Fever | |
| | | 7 | I do not know | |
| | | 8 | no response | |

| | | | | | |
|-------|----|--|------------------|--|---|
| fsymp | 14 | When did you first notice that your child was ill or showing symptoms of illness? | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> | NB: if response is either 2,3,4,5,6,7 , proceed to question 14.1 . If response is equal to 1 , proceed to question 15. |
| | | 1 | Less than 1 Week | | |
| | | 2 | More than 1 Week | | |
| | | 3 | 1 month | | |
| | | 4 | Over a year | | |
| | | 5 | From birth | | |
| | | 6 | I do not know | | |
| | | 7 | no response | | |

| | | | | |
|-------|------|---|--|--|
| wsymp | 14.1 | Why did you not bring the child immediately to the clinic /hospital? | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> | |
| | | 1 Financial expense (too expensive) | | |
| | | 2 Hospital location is far | | |
| | | 3 Symptoms appeared to not need immediate medical attention | | |
| | | 4 I do not know | | |
| | | 5 no response | | |

| | | | | |
|-----|----|---|--|--|
| ref | 15 | Who referred you to Harare hospital? | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> | |
| | | 1 Self/ no referral | | |
| | | 2 local clinic (sister) | | |
| | | 3 Dietician/paediatrician | | |
| | | 4 I do not know | | |
| | | 5 no response | | |

| | | | | |
|------|----|--|--|--|
| pref | 16 | Has child __ previously been referred to the ward before this instance? | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | NB: Proceed to 16.1 if response was ' Yes' |
| | | 1 Yes | | |
| | | 2 No | | |
| | | 3 I do not know | | |
| | | 4 no response | | |
| | | | | |

| | | | | |
|-------|------|---|--|--|
| tpref | 16.1 | For how long was child __ admitted hospital the last time you were at Harare Hos | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> | |
| | | 1 Less than 1 week | | |
| | | 2 1- 2 weeks | | |
| | | 3 2 -4 weeks | | |
| | | 4 I do not know | | |
| | | 5 no response | | |

| | | | | |
|--------|----|---|--|--|
| sibmal | 17 | 11. Other than the child that you have brought into hospital, have any of the other siblings in your household been referred to the CMAM programme or the malnutrition ward? | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | |
| | | 1 Yes | | |
| | | 2 No | | |
| | | 3 I do not know | | |
| | | 4 no response | | |
| | | | | |

Section 4 : Health expenditure

| | | | | |
|-------|----|---|--|---|
| theal | 18 | Before bring the child to the hospital, did you... | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> | NB: proceed to 19 if response -- > 1; if response is 2--> 18.1; if response is 3 --> 18.2 |
| | | 1 Do nothing | | |
| | | 2 See a traditional healer | | |
| | | 3 Purchase medication from pharmacy | | |
| | | 4 I do not know | | |
| | | 5 no response | | |

| | | | | |
|--------|------|--|--|--|
| theald | 18.1 | When you visited the traditional healer, did you pay any money? | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | |
| | | 1 No | | |
| | | 2 Yes (Specify) _____ | | |
| | | 3 I do not know | | |
| | | 4 no response | | |
| | | | | |

| | | | | |
|---------|------|--|--|--|
| tpharmd | 18.2 | When you visited the Pharmacist, did you pay any money? | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | |
| | | 1 No | | |
| | | 2 Yes (Specify) _____ | | |
| | | 3 I do not know | | |
| | | 4 no response | | |
| | | | | |

| | | | | |
|----------|------|--|---|--------------------------------------|
| fee | 19 | <p>When you arrived at the hospital, did you have to pay any money to the hospital</p> <p>1 No</p> <p>2 Yes (Specify) _____</p> <p>3 I do not know</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |
| dfec | 20 | <p>Did you have to buy or bring additional medicine for your child's treatment?</p> <p>1 No</p> <p>2 Yes (Specify amount) _____</p> <p>3 I do not know</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |
| medaid | 21 | <p>Is the child you have accompanied to the hospital on medical aid?</p> <p>1 Yes</p> <p>2 No</p> <p>3 I do not know</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |
| tmode | 22 | <p>How did you travel to the hospital with your child?</p> <p>1 Walk</p> <p>2 Bus</p> <p>3 Combi</p> <p>4 Private car</p> <p>5 Other</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> <p>5 <input type="checkbox"/></p> | |
| tmodcc | 23 | <p>How much did you spend on bus/ taxi/ fuel costs?</p> | | |
| htmode | 24 | <p>Excluding yourself. how many members of your household have travelled to visit/ accompany the child?</p> | | |
| hfood | 25 | <p>Since you have been at the hospital, have you spent any money buying food to eat?</p> <p>1 No</p> <p>2 Yes (Specify amount) _____</p> <p>3 I do not know</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |
| haccomm | 26 | <p>In seeking health care services for your child, have you had to travel to Harare from another city? (i.e. Do you live outside the city of Harare)</p> <p>1 No</p> <p>2 Yes (Specify) _____</p> <p>3 I do not know</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | NB: if response is 1, proceed to Q27 |
| haccomm1 | 26.1 | <p>Where are you living whilst your child is in hospital?</p> <p>1 Relatives</p> <p>2 Lodging (Specify amount per day) _____</p> <p>3 Other (Specify) _____</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |

Section 5 : Indirect cost and coping mechanisms

| | | | | |
|-------|----|--|---|--|
| twait | 27 | <p>How much time did you spend waiting for your child to be seen by a nurse/doctor?</p> <p>1 0- 1 hour</p> <p>2 1-2 hours</p> <p>3 Other (Specify) _____</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |
|-------|----|--|---|--|

| | | | | |
|--------|----|--|---|--|
| tvisit | 28 | <p>How many hours in a day did you spend visiting for your child in hospital?</p> <p>1 0- 1 hour</p> <p>2 1-2 hours</p> <p>3 Other (Specify) _____</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |
|--------|----|--|---|--|

| | | | | |
|------|----|---|---|--|
| care | 29 | <p>Who has been the primary caregiver since the child fell ill?</p> <p>1 You</p> <p>2 Parent</p> <p>3 Other (Specify) _____</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |
|------|----|---|---|--|

| | | | | |
|-----------|----|--|---|--|
| tcaregive | 30 | <p>How many days/ hours have you been absent from work as result of taking care of the child?</p> <p>1 0- 1 hour</p> <p>2 1-2 hours</p> <p>3 Other (Specify) _____</p> <p>4 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> | |
|-----------|----|--|---|--|

| | | | | |
|-----------|----|--|---|--|
| tcaregive | 31 | <p>Since child___ has been ill, how many hours at home did you and (or) caregiver spend away from normal daily activities in order to take care of the child before you brought the child for medical attention?</p> <p>1 0</p> <p>2 0-2 hours</p> <p>3 3-12 hours</p> <p>4 1 day</p> <p>5 Other (Specify) _____</p> <p>6 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> <p>5 <input type="checkbox"/></p> <p>6 <input type="checkbox"/></p> | |
|-----------|----|--|---|--|

It is common that the cost of seeking medical treatment when ill can be exorbitantly high,. Often households may have to employ various coping mechanisms to deal with the added strain on the household budget. The following questions seek to understand how your household adjusts financially to medical expenses.

| | | | | |
|--|----|--|---|--|
| | 31 | <p>Since child___ has been ill, how many hours at home did you and (or) caregiver spend away from normal daily activities in order to take care of the child before you brought the child for medical attention?</p> <p>1 0</p> <p>2 0-3 hours</p> <p>3 3-12 hours</p> <p>4 1 day</p> <p>5 Other (Specify) _____</p> <p>6 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> <p>5 <input type="checkbox"/></p> <p>6 <input type="checkbox"/></p> | |
|--|----|--|---|--|

| | | | | |
|---------|----|--|---|--|
| slabour | 32 | <p>Since the start of illness of your child, how have you coped with household activities? (When the primary caregiver is taking care of child, who has been doing their normal household chores?)</p> <p>1 No one</p> <p>2 Neighbour/friend</p> <p>3 Hired additional labour</p> <p>4 Siblings who are still in school</p> <p>5 Other (Specify) _____</p> <p>6 no response</p> | <p>1 <input type="checkbox"/></p> <p>2 <input type="checkbox"/></p> <p>3 <input type="checkbox"/></p> <p>4 <input type="checkbox"/></p> <p>5 <input type="checkbox"/></p> <p>6 <input type="checkbox"/></p> | <p>NB: proceed to Q32.1 if response is 3 or proceed to Q32.2</p> |
|---------|----|--|---|--|

| | | | |
|----------|------|--|----------------------------|
| slabourh | 32.1 | If you hired additional help from outside, How much do you spend per month? | |
| | | 1 less than \$100 | 1 <input type="checkbox"/> |
| | | 2 More than \$100 | 2 <input type="checkbox"/> |
| | | 3 Barter exchange | 3 <input type="checkbox"/> |
| | | 4 Other (Specify) _____ | 4 <input type="checkbox"/> |
| | | 5 no response | 5 <input type="checkbox"/> |

| | | | |
|-----------|------|---|----------------------------|
| slaboukid | 32.1 | During the period of illness, have any of the other siblings in the household been absent from school? | |
| | | 1 Yes (Specify number of days) _____ | 1 <input type="checkbox"/> |
| | | 2 No | 2 <input type="checkbox"/> |
| | | 3 I do not know | 3 <input type="checkbox"/> |
| | | 4 no response | 4 <input type="checkbox"/> |

| | | | |
|-----------|--------|---|----------------------------|
| slaboukid | 32.1.2 | What was the main reason the siblings were absent from school? | |
| | | 1 Illness (e.g. Flu) | 1 <input type="checkbox"/> |
| | | 2 Taking care of younger sibling (i.e the child in hospital today) | 2 <input type="checkbox"/> |
| | | 3 I do not know | 3 <input type="checkbox"/> |
| | | 4 no response | 4 <input type="checkbox"/> |

| | | | |
|------|----|---|----------------------------|
| cope | 33 | Who is responsible for the expenses related to the medical treatment given to your child? (i.e. Who is paying the medical bills>) | |
| | | 1 Medical Aid | 1 <input type="checkbox"/> |
| | | 2 Government (Excluded from making payment Borrowed money from friends. | 2 <input type="checkbox"/> |
| | | 3 Relatives | 3 <input type="checkbox"/> |
| | | 4 Cash from income earnings | 4 <input type="checkbox"/> |
| | | 5 Sale of assets (livestock, furniture) | 5 <input type="checkbox"/> |
| | | 6 Other (Specify) _____ | 6 <input type="checkbox"/> |
| | | 7 No response | 7 <input type="checkbox"/> |

Section 6 : Socio-economic profile

| | | | | |
|---------|----|--|----------------------------|--|
| sincome | 34 | What is the households main source of income? | | NB: it response is 'none' proceed to Q35 |
| | | 1 Employment | 1 <input type="checkbox"/> | |
| | | 2 Self employed | 2 <input type="checkbox"/> | |
| | | 3 None | 3 <input type="checkbox"/> | |
| | | 4 Government grant | 4 <input type="checkbox"/> | |
| | | 5 Farming | 5 <input type="checkbox"/> | |
| | | 6 Unkown | 6 <input type="checkbox"/> | |
| | | 7 no response | 7 <input type="checkbox"/> | |

| | | | |
|----------|------|--|----------------------------|
| sincomed | 34.1 | If you had to estimate, approximately how much income (in monetary terms) does the entire household earn? | |
| | | 1 Father (specify amount) _____ | 1 <input type="checkbox"/> |
| | | 2 Mother (specify amount) _____ | 2 <input type="checkbox"/> |
| | | 3 Grand parents (specify amount) _____ | 3 <input type="checkbox"/> |
| | | 4 Government (specify amount) _____ | 4 <input type="checkbox"/> |
| | | 5 Siblings _____ | 5 <input type="checkbox"/> |
| | | 6 Unknown _____ | 6 <input type="checkbox"/> |
| | | 7 no response _____ | 7 <input type="checkbox"/> |

| | | | |
|-------|----|---|----------------------------|
| empty | 35 | In the past 6 months, have any members of your household been unemployed or lost their primary source of income? | |
| | | 1 Yes | 1 <input type="checkbox"/> |
| | | 2 No | 2 <input type="checkbox"/> |
| | | 3 I do not know | 3 <input type="checkbox"/> |
| | | 4 no response | 4 <input type="checkbox"/> |

| | | | | | |
|-----|----|---|-----------------|--|--|
| occ | 36 | What is your current occupation? | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> | |
| | | 1 | Unemployed | | |
| | | 2 | Informal trader | | |
| | | 3 | Public servant | | |
| | | 4 | domestic worker | | |
| | | 5 | Factory worker | | |
| | | 6 | Farmer | | |
| | | 7 | Labourer | | |
| | | 8 | Office worker | | |

| | | | | | |
|-------|----|--------------------------------|---------------|--|--|
| bread | 37 | Are you the breadwinner | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | Proceed to Q38 if response is 'no' |
| | | 1 | Yes | | |
| | | 2 | No | | |
| | | 3 | I do not know | | |
| | | 4 | no response | | |

| | | | | | |
|----------|------|---|-----------------|--|--|
| breadocc | 37.1 | What is the current occupation of the breadwinner? | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> | |
| | | 1 | Unemployed | | |
| | | 2 | Informal trader | | |
| | | 3 | Public servant | | |
| | | 4 | domestic worker | | |
| | | 5 | Factory worker | | |
| | | 6 | Farmer | | |
| | | 7 | Labourer | | |
| | | 8 | Office worker | | |

| | | | | | |
|----------|-------------|--|---------------|--|--|
| hfoodexp | 38 | Approximately how much money does your household spend on food on average per month? (i.e expenditure before episode of illness of child?) | | | |
| | | _____ (specify amount) | | | |
| | | 1 | amount) | | |
| | | 2 | None | | |
| | | 3 | I do not know | | |
| 4 | no response | | | | |

| | | | | | |
|----------|----|--|---------------|--|--|
| hifodexp | 39 | Since child__ has been ill, how much have you spent on food for the household? (i.e. have you spent less or have you spent more per month on food?) | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | |
| | | 1 | Increased | | |
| | | 2 | Decreased | | |
| | | 3 | No change | | |
| | | 4 | I do not know | | |

| | | | | | |
|---------|----|--|---------------|--|--|
| ngofood | 40 | Have you ever had to rely on food packages from NGO's or have participated in a supplementary feeding scheme? | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | |
| | | 1 | Yes | | |
| | | 2 | No | | |
| | | 3 | No response | | |
| | | 4 | I do not know | | |

| | | | | | |
|--------|----|---|---------------|--|--|
| mealpd | 41 | Before your child was brought to the hospital or began suffering from illness, how many meals per day did the household consume? | | 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> | |
| | | 1 | 1 meal | | |
| | | 2 | 2-3 meals | | |
| | | 3 | Zero | | |
| | | 4 | I do not know | | |

| | | | | |
|----------|----|---|--|--|
| chmealpd | 42 | <p>How many meals per day did the child you have brought into the hospital consume over the past two weeks?</p> <p>1 1 meal 2 2-3 meals 3 Zero 4 I do not know</p> | <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/></p> | |
|----------|----|---|--|--|

| | | | | |
|-------|----|--|--|--|
| qmeal | 43 | <p>Has the quality of food consumed by the household changes since the illness of the child. (e.g. have you reduced intake of a particular food group)</p> <p>1 Yes 2 No 3 No Change 4 I do not know</p> | <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/></p> | |
|-------|----|--|--|--|

| | | | | |
|---------|----|--|--|--|
| rqmeald | 44 | <p>Why has the quality of food consumed in your household decreased?</p> <p>1 Financial (loss of income, constrained budget) 2 Change in preferences 3 No Change 4 I do not know</p> | <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/></p> | |
|---------|----|--|--|--|

Thank you very much for your responses. All your answers will be treated as confidential. Mazvita, Siyabonga

University of Cape

5.5. UNIVERSITY OF CAPE TOWN - STUDY PROTOCOL LETTER OF APPROVAL (ETHICS)



UNIVERSITY OF CAPE TOWN

Health Sciences Faculty
Faculty of Health Sciences Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • Facsimile [021] 406 6411
e-mail: sumayah.ariel@uct.ac.za

08 March 2011

HREC REF: 007/2011

Ms R Masiwa
c/of Dr O Alaba
Public Health & Family Medicine

PROJECT TITLE: ECONOMIC BURDEN OF CHILD MALNUTRITION IN ZIMBABWE

The HREC must commend you on the quality of the response and the dedicated and careful manner in which each of the amendments has been addressed.

It is a pleasure to inform you that the Ethics Committee has **formally approved** the above-mentioned study.

Approval is granted for one year till the 15 March 2012.

Children are going to be examined by nurses. The protocol Ethics Section therefore needs to state that verbal or non-verbal assent/agreement for this procedure must be given by each child to the nurse before the nurse begins the procedure or indeed touches the child.

Please submit a progress form, using the standardised Annual Report Form (FHS016), if the study continues beyond the approval period. Please submit a Standard Closure form (FHS010) if the study is completed within the approval period.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the REC. REF in all your correspondence.

ariel@uct.ac.za

5.6. MEDICAL RESEARCH COUNCIL OF ZIMBABWE - STUDY PROTOCOL
LETTER OF APPROVAL (ETHICS)

Telephone: 091 437411/13
 Telefax: 091 437412
 E-mail: secretariat@mrcz.org.zw
 Website: www.mrcz.org.zw



Medical Research Council of Zimbabwe
 Josiah Tongogara / Main Street
 P. O. Box CY 873
 Causeway
 Harare

MRCZ APPROVAL LETTER

Ref: MRCZ/B/148

28 January 2011

Barbara Masliwa
 1-19th Avenue
 Harare Park
 Harare

RE: Economic Burden of CHIM Malnutrition in Zimbabwe (MRCZ/A/168)

Thank you for the above titled proposal that you submitted to the Medical Research Council of Zimbabwe (MRCZ) for review. Please be advised that the Medical Research Council of Zimbabwe has **approved** your proposal and **approved** your application to conduct the above titled study. This is based on the following documents that were submitted to the MRCZ for review:

a) Study protocol.

• **APPROVAL NUMBER** : MRCZ/2010

This number should be used on all correspondence, consent forms and documents as appropriate.

• **APPROVAL EFFECTIVE DATE** : 28 January 2011

• **EXPIRATION DATE** : 27 January 2012

• **TYPE OF MEETING** : Expedited Review

After this title, the project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the MRCZ Office should be submitted one month before the expiration date for continuing review.

• **SERIOUS ADVERSE EVENT REPORTING**: All serious problems relating to the study which require action must be reported to the Institutional Ethical Review Committee (IERC) as well as the MRCZ within 7 working days using standard forms obtainable from the MRCZ Office.

• **MODIFICATIONS**: For MRCZ and IERC approval, using standard forms obtainable from the MRCZ Office to request before implementing any changes in the Protocol (including changes to the consent documents).

• **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the MRCZ using standard forms obtainable from the MRCZ Office.

• **QUESTIONS**: Please contact the MRCZ on Telephone No. (04) 79790, 79139 or by e-mail on secretariat@mrcz.org.zw.

• **Other**

• Please be reminded to send in copies of your research results for our records as well as for Health Research Database.

• You're also encouraged to submit electronic copies of your publications in peer reviewed journals that may emanate from this study.

Yours Faithfully

MRCZ SECRETARIAT
 FOR CHAIRPERSON
 MEDICAL RESEARCH COUNCIL OF ZIMBABWE



PROMOTING THE ETHICAL CONDUCT OF HEALTH RESEARCH
 Registered with the USA Office for Human Research Protections (OHRP) as an Educational IRB (number 00001202) (2006-07)

5.7. BMC PUBLIC HEALTH INSTRUCTIONS TO AUTHORS

Research article

Criteria

Research articles should report on original primary research, but may report on systematic reviews of published research provided they adhere to the appropriate reporting guidelines which are detailed in 'About this journal'.

Submission process

Manuscripts must be submitted by one of the authors of the manuscript, and should not be submitted by anyone on their behalf. The submitting author takes responsibility for the article during submission and peer review.

Please note that *BMC Public Health* levies an article-processing charge on all accepted Research article, Case report, Database, Debate, Software, Study protocol and Technical advance articles; if the submitting author's institution is a [BioMed Central member](#) the cost of the article-processing charge is covered by the membership. Please note that the membership is only automatically recognised on submission if the submitting author is based at the member institution.

To facilitate rapid publication and to minimize administrative costs, *BMC Public Health* accepts only [online submission](#).

Files can be submitted as a batch, or one by one. The submission process can be interrupted at any time; when users return to the site, they can carry on where they left off.

See below for examples of [word processor](#) and [graphics file formats](#) that can be accepted for the main manuscript document by the online submission system. Additional files of any type, such as [movies](#), animations, or [original data files](#), can also be submitted as part of the manuscript.

During submission you will be asked to provide a cover letter. Use this to explain why your manuscript should be published in the journal, to elaborate on any issues relating to our editorial policies in the '[About BMC Public Health](#)' page, and to declare any potential competing interests. You will be also asked to provide the contact details (including email addresses) of potential peer reviewers for your manuscript. These should be experts in their field, who will be able to provide an objective assessment of the manuscript. Any suggested peer reviewers should not have published with any of the authors of the manuscript within the past five years, should not be current collaborators, and should not be members of the same research institution. Suggested reviewers will be considered alongside potential reviewers recommended by the Editorial team, Editorial Advisors, Section Editors and Associate Editors.

Overview of manuscript sections for Research article

Manuscripts for Research article articles submitted to *BMC Public Health* should be divided into the following sections (in this order):

Title page

The title page should:

- provide the title of the article
- list the full names, institutional addresses and email addresses for all authors
- indicate the corresponding author

Please note:

- the title should include the study design, for example "A versus B in the treatment of C: a randomized controlled trial X is a risk factor for Y: a case control study"
- abbreviations within the title should be avoided

Abstract

The Abstract of the manuscript should not exceed 350 words and must be structured into separate sections: **Background**, the context and purpose of the study; **Results**, the main findings; **Conclusions**, brief summary and potential implications. Please minimize the use of abbreviations and do not cite references in the abstract.

Keywords

Three to ten keywords representing the main content of the article.

Background

The Background section should be written in a way that is accessible to researchers without specialist knowledge in that area and must clearly state - and, if helpful, illustrate - the background to the research and its aims. Reports of clinical research should, where appropriate, include a summary of a search of the literature to indicate why this study was necessary and what it aimed to contribute to the field. The section should end with a brief statement of what is being reported in the article.

Results and discussion

The Results and discussion may be combined into a single section or presented separately. Results of statistical analysis should include, where appropriate, relative and absolute risks or risk reductions, and confidence intervals. The Results and discussion sections may also be broken into subsections with short, informative headings.

Conclusions

This should state clearly the main conclusions of the research and give a clear explanation of their importance and relevance. Summary illustrations may be included.

Methods

The methods section should include the design of the study, the type of materials involved, a clear description of all comparisons, and the type of analysis used, to enable replication.

For studies involving human participants a statement detailing ethical approval and consent should be included in the methods section.

List of abbreviations

If abbreviations are used in the text they should be defined in the text at first use, and a list of abbreviations can be provided, which should precede the competing interests and authors' contributions.

Competing interests

A competing interest exists when your interpretation of data or presentation of information may be influenced by your personal or financial relationship with other people or organizations. Authors must disclose any financial competing interests; they should also reveal any non-financial competing interests that may cause them embarrassment were they to become public after the publication of the manuscript.

Authors are required to complete a declaration of competing interests. All competing interests that are declared will be listed at the end of published articles. Where an author gives no competing interests, the listing will read 'The author(s) declare that they have no competing interests'.

When completing your declaration, please consider the following questions:

Financial competing interests

- In the past five years have you received reimbursements, fees, funding, or salary from an organization that may in any way gain or lose financially from the publication of this manuscript, either now or in the future? Is such an organization financing this manuscript (including the article-processing charge)? If so, please specify.
- Do you hold any stocks or shares in an organization that may in any way gain or lose financially from the publication of this manuscript, either now or in the future? If so, please specify.
- Do you hold or are you currently applying for any patents relating to the content of the manuscript? Have you received reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript? If so, please specify.
- Do you have any other financial competing interests? If so, please specify.

Non-financial competing interests

Are there any non-financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other) to declare in relation to this manuscript? If so, please specify.

If you are unsure as to whether you, or one your co-authors, has a competing interest please discuss it with the editorial office.

Authors' contributions

In order to give appropriate credit to each author of a paper, the individual contributions of authors to the manuscript should be specified in this section.

An 'author' is generally considered to be someone who has made substantive intellectual contributions to a published study. To qualify as an author one should 1) have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) have been involved in drafting the manuscript or revising it critically for important intellectual content; and 3) have given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content. Acquisition of funding, collection of data, or general supervision of the research group, alone, does not justify authorship.

We suggest the following kind of format (please use initials to refer to each author's contribution): AB carried out the molecular genetic studies, participated in the sequence alignment and drafted the manuscript. JY carried out the immunoassays. MT participated in the sequence alignment. ES participated in the design of the study and performed the statistical analysis. FG conceived of the study, and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

All contributors who do not meet the criteria for authorship should be listed in an acknowledgements section. Examples of those who might be acknowledged include a person who provided purely technical help, writing assistance, or a department chair who provided only general support.

Authors' information

You may choose to use this section to include any relevant information about the author(s) that may aid the reader's interpretation of the article, and understand the standpoint of the author(s). This may include details about the authors' qualifications, current positions they hold at institutions or societies, or any other relevant background information. Please refer to authors using their initials. Note this section should not be used to describe any competing interests.

Acknowledgements

Please acknowledge anyone who contributed towards the article by making substantial contributions to conception, design, acquisition of data, or analysis and interpretation of data, or who was involved in drafting the manuscript or revising it critically for important intellectual content, but who does not meet the criteria for authorship. Please also include the source(s) of funding for each author, and for the manuscript preparation. Authors must describe the role of the funding body, if any, in design, in the collection, analysis, and interpretation of data; in the writing of the manuscript; and in the decision to submit the manuscript for publication. Please also acknowledge anyone who contributed materials essential for the study. If a language editor has made significant revision of the manuscript, we recommend that you acknowledge the editor by name, where possible.

The role of a scientific (medical) writer must be included in the acknowledgements section, including their source(s) of funding. We suggest wording such as 'We thank Jane Doe who provided medical writing services on behalf of XYZ Pharmaceuticals Ltd.'

Authors should obtain permission to acknowledge from all those mentioned in the Acknowledgements section.

Endnotes

Endnotes should be designated within the text using a superscript lowercase letter and all notes (along with their corresponding letter) should be included in the Endnotes section. Please format this section in a paragraph rather than a list.

References

All references, including URLs, must be numbered consecutively, in square brackets, in the order in which they are cited in the text, followed by any in tables or legends. Each reference must have an individual reference number. Please avoid excessive referencing. If automatic numbering systems are used, the reference numbers must be finalized and the bibliography must be fully formatted before submission.

Only articles, datasets and abstracts that have been published or are in press, or are available through public e-print/preprint servers, may be cited; unpublished abstracts, unpublished data and personal communications should not be included in the reference list, but may be included in the text and referred to as "unpublished observations" or "personal communications" giving the names of the involved researchers. Obtaining permission to quote personal communications and unpublished data from the cited colleagues is the responsibility of the author. Footnotes are not allowed, but endnotes are permitted. Journal abbreviations

follow Index Medicus/MEDLINE. Citations in the reference list should include all named authors, up to the first 30 before adding '*et al.*'.

Preparing illustrations and figures

Illustrations should be provided as separate files, not embedded in the text file. Each figure should include a single illustration and should fit on a single page in portrait format. If a figure consists of separate parts, it is important that a single composite illustration file be submitted which contains all parts of the figure. There is no charge for the use of color figures.

Please read our [figure preparation guidelines](#) for detailed instructions on maximising the quality of your [figures](#).

Formats

The following file formats can be accepted:

- EPS (preferred format for diagrams)
- PDF (also especially suitable for diagrams)
- TIFF
- PNG (preferred format for photos or images)
- Microsoft Word (version 5 and above; figures must be a single page)
- PowerPoint (figures must be a single page)
- JPEG
- BMP

Figure legends

The legends should be included in the main manuscript text file at the end of the document, rather than being a part of the figure file. For each figure, the following information should be provided: Figure number (in sequence, using Arabic numerals - i.e. Figure 1, 2, 3 etc); short title of figure (maximum 15 words); detailed legend, up to 300 words.

Please note that it is the responsibility of the author(s) to obtain permission from the copyright holder to reproduce figures or tables that have previously been published elsewhere.

Preparing a personal cover page

If you wish to do so, you may submit an image which, in the event of publication, will be used to create a cover page for the PDF version of your article. The cover page will also display the journal logo, article title and citation details. The image may either be a figure from your manuscript or another relevant image. You must have permission from the copyright to reproduce the image. Images that do not meet our requirements will not be used.

Images must be 300dpi and 155mm square (1831 x 1831 pixels for a raster image).

Allowable formats - EPS, PDF (for line drawings), PNG, TIFF (for photographs and screen dumps), JPEG, BMP, DOC, PPT, CDX, TGF (ISIS/Draw).

Preparing tables

Each table should be numbered and cited in sequence using Arabic numerals (i.e. Table 1, 2, 3 etc.). Tables should also have a title (above the table) that summarizes the whole table; it should be no longer than 15 words. Detailed legends may then follow, but they should be concise. Tables should always be cited in text in consecutive numerical order.

Smaller tables considered to be integral to the manuscript can be pasted into the end of the document text file, in A4 portrait or landscape format. These will be typeset and displayed in the final published form of the article. Such tables should be formatted using the 'Table object' in a word processing program to ensure that columns of data are kept aligned when the file is sent electronically for review; this will not always be the case if columns are generated by simply using tabs to separate text. Columns and rows of data should be made visibly distinct by ensuring that the borders of each cell display as black lines. Commas should not be used to indicate numerical values. Color and shading may not be used; parts of the table can be highlighted using symbols or bold text, the meaning of which should be explained in a table legend. Tables should not be embedded as figures or spreadsheet files.

Larger datasets or tables too wide for a portrait page can be uploaded separately as additional files. Additional files will not be displayed in the final, laid-out PDF of the article, but a link will be provided to the files as supplied by the author.

Tabular data provided as additional files can be uploaded as an Excel spreadsheet (.xls) or comma separated values (.csv). As with all files, please use the standard file extensions.

Preparing additional files

Although *BMC Public Health* does not restrict the length and quantity of data included in an article, there may still be occasions where an author wishes to provide data sets, tables, movie files, or other information as additional files. Results that would otherwise be indicated as "data not shown" can and should be included as additional files. Since many weblinks and URLs rapidly become broken, *BMC Public Health* requires that all supplementary data are included as additional files rather than as a link to your own website. These files can be uploaded using the 'Additional Material files' button in the manuscript submission tool.

The maximum file size for additional files is 20 MB each, and files will be virus-scanned on submission.

Additional files will be linked to the final published article in the form supplied by the author, but will not be displayed within the article. They will be made available in exactly the same form as originally provided by the authors.

If additional material is provided, please list the following information in a separate section of the manuscript text, immediately following the tables (if any):

- File name (e.g. Additional file 1)
- File format including the three-letter file extension (including name and a URL of an appropriate viewer if format is unusual)
- Title of data
- Description of data

Additional files should be named "Additional file 1" and so on and should be referenced explicitly by file name within the body of the article, e.g. 'An additional movie file shows this in more detail [see Additional file 1]'.
University of Cambridge

Style and language

General

Currently, *BMC Public Health* can only accept manuscripts written in English. Spelling should be US English or British English, but not a mixture.

There is no explicit limit on the length of articles submitted, but authors are encouraged to be concise. There is also no restriction on the number of figures, tables or additional files that can be included with each article online. Figures and tables should be numbered in the order in which they are referred to in the text. Authors should include all relevant supporting data with each article.

BMC Public Health will not edit submitted manuscripts for style or language; reviewers may advise rejection of a manuscript if it is compromised by grammatical errors. Authors are advised to write clearly and simply, and to have their article checked by colleagues before submission. In-house copyediting will be minimal. Non-native speakers of English may choose to make use of a copyediting service.

Language editing

For authors who wish to have the language in their manuscript edited by a native-English speaker with scientific expertise, BioMed Central recommends [Edanz](#). BioMed Central has arranged a 10% discount to the fee charged to BioMed Central authors by Edanz. Use of an editing service is neither a requirement nor a guarantee of acceptance for publication. Please contact [Edanz](#) directly to make arrangements for editing, and for pricing and payment details.

Typography

- Please use double line spacing.
- Type the text unjustified, without hyphenating words at line breaks.
- Use hard returns only to end headings and paragraphs, not to rearrange lines.
- Capitalize only the first word, and proper nouns, in the title.
- All pages should be numbered.

- Use the *BMC Public Health* [reference format](#).
- Footnotes are not allowed, but endnotes are permitted.
- Please do not format the text in multiple columns.
- Greek and other special characters may be included. If you are unable to reproduce a particular special character, please type out the name of the symbol in full. **Please ensure that all special characters used are embedded in the text, otherwise they will be lost during conversion to PDF.**

Units

SI units should be used throughout (liter and molar are permitted, however).