RESEARCH SERIES No. 96

CAUSES OF HEALTH INEQUALITIES IN UGANDA: EVIDENCE FROM THE DEMOGRAPHIC AND HEALTH SURVEYS

SSEWANYANA SARAH

KASIRYE IBRAHIM

OCTOBER, 2012

RESEARCH SERIES No. 96

CAUSES OF HEALTH INEQUALITIES IN UGANDA: EVIDENCE FROM THE DEMOGRAPHIC AND HEALTH SURVEYS

SSEWANYANA SARAH

KASIRYE IBRAHIM

OCTOBER, 2012

The Economic Policy Research Centre (EPRC) is an autonomous not-for-profit organization established in 1993 with a mission to foster sustainable growth and development in Uganda through advancement of research –based knowledge and policy analysis. Since its inception, EPRC has made significant contributions to national and regional policy formulation and implementation in the Republic of Uganda and throughout East Africa. The Centre has also contributed to national and international development processes through intellectual policy discourse and capacity strengthening for policy analysis, design and management. The EPRC envisions itself as a Centre of excellence that is capable of maintaining a competitive edge in providing national leadership in intellectual economic policy discourse, through timely research-based contribution to policy processes.

Any enquiries can be addressed in writing to the Executive Director on the following address:

Economic Policy Research Centre
Plot 51, Pool Road, Makerere University Campus
P.O. Box 7841, Kampala, Uganda
Tel: +256-414-541023/4
Fax: +256-414-541022
Email: eprc@eprc.or.ug
Web: www.eprc.or.ug

ABSTRACT

Despite sustained macroeconomic growth and impressive income poverty reduction in Uganda, the country's total child nutrition status remains poor. More so, wide within country disparities in stunting and underweight rates exist across the country. This study exploredthe determinants of child nutrition status and in Uganda using three rounds of the Uganda demographic and health surveys undertaken during 1995–2006.The surveys are nationally representative and capture anthropometric indicators for children aged below 5 years. The study investigated the determinants of health inequalities focusing on child health status through a combination of decomposition and regression analysis. Our results show that household welfare status remains a key determinant of child health status and inequalities in health. Furthermore, the results show that individual maternal education matters more in enhancing child health than does community knowledge about health.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 BACKGROUND

Inequalities in health status are large in most developing countries—especially in sub-Saharan Africa. According to the 2006 World Development Report—which focused on equity and development—most developing countries have large within-country variations in health indicators such as: maternal nutrition, HIV/AIDS prevalence, childhood immunization, malnutrition and infant mortality (World Bank, 2005). Indeed, it is perhaps in the area of child nutrition where inequalities are widest in sub-Saharan Africa. The 2007/2008 Human Development Report shows that for the 18 countries considered to have the lowest human development index, the stunting rates for the poorest children were more than 4 times those of children from the top quintile (UNDP, 2007).Stunting is caused by both poor nutrition intake and by repeated episodes of illness.[1] As such researchers and policymakers have taken an increasing interest in the causes and effects of health inequalities. This is based on the realisation that livelihood opportunities are determined early in life and without addressing such inequities, health disparities could widen (World Bank, 2005).

Inequalities in health in developing countries are perhaps widest with regard to child nutritional health status. According to the 2009 United Nations Children's Fund (UNICEF) report on tracking child and maternal nutrition, 24 developing countries account for over 80% of the world's 195 million children faced with stunting (UNICEF, 2009). Out of the 24 countries, at least 11 are in sub-Saharan Africa. Indeed, in some countries in the region, for example, Ethiopia and Madagascar, the proportion of children aged less than 5 years who are stunted is more than 50%. Furthermore, the UNICEF report shows that in the developing world, countries in sub-Saharan Africa have made the least progress in reducing stunting rates—from 38% to 34% between 1990 and 2008—compared to a reduction of 40% to 29% for all developing countries (UNICEF, 2009). Uganda is among the developing countries with the largest population of stunted children. According to UNICEF estimates, 2.4 million children aged less than 5 years in Uganda are stunted and this ranks the country 14th—based on the ranking of countries with large populations of nutritionally challenged children (UNICEF, 2009). Furthermore, unlike other developing countries, Uganda has made no progress in reducing malnutrition in the recent past.

Nonetheless, issues of maternal and child nutrition have been central to Uganda's human development agenda. In 1999, the Government of Uganda introduced a five-year revolving Health Sector Strategic Plan (HSSP-I) whose objectives included reducing stunting rates from 38% to 28% among children aged 5 years and below (Government of Uganda, 2005b). In addition, the plan sought to provide a nationwide community growth promotion system.[2] In terms of actual indicators, the HSSP II (2005–2009) intended to attain an underweight prevalence rate of 17% by the end of 2009. To meet some of the above objectives, the government with support fromthe World Bank implemented a large-scale community growth promotion project during 1998–2007—the Nutrition and Early Childhood Development Project (NECDP).This project covered 8,000 communities in half the districts in Uganda. Some of the early evaluations of the project show that it significantly reduced

---

[1] Stunting is where a child's height for age index is more than two standard deviations below the median of the reference population and such a child is considered too short for his/her age.

[2] Such community level interventions promote and provide services such as: exclusively breast feeding, inoculations, vitamin supplementation and de-worming medicine.

stunting rates, however, only among children aged 1 year and below (Alderman, 2007). However, several non-governmental organizations (NGOs), notably Save the Children Fund, have questioned both the wisdoms and methods used to implement such donor led cross country projects. As such, the evidence is still mixed on how best to improve the child nutrition status in Uganda.

Uganda has made impressive progress in reducing the incidence of income poverty, although the population of poor persons has remained high due to a very high rate of population growth.[3] Specifically, the incidence of poverty reduced from 56% in 1992/1993 to 24% by 2009/2010, but reversed during the period 1999/2000 and 2002/2003 (Table 1). However, the population of poor persons has remained high only decreasing from 9.6 million persons in 1992/1993 to 7.5 million by 2009/2010. Furthermore, a large population of the poor in Uganda are classified as chronically poor (Government of Uganda, 2010). Such a large population of impoverished persons places huge demands on public health care provision.

Table 1: Trends in income poverty and population poor, 1992/93-2009/10

	Headcount poverty (%)					Population poor ('000)				
	1992/93	1999/00	2002/3	2005/6	2009/10	1992/93	1999/00	2002/3	2005/6	2009/10
All Uganda	54.9	33.4	38.8	31.1	24.5	9,918	7,240	9,810	8,441	7,514
Rural	58.5	37.4	42.7	34.2	27.2	9,283	6,970	9,311	7,870	7,095
Urban	27	9.6	14.3	13.7	9.1	635	270	499	571	419
By geographic location										
Central	45.6	19.3	22.5	16.4	10.7	2,251	1,197	1,666	1,300	817
Eastern	58.8	34.2	45.9	35.9	24.3	2,643	1,951	3,188	2,451	2,204
Northern	72.2	63.4	62.9	60.7	46.2	2,536	2,584	2,900	3,251	2,836
Western	53.1	25.9	32.9	20.5	21.8	2,264	1,410	2,057	1,439	1,603

Source: UBOS UNHS Reports 2000, 2002, 2007 and 2010. The figures for 1992/93 are author's calculations from the HIS 1992/93

Notes: The 1999/2000 figures excludes the districts of then Bundibugyo, Gulu, Kitgum, Kasese and Pader

Despite Uganda achieving some progress in improving overall welfare status, the country is still far from achieving the goal of improved child nutrition status. The most important indicators of child nutritional status have stagnated despite sustained macroeconomic growth and reductions in income poverty.[4] Based on the regular Uganda Demographic and Health Surveys (UDHS), the proportion of children aged below 5 years classified as stunted remained unchanged at 38% between 1995 and2006 (Table 2). Furthermore, within country inequality in stunting rates is also very large. For example, in 2006 only 22% of children in Kampala (the capital city) were stunted while the corresponding rates for South Western Uganda were 49.6%. Such differences can only be minimally attributed to income. In 2006 the sub-region with highest stunting rates (South Western Uganda) had a much lower incidence of poverty than for example North or West Nile sub-regions. Furthermore, Table 2 shows that the indicators for child nutritional status have stagnated during the 15-year period.

[3] Based on the 2002 Uganda Population and Housing Census, Uganda has a population growth rate of 3.2% per annum (UBoS, 2002). This implies that the country's population grows by about 1 million persons every year.

[4] Since 1992, the Ugandan economy has grown at average of 5% per annum while income poverty reduced from 56% in 1992/93 to 31% by 2005/06 (Government of Uganda, 2007).

Table 2: Uganda: Selected Indicators for Child Nutrition Status, 1995-2011

(%)			
Indicator	UDHS survey year		
	1995	2000/01	2006
Stunting Rate	38.3	45	38.1
Wasting Rate	5.3	4.1	6.1
Underweight Rate	25.3	22.8	15.9
Stunting Rates by Sub Regions			
Central 1	38.3	37.1	39.2
Central 2	35.1	35.9	29.8
Kampala	20.6	24.6	22.8
East Central	31.9	34.1	38.3
Eastern	38.4	36.2	36.2
North	35.9	29	40
West Nile	48.9	46.2	37.7
Western	45.7	43.2	37.6
South Western	39.8	50.7	49.6

Source: Uganda Demographic and Health Surveys of: 1995 (Government of Uganda, 1995); 2000/01 (Government of Uganda, 2001); and 2006 (UBoS and Macro International Inc, 2007)

Definitions: (1) Stunting: refer to footnote 1 for the particular definition. (2) A child is wasted if their weight their weight for height index is below -2SD from the median of the reference population. (3) Underweight refers to a child whose weight for age index is more than -2SD below the reference population.

At the same time, the stagnation in nutritional indicators is observed against a backdrop of increasing public expenditure on health. In 2007/08, the share of the national budget attributed to the health sector was about 13%, up from 7% during 1997/98 (Government of Uganda, 2009).[5] Overall, the situation suggests that improvements in welfare status alone or increase in public spending on health may not be able to improve overall child nutrition status or reduce inequalities in Uganda. As such, there are renewed calls to understand why child nutritional status indicators remain poor in Uganda despite a substantial increase in public spending on health and substantial gains in welfare status.

The overall objective of the study was to investigate determinants of child health status and changes in health inequalities in Uganda, with a focus on child health status as measured by the levels of stunting. Specifically, the study: (i) Estimated determinants of child malnutrition and examined how the determinants of child malnutrition have changed overtime in Uganda during the 1995–2006 period; and (2) Examined the patterns and changes overtime of the stunting rates between 1995 and 2006.

The rest of the study is organized as follows. In the next section, a survey of the related literature and justification of the study is provided. The methodology is presented in Section 3andthe data sources are discussed in Section 4. Section 5 provides the results of the analysis while the conclusions appear in Section 6.

[5] In the recent past, the composition of public health expenditures has favoured infrastructural investments (which, however, are poorly stocked) and to a certain extent expenditures on HIV/AIDS activities.

2.0 LITERATURE REVIEW ON INEQUALITIES IN HEALTH OUTCOMES

Due to widespread evidence showing that health inequalities may be more pronounced than income inequalities, there is a vast and growing literature on analyzing the causes and impact of health inequalities in developing countries.[6] Examples of empirical studies in the recent past include Pradhanet al. (2003) Wagstaffet al. (2003) and Sahn and Younger (2005). The main focus for most of the above studies is the link between income and health—most especially how income inequalities drive health disparities. Evidence from both developed and developing countries is mixed. Although some studies find income inequality primarily drives inequalities in health, other studies find only small and insignificant impacts of income inequality onhealth. For example, Wagstaffet al. (2003) show that in Vietnam, changes in stunting rates are partly explained by levels of income inequality. However, Deaton (2003), based on extensive review of the literature on income inequality and health, concludes that income inequality does not substantially alter the health status of a population.

One aspect of health inequality extensively analysed in Africa is access to health facilities. Studies examine inequalities in use of health services using benefits incidence analysis (Castrol-Leal et al., 2000; Sahn and Younger, 2000). In particular, the studies investigate who benefits from public expenditures on health and do the poor—who are targeted beneficiaries—account for a larger share of the health subsidy. For example, Castrol-Leal et al. (2000) show that, except in South Africa, rich individuals account for a disproportionate share of the health subsidy in most countries in Africa. Also, other studies such as Sahn and Younger (2000) show that public expenditures on hospital care are the least progressive of all health care expenditures.

With regard to contextual factors driving health inequalities, in sub-Saharan African literature, political factors are highlighted as major drivers of both income and health inequality (Milanovic, 2003; Moradi and Baten, 2005). For example, Moradi and Baten (2005) show that ethnic fractionalization significantly explains inequality observed in child heights across Africa. Using data from a demographic and health survey (DHS), the authors find evidence of U-shape relationship between ethnic fractionalization and health inequality. In particular, inequality first reduces as the share of the population of the largest ethnic group in the country increases up to a limit beyond which inequality starts to rise as the dominant ethnic group becomes too large.

The inequality literature on Uganda has concentrated more on income and to a limited extent education than on health (see, e.g.,Canagaraghet al., 2001; Ssewanyanaet al., 2004; Schipper and Hoogeveen, 2005; Ssewanyana et al., 2007). To the best of our knowledge no previous study has explicitly examined the nature and determinants of health inequalities in Uganda. This is therefore the focus of our study—to investigate the effects of individual, household, and community factors on child health inequality in Uganda. The current debates on efficacy of community growth promotion programmes in Uganda (discussed below) provide another reason for undertaking this study.

Uganda provides a good case for investigating issues of health inequality for other reasons as well. First, as earlier mentioned, current policy debates on how best to address child nutrition status and consequently reduce health inequalities, is mixed.

[6] Sahnand Younger (2009) provides a recent review of this literature and also explains why inequalities in health matter more than inequalities income.

While the Ministry of Health advocates more for improved management of childhood illness as a means of improving the health status of children, some development partners favour community growth promotion programmes (Government of Uganda, 2005a, 2003). However, the stagnation of child health status in an era of increased health spending, has made policymakers realize that there is limited knowledge of what drives overall child health status and inequality. Consequently, we believe this study will provide policymakers with empirical evidence ofthe implications of the above divergent views. Second, as highlighted in Uganda's National Development Plan (2010–2014), consensus is that the various forms of inequality are affecting improvements in welfare status. As such, the country has a renewed focus on issues of social protection in various policy documents (Government of Uganda, 2010). Third, by combining decomposition and regression analysis, the study provides a deeper and more enriched understanding of the determinants of health inequality in Uganda. Finally, although the focus of this study is Uganda, the implications of the findings can be extended to other sub-Saharan African countries that have not experienced changes in child health status.

3.0 METHODS

The analysis is based on two broad categories of estimations. First, we estimated the determinants of child height for age z-scores (HAZ) scores for Uganda—for all children combined and for each survey round separately. Specifically, we estimated reduced form regressions for determinants of child HAZ scores.

3.1 Determinants of child health status

The analysis of determinants of child health status is based on a household model in which household members maximize welfare where health status is one of the main arguments (Becker, 1981; Singh et al., 1986). The model has been widely used in studies examining the determinants of child and adult health status (Behrman and Deolalikar, 1988). In this model, a household's welfare function is determined by individual utilities and the welfare function takes the form

1 $$W(U_m^M, U_d^1, \ldots, U_d^D, U_{ch}^1, \ldots, U_{ch}^J)$$

where U^i indicates individual utility function; i = 1,..., n represents household members who include a mother ($i = M$)—assumed to be the caregiver for children's health; D are other adults; and i = 1,...J are children within the household. The individual utility is a function of health/nutritional status, consumption of goods and individual time available for leisure and this is represented as:

2 $$U^i = U(H, X, T_L)$$

where H represents a vector of health status; X are food and non-food consumption goods; and T_L is leisure available to each individual. For empirical tractability, we focus on a child aged 5 years or below in the exposition below. In this framework, the health status depends on consumption of food and non-food services and care-giving. The health status of a child depends on child care received and on consumption of other goods. For such a child, the health status function is given by:

3 $$H_{ch}^i = H(C^i, X_N^i; \xi, \Omega) \; i = 1, \ldots, J)$$

where C^i is the nurturing or child care received by the ith child; X^i_N represents health and other services consumed; ξ are the child's own characteristics, for example, past health inputs and genetic endowment; and Ω are household or community characteristics that can impact on health,for example, access to safe water. The child care received by any infant depends on inputs such as: food intake, breastfeeding practices, use of health services, and the time devoted by the mother on nurturing activities and on the mother's education attainment. The child care function can be expressed as:

4 $$C_i = C(H_m, T_c^i; E^M, \Omega)$$

where H_m is the health status of the mother; T^l_c is the time input by mother for child care; E^M is the education attainment by the mother; and Ω as before represents all community level factors that affect health status and child care, for example, access to health infrastructure and cultural practices relating to child care. However, the mother's health status is a function of consumption of food and non-food goods, individual genetic endowment, health services, community characteristics and her bargaining power within the household.

5 $$H_m = H(C^M, X_N^M; \xi^M, \Omega)$$

As indicated by previous authors (e.g., Glick et al.,2007), immense challenges in the econometric estimation of health production functions such as the ones postulated in Equations 3 and 5. First, health production is a complex relationship. For example, issues such as growth attainment can only be captured by longitudinal data which are rarely available due to costs. Second, there is a possibility that health inputs are correlated with the error term leading to concerns of endogeneity. For example, children who generally have poor health use health services more than those who are healthy.

In the literature, instrumental variables (IV) estimation methods are used to deal with such endogeneity of health inputs andfixed effects models are used to deal with missing community level health information. However, suitable instruments in DHS type surveys are unavailable, given the way such data are collected. For example, no information is collected on the availability of health and other facilities at community level. Where such data limitations exist, as an alternative to IV estimation, authors adopt the reduced form model which provides a statistical framework for examining determinants of individual health status without accounting for the biological mechanisms that determine health status. In this case, the reduced form model was obtained by maximizing the household welfare function Equation 1 subject to a household budget/income constraint; individual time constraints; and the biological limits to health production of the child (Equation 3) and mother (Equation 5). This leads to the following reduced form equation for the th child's health status:

6 $$H^i_{ch} = h(\xi^i_J, \xi^M, \Omega, E^M, P, I) \; i = 1,\ldots,J$$

where P is a vector of prices for food, non-food, and health services consumed while I represents exogenous household income. Equation 6 shows that health status of children is a function of own and mother's genetic endowment (ξ^i_J, ξ^M); the environment/community in which they reside (Ω); the mother's education (E^M); prices (P); and household income (I).

Due to the data limitations, we could notcapture all the variables identified in the reduced form Equation 6. As such, the estimations used several proxies. First, we used children HAZ scores as our measure of child health status. The genetic endowment of the child and mother was captured by the mother's height. The environment in which the child resides was captured by both health indicator variables and variables for geographic location. The mother's education wascaptured by dummy variables of education level attained. Finally, given the nature of the dataset we used (which do not capture prices), we assumed that prices paid wereconstant and equal to unity while the household income was proxied by the household asset index. In Section 3.2 we provide the justification for using HAZ and the other variables.

3.2. Variables used in the estimations

3.2.1 Dependent variable

As earlier mentioned, we used HAZ as our measure of child health status. The HAZ is a long-term measure of nutritional health: the z-score reflects any sustained experience of inadequate nutrient intake coupled with untreated illnesses, which can result in stunted growth (Mosley and Chen 1984; Martorell and Habicht, 1986). Due to this particular characteristic, for a given child it may not be possible to correct nutritional deficiencies in height suffered during the first five years of life.

3.3.2 Explanatory variables

Child's characteristics: Previous studies such as Ssewanyana (2003) show that children's own characteristics are important determinants of health during infancy. For example, boys have lower nutritional status than girls. Consequently, we included indicators for a child's gender, age, and whether a child wasfrom a multiple birth (i.e., twin, triplet, or more multiples) and also the birth order of the child. For the child's age, we included dummy variables for: age 7–12 months; age 13–18 months; age 19–24 months; age 25–36 months; age 37–48 months; and age 49–60 months. This demarcation caters for the fact that child health is likely to worsen with increase in age as children are weaned and exposed to solid foods. For birth order, we included a dummy for a child being of a birth order greater than three.

Mother's characteristics: We included several characteristics relating to mother such as: age at child birth; education attainment; and mother's height. Children born by younger mothers are more likely to suffer from ill-health than those of adult mothers, so we included an indicator for mother's age. Further more, given the possibility that stunting can be cross-generational (i.e., mothers who were stunted during childhood also more likely to produce stunted children), we included controls for a mother's height which captures both her current health status and any genetic effects. Education attainment is included as it can affect a woman's ability toprocess health information which has direct bearing on the child's health. Specifically, we included the following dummy variables for mother's education: incomplete primary; completed primary; incomplete secondary; and completed secondary education.

Household characteristics: We also included a measure of household wealth status as incomes are important for nutrient availability and the treatment of illnesses. However, the surveys do not solicit information on household income or capture information on household consumption—an effective income proxy. Following studies that account for household wealth in the absence of expenditure data (e.g.,Filmer and Pritchett, 2001; Sahn and Stifel, 2003; Ssewanyana and Younger, 2008), we used factor analysis to construct an asset index for the household. In the analysis, we used the log of asset index and the squared term for the asset index to capture any non-linearities between children's health status and income.

We also included interaction terms to further test for non-linearities between child health and exogenous variables. First, we considered whether the two key inputs of maternal education and household wealth status were substitutesby including interactions terms between dummies for education attainment and the log of asset index. Second, we examined whether the wealth effects differ by gender by including an interaction term for gender and the log of the asset index.

Access to public goods and location variables: We also included variables relating to a household's access to water and sanitation infrastructure. In our estimation, water and sanitation variables proxy capture the daily environment faced by the household and as such the level of contamination and ease of transmission of pathogens within this environment. However, because household level water and sanitation variables are choice variables, we opted to use cluster level indicators of water/sanitation use. Specifically, we constructed cluster level variables for: use of piped water; use of boreholes; and the use of protected well/springs. For sanitation, we constructed cluster level variables for: use of traditional pit latrine; use of an improved pit latrine; and no toilet facility. Finally, we included location variables, whether a household is in a rural area and the geographical sub-regions—Central 1, Central 2, Eastern, Eastern Central, Northern, West Nile, Western and South Western (Kampala was omitted).

Access to health services variables: For indicators relating to health care use, we used cluster/Enumeration Area (EA) and district level averages to control for possible endogeneity from individual level data relating to health care use. Averages were used for the following indicators of health care use: receipt of any or all vaccinations; mother's knowledge of oral rehydration therapy; prenatal and birthing care by any medical professional; and the use of modern contraceptive methods. Earlier studies such as Mairaraet al. (2009), examining determinants of child nutritional health status using DHS, have used techniques to control for possible endogeneity of individual health care use.

4.0 DATA AND VARIABLES USED IN THE ESTIMATION

4.1 Datasets

The study used the three most recent demographic and health surveys conducted by the Uganda Bureau of Statistics and Macro International—the 1995, 2000/2001 and 2006 UDHS. These surveys are part of global effort, supported by the United States Government, to monitor and evaluate population, health and nutrition programmes in developing countries at intervals of five years. The surveys are nationally representative covering: 8,093 households in 1995 (Government of Uganda, 1995); 8,531 households in 2000/2001 (Government of Uganda, 2001) and 9,864 households in 2006 (UBoS and Macro International Inc, 2007). All the surveys are based on a two-stage cluster sampling design. In the first stage, clusters are the principal sampling unit and inthe second, 25–30 households are randomly selected from each cluster. Furthermore, the surveys are similar in scope and coverage and consequently this study pooled the three rounds to capture information relating to child health status and the use of preventive health services, for example, immunization; access to water and sanitation services; and parental education.

The standard DHS collect biomarkers such as children's height and weight and these form the basis of analysis in this study. As such, for all children aged less than 5 years, the surveys report standard anthropometric measures of: height for age; weight for age; and weight for height. We selected children's anthropometric indicators as our measure of health status because they reflect any sustained experience of food deprivation and untreated illnesses (Keller, 1983; Martorell and Habicht, 1986). Furthermore, these particular indicators are less susceptible to recall bias compared, for example, to self-reported morbidity. In the next section, we detail the specific variables used in the analysis.

5.0 RESULTS

5.1 Descriptive statistics

Table 3 shows the key characteristics of the children and their households used in the analysis. The share of male children is 50% and this is similar across the three survey rounds. Only a small proportion of children in our sample werea result of multiple births (about 2%). However, at least 52% of the children in our combined sample were of a birth order greater than three. By 2006 the proportion of children with a birth order greater than 3 had risento 58%. The proportion of mothers without education decreased over the survey years—from 31% in 1995 to 23% by 2006. This can be attributed partly to Universal Primary Education (UPE), introduced in 1997. However, the structure of higher education attainment remained the same. On average, mothers in our sample were aged 26 years at the time of the child birth; the trends suggest an improvement in maternal health, as captured by the mother's height—from 158cm in 1995 to 163cm by 2006.

The average use of piped water (both household connection and public standpipes) in the community is about 6% and the use of piped water increased between 1995 and 2006. However, the use of unprotected wells remains predominant across the three survey rounds. The proportion of children who have received any vaccination increased from 82% in 1995 to 92% in 2006, although the proportion of children who received all vaccinations remains very low—at 46% in 2006. Maternal use of modern contraception and knowledge of Oral Rehydration Therapies (ORTs) improved overtime while the use of prenatal care and birth attendance remained constant.

Table 3: Descriptive statistics: means for variables used in the analysis

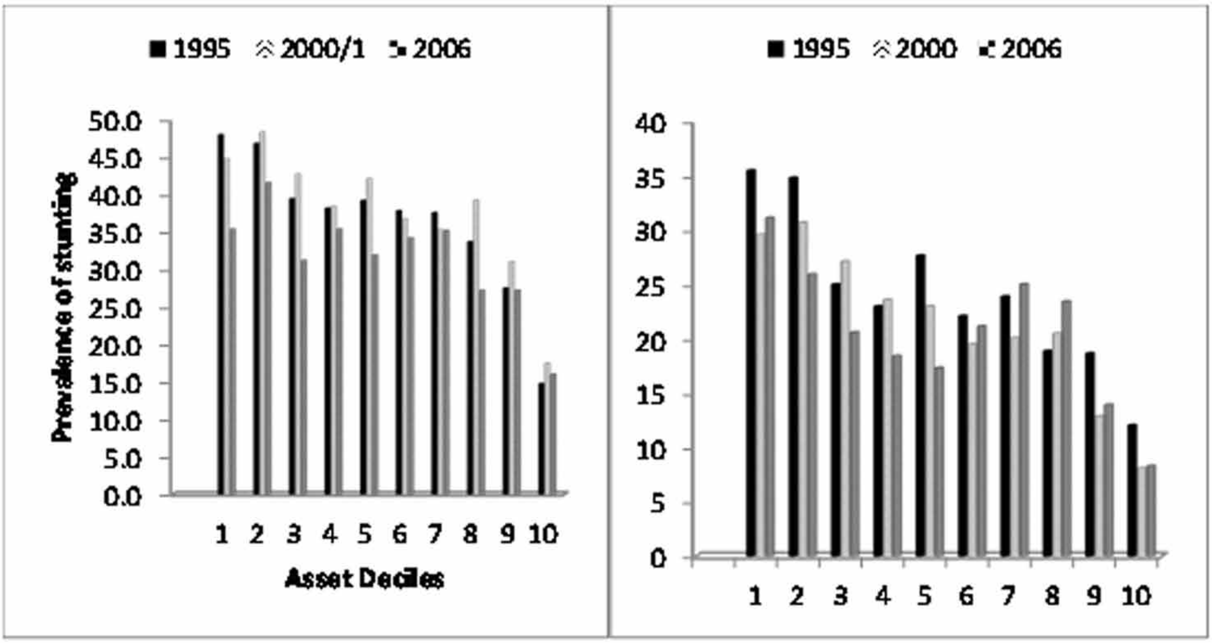
	All waves	Survey round		
		1995	2000	2006
Height for age Z-score	-1.55	-1.58	-1.61	-1.33
Child is Male	0.50	0.49	0.50	0.52
Child is a twin	0.02	0.02	0.02	0.03
Child age category				
Age 0-6 months	0.13	0.15	0.11	0.11
Age 7-12 months	0.14	0.16	0.12	0.12
Age 13-18 months	0.13	0.15	0.12	0.11
Age 19-24 months	0.12	0.14	0.11	0.10
Age 25-36 months	0.20	0.21	0.19	0.20
Age 37-48 months	0.19	0.18	0.19	0.19
Age 49-60 months/3	0.09		0.15	0.16
Birth order>3 child	0.52	0.49	0.53	0.58
Mother Education (Base: No Education)				
No education	0.27	0.31	0.25	0.23
Incomplete primary	0.42	0.39	0.44	0.42
Complete primary	0.20	0.19	0.21	0.22
Incomplete secondary	0.07	0.07	0.07	0.08
Complete Secondary	0.04	0.04	0.03	0.05
Mother's age at child birth (years)	26	26	26	27
Mother's height (centimetres)	159	158	158	163
Log of household asset index		0.40	0.39	0.28
Log of household asset index squared		0.30	0.28	0.16
Water sources				
Piped water/2	0.06	0.05	0.05	0.08
Borehole/2	0.21	0.15	0.22	0.31
Protected spring/2	0.15	0.22	0.15	0.00
Unprotected spring/2	0.34	0.45	0.23	0.37
Health care indicators				
Any Vaccination/1	0.86	0.82	0.88	0.92
All Vaccination/1	0.42	0.39	0.42	0.46
At least one tetanus toxoid /1	0.77	0.81	0.73	0.78
Prenatal care by professional /1	0.87	0.87	0.87	0.88
Birth attended by professional /1	0.38	0.38	0.38	0.39
Use of modern contraception /2	0.14	0.08	0.18	0.17
Knowledge of ORT /2	0.83	0.72	0.92	0.87

Location variables				
Kampala (capital city)	0.05	0.05	0.04	0.05
Central 1	0.10	0.11	0.11	0.10
Central 2	0.10	0.10	0.11	0.08
Eastern Central	0.12	0.12	0.12	0.11
Eastern Central	0.18	0.15	0.21	0.16
Northern	0.11	0.11	0.09	0.15
West Nile	0.08	0.09	0.08	0.06
Western	0.12	0.14	0.09	0.15
South Western	0.15	0.14	0.16	0.13
Rural dummy	0.90	0.89	0.91	0.90
Number of observations	12,035	4,519	5,146	2,370

Notes: /1 These variables are averages for the district in the year of the child's birth.
2 These two variables are cluster averages
3. In the 1995, anthropometric indicators were collected for only children aged up to 4 years

For child anthropometric indicators, we considered three standard indicators: stunting (whether a child's height for age score is less than 2 standard deviations of reference population); underweight (whether a child weight for age z-scores is less than 2 standard deviations of the reference population); and wasting (whether a child's weight for height z-scores are less than 2 standard deviations below the reference population. The lower part of Table 3 shows that stunting and underweight rates have reduced by about 6 percentage points between 1995 and 2006. However, wasting rates remained more or less unchanged. Finally, Figure 1, which plots trends in stunting and underweight rates by asset index deciles during the 1995–-2006 period, shows that children's nutritional status are linked to household welfare or income status. Specifically, deficiencies in nutritional status decrease with higher welfare status of the household.

Figure 1: Stunting and Underweight rates by asset index deciles, 1995-2006.



Source: Author's calculations from the 1995, 2000/1 and 2006 UDHS surveys

5.2 Regression results: Determinants of children's nutritional status

The results examining the determinants of HAZ scores are presented in Table 4 for all combined survey rounds and for each survey round separately. Table 4 also presents the coefficients estimate from the ordinary least squares (OLS) regressions and the robust standard errors are reported in brackets. The results indicate that a child's own characteristics are important covariates for nutritional status. In particular, older children were shorter than younger children. Similarly, children from multiple births and those of higher birth order greater than 3 hadlower health status, suggesting increased competition of scarce household resources in the presence of multiple birthsor for a higher birth order. Table 4 also shows that male infants were significantly less healthy than their female counterparts. However, the results were only significant for the 1995 and 2000 UDHS survey rounds.By 2006, the male disadvantage with respects to nutritional health had been eliminated.

Education variables—in particular higher maternal educational attainment—also significantly boost children's health status. For example, completion of secondary schooling increased HAZ scores by about 0.24 of standard deviation. However, the impacts of completion of secondary education were insignificant in 1995. The results also show that increased maternal education had a large payoff. In particular, the impacts of completing secondary schooling on anthropometric scores were, in most cases, more than double the impacts for completing primary schooling. Similar results suggesting larger impacts of maternal than paternal education have been found in other studies examining determinants of child nutritional status in sub-Saharan Africa (for example, Sahn and Alderman, 1997 for Mozambique; Mariaraet al., 2009 for Kenya). Other important maternal indicators include the mother's health status as captured by a mother's height and also mother's age—both significantly increase a child HAZ scores. However, the magnitudes of the impacts of either mother's height or age at birth were small in comparison to other indicators, for example, household asset status and education.

From a policy perspective, the results for child nutritional health status show that income was a very important determinant of child health. In particular, doubling of the household asset score increased HAZ scores by about 0.75 of a standard deviation during 1995–2006. If we relate the above results to Uganda's key macroeconomics indicators between 1995 and 2006, then the 94% increase in Uganda's gross domestic product—registered during 1995 and 2006 (Government of Uganda, 2010), would translate into an increase in HAZ score by as much as 0.72 of standard deviation—all else held constant.

[7]The maternal education dummies were only jointly significant for all but the most recent UDHS survey round (2006).

Table 4: Determinants of children's HAZ scores in Uganda (1995-2006)

Variable	Combined	Survey round		
		1995	2000	2006
Child's own characteristics				
Child is Male	-0.123***	-0.177***	-0.086**	-0.059
	[0.03]	[0.04]	[0.04]	[0.06]
Child is a twin	-0.657***	-0.622***	-0.739***	-0.682***
	[0.08]	[0.13]	[0.13]	[0.20]
Child age category				
Age 7-12 months	-0.735***	-0.677***	-0.764***	-0.731***
	[0.05]	[0.09]	[0.08]	[0.14]
Age 13-18 months	-1.183***	-1.056***	-1.308***	-1.139***
	[0.06]	[0.09]	[0.09]	[0.16]
Age 19-24 months	-1.304***	-1.256***	-1.440***	-1.148***
	[0.06]	[0.11]	[0.09]	[0.16]
Age 25-36 months	-1.051***	-1.067***	-1.135***	-0.849***
	[0.06]	[0.10]	[0.09]	[0.15]
Age 37-48 months	-1.150***	-1.152***	-1.192***	-1.100***
	[0.06]	[0.11]	[0.09]	[0.15]
Age 49-60 months	-1.175***		-1.242***	-1.150***
	[0.07]		[0.09]	[0.16]
Birth order>3 child	-0.106***	-0.047	-0.174***	-0.074
	[0.04]	[0.06]	[0.05]	[0.09]
Mother's characteristics				
Incomplete primary	0.009	-0.069	0.100**	-0.039
	[0.03]	[0.05]	[0.05]	[0.09]
Complete primary	0.152***	0.103	0.207***	0.080
	[0.04]	[0.07]	[0.06]	[0.10]
Incomplete secondary	0.130**	0.161*	0.056	0.122
	[0.06]	[0.09]	[0.09]	[0.14]
Complete Secondary	0.239***	0.016	0.384***	0.340*
	[0.07]	[0.11]	[0.11]	[0.18]
Mother's age at child birth	0.020***	0.018***	0.020***	0.013*
	[0.00]	[0.00]	[0.00]	[0.01]
Mother's height	0.003***	0.015***	0.044***	0.000
	[0.00]	[0.00]	[0.00]	[0.00]
Log of household asset index		0.680***	0.745***	0.767**
		[0.18]	[0.18]	[0.36]
Log of household asset index squared		-0.092	-0.134	-0.123
		[0.11]	[0.12]	[0.22]
Water sources				
Piped water/2	0.258**	0.359	0.201	0.492**
	[0.10]	[0.23]	[0.16]	[0.24]
Borehole/2	0.160**	0.333	-0.105	0.290*

	[0.08]	[0.23]	[0.12]	[0.15]
Protected spring/2	-0.019	0.172	-0.114	3.288
	[0.09]	[0.22]	[0.12]	[3.26]
Unprotected spring	0.238***	0.164	0.384***	0.103
	[0.07]	[0.21]	[0.10]	[0.16]
Health care indicators				
Any Vaccination/1	-0.370***	-0.520**	-0.256	-0.760*
	[0.14]	[0.25]	[0.21]	[0.44]
All Vaccination/1	-0.161*	-0.066	-0.217	-0.232
	[0.09]	[0.18]	[0.17]	[0.24]
At least one tetanus toxoid /1	-0.043	0.033	0.086	-0.032
	[0.12]	[0.31]	[0.15]	[0.22]
Prenatal care by professional /1	0.208*	0.362	0.154	0.195
	[0.13]	[0.32]	[0.19]	[0.27]
Birth attended by professional /1	0.331***	0.367*	0.265	0.037
	[0.12]	[0.21]	[0.21]	[0.24]
Use of modern contraception /2	0.444***	0.336	0.336**	0.618**
	[0.11]	[0.23]	[0.16]	[0.25]
Knowledge of ORT /2	-0.130	-0.208	-0.090	-0.095
	[0.10]	[0.15]	[0.24]	[0.30]
Location variables				
Central 1	0.066	0.109	0.091	0.003
	[0.08]	[0.13]	[0.13]	[0.24]
Central 2	0.212**	0.176	0.211	0.194
	[0.08]	[0.13]	[0.14]	[0.24]
Eastern Central	0.338***	0.283**	0.195	0.161
	[0.08]	[0.12]	[0.13]	[0.24]
Eastern Central	0.447***	0.322**	0.303**	0.322
	[0.09]	[0.15]	[0.15]	[0.25]
Northern	0.419***	0.281*	0.316**	0.220
	[0.09]	[0.16]	[0.15]	[0.26]
West Nile	0.264***	0.166	0.001	0.382
	[0.10]	[0.17]	[0.17]	[0.25]
Western	0.218**	0.119	0.350**	0.297
	[0.10]	[0.15]	[0.17]	[0.26]
South Western	0.156	0.373**	0.016	0.040
	[0.10]	[0.15]	[0.16]	[0.26]
Rural dummy	-0.146***	-0.214***	-0.053	0.038
	[0.05]	[0.07]	[0.08]	[0.17]
Joint tests for significance				
F-test for all education dummies	6.27***	3.28**	4.98***	1.61
(p-value)	(0.000)	(0.010)	(0.000)	(0.172)
F-test for all water source indicators	5.51***	1.36	7.89****	1.86
(p-value)	(0.002)	(0.246)	(0.000)	(0.114)
F-test for all health care indicators	6.83	1.83	1.96*	1.94

(p-value)	(0.000)	(0.076)	(0.057)	(0.059)
F-test for all location variables	8.53	3.1***	3.31	1.12
(p-value)	(0.000)	(0.001)	(0.000)	-0.345
Observations	10,887	4,480	4,344	2,063
R-squared	0.17	0.18	0.24	0.15

Notes: /1 These variables are averages for the district in the year of the child's birth.
2 These two variables are cluster averages
***Significant at 10%; **significant at 5%; ***significant at 1%.**
Robust standard errors in parentheses, all clustered at community level

Our results for the effects of source of drinking water at the community show a mixed picture. Increased use of piped water and boreholes were both associated with increases in child HAZ scores, but, the water effects were only significant in 2006. However, increased use of unprotected wells/springs shows counterintuitive results. Specifically, the results for use of unprotected wells/springs suggest that increased use improves short-term child health and this is unexpected. Previous studies such as Strauss and Thomas (1995) and Younger and Bahiigwa (2005) note that is not uncommon to find insignificant and, in some cases, results that suggest that particular water facilities increase the risk of stunted growth. According to Younger and Bahiigwa (2005), such anomalies are explained by the fact that households may be using multiple sources of water, for example, a protected spring and surface water at the same time or that the latrine may be poorly constructed and as such does not adequately prevent the spread of pathogens that cause child ill-health. Such factors could lead to a situation where water and sanitation sources considered of superior technology in terms of preventing the transmission of disease do not actually fit the purpose. Nonetheless, our tests for significance of water source variables indicate that for all models, cluster level water source indicators were jointly significant determinants of child health status. It is also worth noting our health care use indicators are the generally insignificant. Use of modern contraception is the only consistently significant health care use indicator. The insignificance of other health care indicators suggests that household factors may matter more for child nutritional health.

It is possible that unobserved heterogeneity not captured by the sub-region dummies may have affected our results in Table 4. As such, we also examined whether community effects are important in explaining child health status. Table 5 shows the results for the major policy variables before (column 1) and after considering community fixed effects (columns 2–5). Community fixed effects were very significant (Table 5). Specifically, the importance of maternal education reduced considerably after considering community fixed effects. This suggests that individual education matters more than community knowledge in improving child health status. However, community effects had no impact on income variable. This suggests that wealthier, better equipped communities do not produce better health outcomes.

Table 5: Determinants of children's HAZ scores in Uganda (1995-2006)

	Combined		Survey round		
			1995	2000	2006
	I	II	III	IV	V
Child's own characteristics					
Child is Male	-0.123***	-0.115***	-0.178***	-0.076**	-0.035
	[0.03]	[0.03]	[0.04]	[0.04]	[0.06]
Child is a twin	-0.657***	-0.718***	-0.608***	-0.783***	-0.885***
	[0.08]	[0.09]	[0.13]	[0.13]	[0.22]
Birth order>3 child	-0.106***	-0.126***	-0.090	-0.165***	-0.089
	[0.04]	[0.04]	[0.06]	[0.06]	[0.09]
Mother's characteristics					
Incomplete primary	0.009	-0.049	-0.081	0.055	-0.210**
	[0.03]	[0.04]	[0.06]	[0.05]	[0.10]
Complete primary	0.152***	0.074	0.063	0.142**	-0.093
	[0.04]	[0.05]	[0.07]	[0.07]	[0.12]
Incomplete secondary	0.130**	0.069	0.136	-0.016	0.031
	[0.06]	[0.06]	[0.09]	[0.09]	[0.16]
Complete Secondary	0.239***	0.132*	-0.052	0.318***	0.106
	[0.07]	[0.08]	[0.12]	[0.12]	[0.21]
Mother's age at child birth	0.021***	0.023***	0.020***	0.020***	0.019***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]
Mother's height	0.003***	0.003***	0.014***	0.042***	0.000
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Log of household asset index			0.537***	0.730***	0.930**
			[0.20]	[0.19]	[0.42]
Log of household asset index squared			0.008	-0.086	-0.253
	[0.08]	[0.08]	[0.12]	[0.13]	[0.27]
Child characteristics	YES	YES	YES	YES	YES
Water use indicators	YES	NO	NO	NO	NO
Health care indicators	YES	NO	NO	NO	NO
Location variables	YES	NO	NO	NO	NO
Community Fixed Effects	NO	YES	YES	YES	YES
Observations	11,041	11,041	4,480	4,363	2,096
R-squared	0.17	0.27	0.24	0.32	0.33

Notes: *Significant at 10%, **significant at 5%, ***significant at 1%
Robust standard errors in parentheses, all clustered at community level

Another issue we examined was whether there was non-linearity between child health status and other exogenous variables. First, we interacted dummy variables of maternal education attainment and household wealth status to examine whether the two were substitutes. In addition, we included interaction terms of gender of the child with household wealth status to establish any differences. The results of this exercise are presented in Table 6. The interaction terms for maternal education suggest that household wealth status is less important for households with mothers who have higher education attainment. However, no significant effects of income on health of children by gender were noted. Finally, we estimated separate regressions for girls and boys to establish whether the coefficients remain the same when we run separate regressions by gender. Only a few variables differed when we ran gender specific regions (results not presented). First, the health status of boys didnot deteriorate for children of higher birth order as was the case for girls. Second, the impact of maternal completion of secondary education wasabout twice for boys compared to girls. Third, household wealth status mattered more for girls than boys in improving nutritional scores.

Table 6: Interaction of variables with household wealth status

	Combined		Survey round		
			1995	2000	2006
	I	II	III	IV	V
Child's own characteristics					
Child is Male	-0.123***	-0.093**	-0.213***	-0.029	0.001
	[0.03]	[0.04]	[0.06]	[0.06]	[0.08]
[Child is Male]X[log of asset index]		-0.082	0.084	-0.145	-0.232
		[0.07]	[0.11]	[0.11]	[0.21]
Child is a twin	-0.657***	-0.659***	-0.632***	-0.737***	-0.677***
	[0.08]	[0.08]	[0.13]	[0.13]	[0.20]
Birth order>3 child	-0.106***	-0.107***	-0.048	-0.174***	-0.077
	[0.04]	[0.04]	[0.06]	[0.05]	[0.09]
Mother's characteristics					
Incomplete primary	0.009	0.043	-0.028	0.110	0.099
	[0.03]	[0.05]	[0.08]	[0.07]	[0.13]
Complete primary	0.152***	0.246***	0.252**	0.247**	0.163
	[0.04]	[0.07]	[0.10]	[0.10]	[0.16]
Incomplete secondary	0.130**	0.065	0.051	-0.018	0.203
	[0.06]	[0.10]	[0.15]	[0.16]	[0.23]
Complete Secondary	0.239***	0.322**	0.242	0.247	0.551*
	[0.07]	[0.14]	[0.20]	[0.25]	[0.31]
[Incomplete primary] X[log of asset index]			-0.184	-0.043	-0.760
			[0.24]	[0.22]	[0.56]
[Complete primary]X[log of asset index]			-0.398	-0.103	-0.521
			[0.24]	[0.23]	[0.57]
[Incomplete secondary]X[log of asset index]			0.024	0.089	-0.548
			[0.27]	[0.26]	[0.61]
[Complete Secondary]X [log of asset index]			-0.410	0.124	-0.729
			[0.27]	[0.31]	[0.65]
Log of household asset index	0.797***	0.965***	0.725***	0.898***	1.360**
	[0.12]	[0.16]	[0.22]	[0.24]	[0.57]
Log of household asset index squared	-0.137*	-0.117		-0.182	-0.044
	[0.08]	[0.09]		[0.15]	[0.31]
Mother's age at child birth	0.021***	0.021***	0.018***	0.020***	0.016**
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]
Mother's height	0.003***	0.003***	0.015***	0.044***	0.000
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Constant	-1.670***	-1.704***	-3.464***	-8.438***	-0.673
	[0.23]	[0.24]	[0.53]	[0.60]	[0.55]
Observations	10,887	10,887	4,480	4,344	2,063
R-squared	0.17	0.17	0.18	0.24	0.15

Notes: *Significant at 10%, **significant at 5%, ***significant at 1%
Robust standard errors in parentheses, all clustered at community level

6.0 CONCLUSIONS AND IMPLICATIONS

The study examined the determinants of child health status in Uganda—a country that has very poor health indicators despite increased spending on health during the implementation of the poverty reduction strategy papers. We used three cross-sectional UDHS surveys—conducted in 1995, 2000/2001 and 2006 and proxy child health using anthropometric indicators. Bearing in mind possible endogeneity, we used community averages for use of water and sanitation facilities and health care services instead of individual-level data on health care use. We found that it was mainly indicators of household welfare status that matter most for children's nutritional outcomes—notably asset holdings and higher maternal education attainment. Furthermore, our community fixed effects regressions suggest that individual education attainment matters more than community knowledge. A key implication of our findings on child health is that one cannot overstate the importance of household incomes—even in an environment of free public health services such as sexists in Uganda today.

Previous research on Uganda also points to the efficacy of incomes for child health. For example, Lawson and Appleton (2007) show that doubling of household incomes would increase the mean HAZ score for pre-school boys in Uganda by 0.57 of a standard deviation or reduce morbidity by as much as 20%. Earlier studies such as Mackinnon (1995) also show that education programmes—which also impact on adult incomes—are important for public awareness of illness and for seeking treatment. Nonetheless, incomes alone cannot solve all Uganda's health problems. For example, Ssewanyana and Younger (2008) show that improvement in the primary school completion rates for mothers would result in faster reduction in Uganda's infant mortality rate compared to an increase in incomes.

Our results also highlighted the importance of higher female education for child health. Although Uganda has attained relative success in increasing female enrolment in primary school under UPE, similar success is yet to be registered for secondary schooling despite the introduction of the universal secondary education (USE) in 2007. Unlike, UPE, USE is not free to every UPE graduate. The secondary programme is means tested based on performance on primary leaving examinations. Without increasing female education beyond primary, Uganda is unlikely to register significant changes in child health status.

Despite the breadth of the DHS type surveys and large sample used in the analysis, this remains a study based on cross-sectional surveys with all the limitations of using such types of data. As DHS surveys are primarily designed to track trends in population, health and nutritional programmes, they are not particularly well suited to some economic analysis. For example, we did not examine the impacts of orphan status on child health despite the high incidence of orphanhood in Uganda—at least 13% and 5% of children aged less than 18 years and 6 years respectively report in 2009/2010 having lost at least one parent (UBoS, 2010).

7.0 REFERENCES

Alderman, H. 2007. "Improving nutrition through community growth promotion: Longitudinal Study of the Nutrition and Early Child Development Program in Uganda".World Development,35(8): 1376–89.

Becker, G.S. 1981. A Treatise on the Family. Cambridge, Massachusetts:Harvard University Press

Behrman, J.R. and A.B. Deolalikar. 1988. "Health and nutrition".InH. Chenery and T.N. Srinivasan. (eds.).Handbook of Development Economics,1: 631–711.

Castrol-Leal, F., J. Dayton., L. Demeryet al. 2000. "Public spending on health care in Africa: do the poor benefit?".Bulletin of World Health Organization,78(1):66–74.

Deaton, A. 2003. "Health, inequality, and economic development".Journal of Economic Literature, 4(3): 353–78.

Filmer, D and L. Prittchet. 2001. "Estimating wealth effects without expenditure data or tears: An application of education enrolment in states of India". Demography,38(1): 115–32.

Glick, P.J., A. Marini and D.E. Sahn. 2007. "Estimating the consequences of unintendedfertility for child health and education in Romania: An analysis usingtwin data".Oxford Bulletin of Economics and Statistics,69(5): 667–91.

Government of Uganda. 2003. Uganda Participatory Poverty Assessment Report 2002. National Report. Ministry of Finance Planning and Economic Development, Kampala.

Government of Uganda. 2005a. Health Sector Strategic Plan II, 2005/6-2009/10. Ministry of Health, Kampala.

Government of Uganda.2005b. Annual Health Sector Performance Report, 2004/5.Ministry of Health,Kampala.

Government of Uganda.2007. The Uganda National Household Survey 2005/2006, Report on the Socio-economic Survey. Uganda Bureau of Statistics, Kampala.

Government of Uganda. 2009.Background to the Budget 2009/2010. Ministry of Finance Planning and Economic Development, Kampala.

Government of Uganda.2010. National Development Plan 2010-2014. Government of Uganda, Kampala.

_____, (2001), Uganda Demographic and Health Survey 2000/2001 Uganda Bureau of Statistics, Entebbe.

______, (1995), Uganda Demographic and Health Survey 1995 Ministry of Finance Planning and Economic Development, Statistics Department, Entebbe and Macro International, Calverton, Maryland.

Keller, W. 1983." Choices of Indicators of Nutritional Status. Evaluation of Nutrition in Third World Communities".Nestle Foundation Publication Series. Bern: H. Huber..

Lawson, D. and S. Appleton. 2007." Child health in Uganda—Policy determinants and measurements". European Journal of Development Research,2(2): 191–204.

Mackinnon, J. 1995." Health as an informationgood: The determinants of child nutrition and mortality during political and economic recovery in Uganda". CSAE Working Paper No. 95-9.Centre of Study of African Economies, Oxford.

Mariara, J.K., G.K. Ndenge and D.K. Mwabu. 2009." Determinants of children's nutritional status in Kenya: Evidence from demographic and health surveys".Journal of African Economies, 18(3): 363–87.

Martorell, R. and J.P. Habicht. 1986." Growth in early childhood in developing countries". In R.Fulkner and J.M. Tanner, eds., Human Growth: A Comprehensive Treatise. New York: Plenum.

Milanovic, B. 2003." Is Inequality in Africa really different?".Development Research Group Working Paper No. 3169. Development Research Group, TheWorld Bank, Washington, D.C.

Moradi, A and J. Baten. 2005." Inequality in Sub-Saharan Africa: New data and new insights from anthropometric estimates".World Development, 33(8): 1233–65.

Mosley, W.H. and L.C. Chen. 1984." An analytical framework for the study of child survival in developing countries"Population and Development Review,10(supplement): 25–45.

Pradhan, M, D.E. Sahn and S.D. Younger. 2003." Decomposition world health Inequalities".Journal of Health Economics,22(2): 271–93.

Sahn, D.E. 2009." Health inequality across populations of individuals".Paper prepared for the AERC Workshop, Ghana, 2009.

Sahn, D.E and D. Stifel. 2003." Exploring alternative measures of welfare in the absence of expenditure data".Review of Income and Wealth, 49(4): 463–89.

Sahn, D. E and Younger, S. D. (2009), 'Measuring intra-household health inequality: explorations using body mass index', Health Economics, Vol. 18, Supplement 1, S13-S36.

Sahn, D. E and S.D. Younger. 2000." Expenditure incidence in Africa: microeconomic evidence".Fiscal studies,21(3): 329–47.

Sahn, D.E. and S.D. Younger.2005." Improvements in child health: Does inequality matter?".Journal of Economic Inequality,3(1): 125–43.

Sahn, D.E and Alderman, H. (1997), 'On the Determinants of Nutrition in Mozambique: The Importance of Age Specific Effects', World Development, Vol.25, No. 4, 577–88.

Schipper, Y and J.G. Hoogeveen. 2005. Which Inequality Matters? Growth Evidence Based on Small Area Welfare Estimation in Uganda.World Bank Policy Research Working Paper No. 3592. Washington, D.C.: The World Bank.

Singh, I., L. Squire and J. Strauss.eds. 1986. Agricultural Household Models: Extensions, Applications and Policy. Baltimore: Johns Hopkins University Press.

Ssewanyana, S.N.2003. Food Security and Child Nutrition Status among Urban Poor Households in Uganda: Implications for Poverty Alleviation.AERC Research Paper 130.African Economic Research Consortium, Nairobi.

Ssewanyana, S and S.D. Younger. 2008." Infant mortality in Uganda: Determinants, trends, and Millennium Development Goals".Journal of African Economies, 17:(1): 34–61.

Ssewanyana, S, D. Angemi, I.Kasirye, and L. Bategeka. 2007." Inequality beyond income in Uganda: Does it call for more public response".Paper submitted to the Ministry of Finance Planning and Economic Development.

Ssewanyana, S., J.A. Okidi, D. Angemi and V. Barungi.2004. Understanding the Determinants of Income Inequality in Uganda.EPRCResearch Paper No. 39. Economic Policy Research Centre,Kampala.

Strauss, J and D. Thomas. 1995." Empirical modeling of household and family decisions"In J. Behrman and T.N. Srinivasan, eds., The Handbook of Development Economics, Volume IIIa. Amsterdam: North Holland.Chapter 34

UBoS (Uganda Bureau of Statistics). 2002. The 2002 Population and Housing Census. Entebbe: Uganda Bureau of Statistics.

UBoS (Uganda Bureau of Statistics). 2010. Uganda National Household Survey 2009/10: Socio-Economic Module Abridged Report. Kampala: UBoS.

_________, (2007) Uganda National Household Survey 2005-2006: Social Economic Report (Kampala:UBoS).

_________, (2000) Uganda National Household Survey 1999-2000: Social Economic Report (Kampala:UBoS).

UBOS (Uganda Bureau of Statistics) and ORC Macro International. 2001. Uganda Demographic and Health Survey 2001. Calverton, Maryland: UBOS and Macro International Inc.

UBOS (Uganda Bureau of Statistics)and Macro International Inc. 2007. Uganda Demographic and Health Survey 2006. Calverton, Maryland: UBOS and Macro International Inc.

UNICEF (United Nation Children's Fund). 2009. Tracking Progress on Child and Maternal Nutrition: A Survival and Development Priority. New York: UNICEF.

UNDP (United Nations Development Programme). 2007. Human Development Report 2007/2008. Beyond Scarcity: Power, Poverty, and the Global Water Crisis. New York: UNDP.

Wagstaff, A., E. von Doorslaer and N. Watanabe. 2003. "On decomposition the cases of health sector inequalities with an application to malnutrition inequalities in Vietnam", Journal of Econometrics,112(1): 207–23.

World Bank. 2005.World Development Report 2006: Equity and Development. Washington, D.C.: The World Bank.

Younger, S.D. and G. Bahiigwa. 2005." Child health status in Uganda". SAGA Working Paper.Cornell University.

8.0 EPRC RESEARCH SERIES

Listing of EPRC Research Series published since 2005 to date. Full text format of these and earlier papers can be downloaded from the EPRC website at www.eprc.or.ug

95	Kasirye Ibrahim	HIV/AIDS Sero-Prevalence And Socioeconomic Status:	September 2012
94	Ssewanyana Sarah and Kasirye Ibrahim	Poverty And Inequality Dynamics In Uganda: Insights From The Uganda National Panel Surveys 2005/6 And 2009/10	September 2012
93	Othieno Lawrence & Dorothy Nampewo	Opportunities And Challenges In Uganda's Trade In Services	July 2012
92	Kuteesa Annet	East African Regional Integration: Challenges In Meeting The Convergence Criteria For Monetary Union: A Survey	June 2012
91	Mwaura Francis and Ssekitoleko Solomon	Reviewing Uganda's Tourism Sector For Economic And Social Upgrading	June 2012
90	Shinyekwa Isaac	A Scoping Study Of The Mobile Telecommunications Industry In Uganda	June 2012
89	Mawejje Joseph, Munyambonera Ezra & Bategeka Lawrence	Uganda's Electricity Sector Reforms And Institutional Restructuring	June 2012
88	Okoboi Geoffrey and Barungi Mildred	Constraints To Fertiliser Use In Uganda: Insights From Uganda Census Of Agriculture 2008/9	June 2012
87	Othieno Lawrence Shinyekwa Isaac	Prospects And Challenges In The Formation Of The Comesa-Eac And Sadc Tripartite Free Trade Area	November 2011
86	Ssewanyana Sarah, Okoboi Goeffrey & Kasirye Ibrahim	Cost Benefit Analysis Of The Uganda Post Primary Education And Training Expansion And Improvement (Ppetei) Project	June 2011
85	Barungi Mildred & Kasirye Ibrahim	Cost-Effectiveness Of Water Interventions: The Case For Public Stand-Posts And Bore-Holes In Reducing Diarrhoea Among Urban Households In Uganda	June 2011

84	Kasirye Ibrahim & Ahaibwe Gemma	Cost Effectiveness Of Malaria Control Programmes In Uganda: The Case Study Of Long Lasting Insecticide Treated Nets (Llins) And Indoor Residual Spraying	June 2011
83	Buyinza Faisal	Performance And Survival Of Ugandan Manufacturing Firms In The Context Of The East African Community	September 2011
82	Wokadala James, Nyende Magidu, Guloba Madina & Barungi Mildred	Public Spending In The Water Sub-Sector In Uganda: Evidence From Program Budget Analysis	November 2011
81	Bategeka Lawrence & Matovu John Mary	Oil Wealth And Potential Dutch Disease Effects In Uganda	June 2011
80	Shinyekwa Isaac & Othieno Lawrence	Uganda's Revealed Comparative Advantage: The Evidence With The Eac And China	September 2011
79	Othieno Lawrence & Shinyekwa Isaac	Trade, Revenues And Welfare Effects Of The Eac Customs Union On Uganda: An Application Of Wits-Smart Simulation Model, Eprc Research Series	April 2011
78	Kiiza Julius, Bategeka Lawrence &Ssewanyana Sarah	Righting Resources-Curse Wrongs In Uganda: The Case Of Oil Discovery And The Management Of Popular Expectations	July 2011
77	GulobaMadina, Wokadala James &Bategeka Lawrence	Does Teaching Methods And Availability Of Teaching Resources Influence Pupil's Performance?: Evidence From Four Districts In Uganda	August 2011
76	Okoboi Geoffrey, Muwanika Fred, Mugisha Xavier &NyendeMajidu	Economic And Institutional Efficiency Of The National Agricultural Advisory Services' Programme: The Case Of Iganga District	2011
75	Okumu Luke &Okuk J. C. Nyankori	Non-Tariff Barriers In Eac Customs Union: Implications For Trade Between Uganda And Other Eac Countries	December 2010
74	Kasirye Ibrahim & Ssewanyana Sarah	Impacts And Determinants Of Panel Survey Attrition: The Case Of Northern Uganda Survey 2004-2008	April 2010

73	Twimukye Evarist, Matovu John Mary, Sebastian Levine & Birungi Patrick	Sectoral And Welfare Effects Of The Global Economic Crisis On Uganda: A Recursive Dynamic Cge Analysis	July 2010
72	Okidi John & Nsubuga Vincent	Inflation Differentials Among Ugandan Households: 1997 - 2007	June 2010
71	HisaliEria	Fiscal Policy Consistency And Its Implications For Macroeconomic Aggregates: The Case Of Uganda	June 2010
70	Ssewanyana Sarah &Kasirye Ibrahim	Food Security In Uganda: A Dilemma To Achieving The Millennium Development Goal	July 2010
69	Okoboi Geoffrey	Improved Inputs Use And Productivity In Uganda's Maize Sector	March 2010
68	Ssewanyana Sarah &Kasirye Ibrahim	Gender Differences In Uganda: The Case For Access To Education And Health Services	May 2010
67	Ssewanyana Sarah	Combating Chronic Poverty In Uganda: Towards A New Strategy	June 2010
66	Sennoga Edward &Matovu John Mary	Public Spending Composition And Public Sector Efficiency: Implications For Growth And Poverty Reduction In Uganda	February. 2010
65	Christopher Adam	The Conduct Of Monetary Policy In Uganda: An Assessment	September 2009
64	Matovu John Mary, TwimukyeEvarist, Nabiddo Winnie & Guloba Madina	Impact Of Tax Reforms On Household Welfare	May 2009
63	Sennoga Edward, Matovu John Mary & Twimukye Evarist	Tax Evasion And Widening The Tax Base In Uganda	May 2009
62	Twimukye Evarist & Matovu John	Macroeconomic And Welfare Consequences Of High Energy Prices	May 2009
61	Matovu John &Twimukye Evarist	Increasing World Food Price: Blessing Or Curse?	May 2009
60	Sennoga Edward, Matovu John &TwimukyeEvarist	Social Cash Transfers For The Poorest In Uganda	May 2009
59	Twimukye Evarist, Nabiddo Winnie & Matovu John	Aid Allocation Effects On Growth And Poverty: A Cge Framework	May 2009
58	Bategetka Lawrence, Guloba Madina & Kiiza Julius	Gender And Taxation: Analysis Of Personal Income Tax (PIT)	April 2009

57	Ssewanyana Sarah	Gender And Incidence Of Indirect Taxation: Evidence From Uganda	April 2009
56	Kasirye Ibrahim &HisaliEria	The Socioeconomic Impact Of HIV/AIDS On Education Outcomes In Uganda: School Enrolment And The Schooling Gap In 2002/03	November 2008
55	Ssewanyana Sarah & Okidi John	A Micro Simulation Of The Uganda Tax System (UDATAX) And The Poor From 1999 To 2003	October 2008
54	Okumu Mike, Nakajjo Alex & Isoke Doreen	Socioeconomic Determinants Of Primary Dropout: The Logistic Model Analysis	February. 2008
53	Akunda Bwesigye Denis	An Assessment Of The Casual Relationship Between Poverty And Hiv/Aids In Uganda	September. 2007
52	Rudaheranwa Nichodemus, Guloba Madina & Nabiddo Winnie	Costs Of Overcoming Market Entry Constraints To Uganda's Export-Led Growth Strategy	August 2007
51	Kasirye Ibrahim	Vulnerability And Poverty Dynamics In Uganda, 1992-1999	August 2007
50	Sebaggala Richard	Wage Determination And Gender Discrimination In Uganda	May 2007
49	Ainembabazi J. Herbert	Landlessness Within The Vicious Cycle Of Poverty In Ugandan Rural Farm Household: Why And How It Is Born?	May 2007
48	Obwona Marios & Ssewanyana Sarah	Development Impact Of Higher Education In Africa: The Case Of Uganda	January 2007
47	Abuka Charles, Egesa Kenneth, Atai Imelda & Obwona Marios	Firm Level Investment: Trends, Determinants And Constraints	March 2006
46	Okidi A. John, Ssewanyana Sarah Bategeka Lawrence & Muhumuza Fred	Distributional And Poverty Impacts Of Uganda's Growth: 1992 To 2003	December 2005
45	Okidi John A , Ssewanyana Sarah, Bategeka Lawrence & Muhumuza Fred	Growth Strategies And Conditions For Pro-Poor Growth: Uganda's Experience	December 2005
44	Obwona Marios , Wasswa Francis & Nambwaayo Victoria	Taxation Of The Tobacco Industry In Uganda: The Case For Excise Duty On Cigarettes	November 2005

43	Obwona Marios & Ndhaye Stephen	Do The HIPC Debt Initiatives Really Achieve The Debt Sustainability Objectives? Uganda's Experience	August 2005
42	Rudaheranwa Nichodemus	Trade Costs Relating To Transport Barriers On Uganda's Trade	May 2005

Notes

Notes

ECONOMIC POLICY RESEARCH CENTRE - EPRC
Plot 51 Pool Road, Makerere University
P. O. Box 7841, Kampala - Uganda
Tel: +256 414-541022
E-mail: eprc@eprc.or.ug
Website: www.eprc.or.ug