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Household Production of Human Health in Kenya: An Econometric Analysis

Thomas Mutinda Muthama

Lead Data Analyst, Centre for Statistical and Econometric Analysis, THE NOG AKUDOS SEARCHTRIPP, Kenya

Abstract: ***Non communicable chronic illnesses are becoming increasingly significant causes of morbidity, disability and premature mortality both in developing and newly developed countries, placing additional burdens on already overtaxed national health budgets. However, the per cent allocation of health expenditure to non-communicable diseases is still very minimal, despite the fact that non-communicable diseases are on the increase particularly among poor people in large cities at the global level, the sub-Saharan countries and also in Kenya. The purpose of this study is to incorporate the effect of household responses to shock on non-communicable chronic illnesses in a household health production model. Specifically, the study sought to determine the effect of household response to shocks on chronic non communicable illnesses; and the effect of diet and nutrition on non communicable chronic illnesses. The study found that diet and nutrition; households respond to shocks; and socio-economic characteristics affects household health status. In conclusion, consumption of meat, dairy products, and drinking beverages and non-alcoholic beverages do increase the presence of NCDs. NCDs will increase due to consumption of bacon, ham salami, and minced meat; cheese, and butter; and drinking mineral water, tea bags, coffee instant, drinking choco, and sodas. When households responds to shocks by seeking help from government or non-governmental institutions it leads to a decline in NCDs. NCDs also reduced in households who respond to shocks through working more or for longer hours. The study also concludes that the presence of NCDs would be higher in households where there is paternal orphan. The study recommends that households' ought to be informed through health education on the risks posed by continual consumption of bacon, ham salami, and minced meat; cheese, and butter; and drinking mineral water, tea bags, coffee instant, drinking choco, and sodas. In cushioning households against non-communicable diseases, the government; local and international non-governmental organizations ought to rapidly respond to shocks on households. In addition, individuals in any households ought to encouraged and motivated to worker more or for longer hours. Increased attention by both the government and non-governmental institutions, need to be given to households who have paternal orphans. This is the case since; the father figure protects both the children and their mother against abuse and exploitation by relatives from infringing on their rights and possessions.***

Keywords: Household Production, Econometric Analysis, Non-Communicable Diseases, Households Response to Shocks, Diet and Nutrition

1. Introduction

1.1 Background of the Study

Human capital is regarded as a consequence of long-term education (*education* human capital), good health (*health* human capital) and good nutrition [2]. [6] demonstrated that health could be viewed as a durable capital stock that produces an output of healthy time. Individuals can and do invest in themselves according to the following relationship.

$$H_t - H_{t-1} = I_{t-1} - \delta_{t-1} H_{t-1} \qquad \ldots (1)$$

Where H_t is health stock at the beginning of period t; H_{t-1} is health stock during period t–1; I_{t-1} and δ_{t-1} are gross investment and rate of depreciation during period t–1 respectively. Health itself is viewed as a current service derived from a depreciating stock of health human capital, formed by investments in health care, and also impacted by health-related behaviours, which interact with the individual's initial health stock [12]. Good health is demanded and supplied as a commodity. The input of both market and non- market goods and services and the individual's own time determine the production of the health commodity which increases the health capital of an individual [8]. This commodity may allow the person to achieve an increase in wages by allowing them to apply less time to sickness [14].

Health production is not properly linked to patterns of demand for market inputs and to behavioural changes [10]. In Kenya, the Ministry of Health designed the second National Health Sector Strategic Plan (NHSSP II 2005 – 2010), which puts emphasis on disease prevention and health promotion. It defines community level as the first level of care in a six-tier[1] structure. The same is reflected in the Kenya vision 2030 in which one of the health sectors flagship projects for 2012 is to revitalize community health centers in order to promote preventive health care and a promote healthy individual lifestyles [5]. In the most general sense, "lifestyle" refers to all the factors over which households have some control, such as dietary patterns [1], and [11]. This health promotion (or health education) is a dynamic, planned and measurable process aimed at the prevention of communicable and non-communicable diseases (NCD) by helping people change their behaviour/lifestyle[2] to move toward a state of optimal health[3].

[1] Level one is village/ households/ individuals; level two is dispensaries/ clinics; level three is health centers, maternities, nursing homes; level four is primary (district) hospitals; level five is secondary (provincial) hospitals; and level six is tertiary (national) hospitals

[2] Lifestyle change can be facilitated through a combination of efforts to enhance awareness, change behavior and create environments that support good health practices".

[3] Optimal health is defined as a balance of physical (fitness, nutrition, medical self-care, control of substance abuse); emotional (care for emotional crisis, stress management); social (communities, families, friends); spiritual (love, hope,

Given the rapidity with which traditional diets and lifestyles are changing in many developing countries, it is not surprising that food insecurity and undernutrition persist in the same countries where chronic diseases are emerging as a major epidemic. The epidemic of obesity, with its attendant comorbidities - heart disease, hypertension, stroke, and diabetes- is not a problem limited to industrialized countries. Children are in a similar situation; a disturbing increase in the prevalence of overweight among this group has taken place over the past 20 years in developing countries.

1.1.1 Non-Communicable Diseases

The burden of chronic non-communicable diseases (NCD), especially heart disease, stroke, hypertension, diabetes, cancer and chronic respiratory disease, is rising in low and middle-income countries. Chronic NCDs accounted for 60% of global death in 2005, including cardiovascular diseases and diabetes (32%), cancers (13%), and COPD (7%). Of concern, available data suggests that the burden of chronic NCD is greater in low and middle-income countries than that in high-income countries. The World Health Report identified a number of key risk factors and quantified the contribution of each to the global burden of cardiovascular disease, amongst them was low intake of fruit and vegetables. High blood pressure is a major modifiable risk factor for cardiovascular diseases (CVDs) and a leading cause of the CVD burden worldwide, the higher the blood pressure, the greater the chance of heart attack, heart failure, stroke, and kidney disease.

Chronic diseases such as obesity, diabetes, cardiovascular diseases, and cancer present the greatest public health burden, either in terms of direct cost to society and government or in terms of disability adjusted life years (DALYs). The myth that chronic NCDs are 'diseases of affluence,' has led health authorities, particularly in low and middle-income countries, to be unaware of this threatening burden of chronic NCDs which is largely driven by the aging of populations and changing of the lifestyles. Globally, health budgets allocated for chronic NCD prevention and control are insufficient. The misguided belief that interventions for chronic NCD prevention and control are less cost-effective than those for acute infectious diseases discourages health authorities from investing in chronic NCD prevention.

In the modern literature on health promotion, health is defined as having two distinct dimensions of positive health (well being) and negative health (ill health). The positive dimension of health consists of the qualitative aspects of health and human life in general, and is strongly associated with the concept of "fitness". The negative dimension is determined by the presence or absence of disease, illness, deformity, unwanted states, injury, disability and handicap.

1.2 Problem Statement

The health of individuals and global public health is threatened and burdened both by the well-known infections (Malaria, TB, STI, HIV/AIDS), and also by non communicable chronic illnesses (cardiovascular diseases, cancer, trauma/accidents and stress, earlier labeled as ''diseases of affluence'' but now are increasingly emerging among the poor both in poorer countries and in the poorer population groups in richer countries. The Abuja declaration outlined that governments ought to allocate 15 per cent of the government expenditure to health. However, still most governments have not yet met this target. Moreover, the per cent allocation of health expenditure to non-communicable diseases is still very minimal, despite the fact that non-communicable diseases are on the increase particularly among poor people in large cities at the global level, the sub-Saharan countries and also in Kenya. The poor people are at an increased social disadvantage in terms of the incidence as well as access to preventive services and treatment. They are most at risk, show lower rates of acceptance of health-promoting behaviours and the least power to effect change, thus widening the degree of inequality between the rich and poor. However, poverty has been found to be a predictor of chronic NCDs in 'low income' countries like the 'high income' countries.

Chronic non-communicable diseases (NCDs) such as heart disease and stroke, diabetes mellitus, cancer, and chronic respiratory diseases account for approximately 60% of total mortality in the world, with around 80% of these deaths occurring in low and middle-income countries. According to a recent projection, seven out of every 10 deaths in low-income countries will be from chronic NCDs by 2020, and poses a serious challenge to the developing countries. Non communicable chronic illnesses are becoming increasingly significant causes of morbidity, disability and premature mortality both in developing and newly developed countries, placing additional burdens on already overtaxed national health budgets. Rapid changes in diets and lifestyles have occurred with urbanization and market globalization, which has seen expansion and diversification of food availability and increased accessibility to services. These have had significant negative consequences in terms of inappropriate dietary patterns especially among poor people. This is having a significant impact on the health and nutritional status of populations, particularly in developing countries. Dietary adjustments may not only influence present health, but may determine whether or not an individual will develop non communicable chronic illness much later in life.

Most studies focusing on the causes and determinants of health though based on the household health production model, none of the studies used non communicable chronic illness as the dependent variable. In addition, the determinants used are behavioural factors such as cigarette smoking, alcohol consumption, exercise and the like, but none examined the effect of how households responds to shocks and other lifestyle related factors in relation to chronic non communicable illnesses. This study will bridge the gap and utilize a household health production model for various non communicable chronic illnesses.

1.3 Objectives

The general objective of this study is to incorporate the effect of the household responses to shock on non-communicable chronic illnesses in a household health

charity); and intellectual (educational achievement, career development) health.

production model. Specifically the study sets out to address the following objectives:

1) To determine the effect of household response to shocks on chronic non communicable illnesses;
2) To ascertain the effect of diet and nutrition on non communicable chronic illnesses;

2. Literature Review

2.1 Theoretical Framework

This study is based on the human capital theory as put forward by [2]. It was further employed in household production by [6] to develop his model of the demand for health. [10] added that, the health capital accumulated by successful treatment of an illness in a previous period can be wiped out by a random illness in the next period, so that death can occur during a period of good health.

2.2 Health Status

[10] argued that health is an inherently personal phenomenon, for it is part and parcel of human beings and hence can be properly measured only at the individual level. He also noted that health is a dimension of human capital, which is theoretically defined as unobservable general ability of the people; and this unobservability of health greatly complicates its measurement.

Measures of health can be divided as follows self assessed health status (SAH); illness restricted activity days; other functional limitations like problems with activities of daily living (ADLs); presence of acute and chronic conditions; utilization of medical care; clinical assessments of mental health; nutritional status such as height, weight or body mass index and expected future mortality [10]. The health capital has mostly been measured by mortality and morbidity rates, life expectancy at birth and various indicators of disease burdens like disability-adjusted life years and quality-adjusted life-years, and categorical measure of overall health status or type (acute or chronic) of disease [10], and [15].

Self assessed health (SAH) is a simple subjective measure of health that provides an ordinal ranking of perceived health status [3]. Using such a measure is advantageous, as it is based on a very simple survey question that has a high reliability [15]. SAH should therefore be interpreted as indicating a perceived health status relative to the individuals' concept of the 'norm' for their age group. A more objective measure is to use biomedical evidence which suggests that calorie intake is correlated with increases in oxygen uptake [10], and [13]. According to [10] calorie intake measure the quantity of nutritional inputs used to produce health while the accumulative nutrition-based measures of health expressed in anthropometrics, such as height, weight, arm circumference, and body mass index (KGs/M^2) are the outcomes of these nutritional inputs. In this study health status will be measured by the number of individuals in a household who have non-communicable chronic illness.

2.3 Households Response to Shocks

Households respond to shocks through various ways, with the aim of coping or regaining household's former welfare level. The household's responses include reduction in expenditure (reduced food consumption, consumed lower cost but less preferred foods, reduced non food expenditures); help from government and non-governmental institutions (local NGO, international NGO, government); help from relatives or friends (borrowed money from relatives, family or friends); seeking spiritual intervention (received help from religious institutions, spiritual help like prayers, sacrifices and consulted diviner); borrowing money (money lender, institutions like banks); sold farm land; children affected (sent children to live with relatives, removed children from school to work); and new investment venture (started a new business, worked more or for longer hours).

2.4 Calorie Intake (Diet/ Nutrition)

Many people in the developing world likewise are abandoning traditional diets rich in fibre and grain for diets that include greater consumption of sugars, oils and animal fats. Calorie intake is discussed under different types of cereals namely sorghum flour, sorghum grain, millet flour, millet grain, and maize flour loose; the pulses are grams, njahi black grams, and peas; for meat we shall include bacon, ham salami, minced meat, and sausages; dairy products and eggs incorporates cheese, eggs, butter, margarine, and peanut butter; fruits includes banana ripe, oranges, melons, apples, grapes, and strawberries; beverages for drinking and non alcoholic beverages includes mineral water, tea bags, coffee instant, drinking choco, and sodas; and lastly spices consists of tomato sauce, chili sauce, vinegar, baking powder, and yeast.

The high and increasing consumption of sugars-sweetened drinks by children in many countries is of serious concern. It has been estimated that each additional can or glass of sugars-sweetened drink that they consume every day increases the risk of becoming obese by 60%. Most of the evidence relates to soda drinks but many fruit drinks and cordials are equally energy-dense and may promote weight gain if drunk in large quantities. It is recognized that higher intakes of free sugars threaten the nutrient quality of diets by providing significant energy without specific nutrients. A high intake of energy-dense foods promotes weight gain as they tend to be high in fat (e.g. butter, oils, fried foods), sugars or starch, while energy-dilute foods have a high water content (e.g. fruits and vegetables). While energy from fat is no more fattening than the same amount of energy from carbohydrate or protein, diets that are high in fat tend to be energy-dense. An important exception to this is diets based predominantly on energy-dilute foods (e.g. vegetables, legumes, fruits) but which have a reasonably high percentage of energy as fat from added oils. Fruits and vegetables contribute to cardiovascular health through the variety of phytonutrients, potassium and fibre that they contain. Daily intake of fresh fruit and vegetables (including berries, green leafy and cruciferous vegetables and legumes), is recommended to reduce the risk of coronary heart disease, stroke and high blood pressure.

2.5 Socio-economic and other background variables

Education influences many decisions that impact the quality of life such as a choice of job, ability to select a healthy diet, avoid unhealthy habits and efficient use of health care [11]. More educated individuals are healthier because their investment in the future gives them the right incentives to protect their health [9]. Another explanation, based on education entering as a factor in the health production function, emphasizes that education improves the access to health-related information and the processing of that information to make health-related decisions [4]. An increase in adult education, increase the efficiency of translating variable inputs in the health production function [7]. Hence, it increases both the demand for health and the productivity of health inputs. In this study the number of household members with complete primary education was used. In addition, the number of individuals living in the household including the respondents (household size) and binary variables representing whether a household had paternal orphans[4] or maternal orphans[5] was included in the study.

3. Methodology

3.1 Sampling Technique

The households were randomly selected to comprise the "The Kenya Integrated Household Budget Survey (KIHBS), 2005/2006'' sample, which was designed to generate representative statistics at the national, provincial and district levels. The sampling design involved a number of stages. In the first stage, 1,343 clusters were stratified by district (and by both urban and rural areas within each district). The objective was to make the total sample representative and descriptive of the unequal distribution of the population across districts. In the KIHBS sample, 10 households were randomly selected with equal probability in each cluster to give a total sample of 13,430 households allocated into 136 explicit strata: the urban and rural areas of all districts except Nairobi and Mombasa, which are entirely urban. However, in the six districts that contain municipalities, clusters in the urban sample were further stratified into six groups: five socio-economic classes in the municipality itself and other urban areas in the district. This ensured that different types of neighbourhoods and social classes within municipal areas are all represented in the sample. The total sample sizes in rural and urban areas were 8,610 and 4,820 households respectively. The 1,343 KIHBS clusters are the Primary Sampling Units (PSUs) from the NASSEP IV sampling frame, which is designed to give nationally, and sub nationally, representative household survey samples. The third stage involved calculation of sampling selection probabilities of each KIHBS household, which are used to derive sampling weights needed to compute unbiased estimates and statistics.

3.2 Data

The study used secondary data from KIHBS, the first major household survey to be implemented under the National Statistical System (NSS) programme and is the largest and most unique sample survey ever undertaken by the Central Bureau of Statistics (CBS[6]). The survey covered all the 70 districts including rural and urban clusters with data being collected from all arid and semi arid areas for the first time in a decade. The survey was conducted over a period of 12 months, which covers all possible seasons, as in contrast to previous surveys where the longest survey conducted by the Bureau was for three (3) months. KIHBS used both diary and recall methods in collecting household consumption and purchase information. Kenya is among the few countries in the world that has applied this hybrid method of collecting household expenditure data aimed at enhancing the amount and quality of the data.

Data collection for KIHBS 2005/06 was undertaken for a period of 12 months starting 16th May 2005. The Survey was conducted in 1,343 randomly selected clusters across all districts in Kenya and comprised 861 rural and 482 urban clusters. Following a listing exercise, 10 households were randomly selected with equal probability in each cluster resulting in a total sample size of 13,430 households. The year-long survey was organized into 17 cycles of 21 days each, during which enumerators conducted household interviews in the clusters. The districts were further grouped into 22 zones that were logistically convenient for field teams to operate. Seasonal variation was captured by randomizing visits to the selected clusters so that in each cycle at least one cluster was visited in each zone.

4. Study Findings

In order to address the study objectives, the researcher conducted a regression model as presented in table 4.1 showing the effect of diet and nutrition, household response to shocks, and socio-economic characteristics on household health status (namely the presence of either blood pressure or heart problem in a household).

4.1 Effect of Diet and Nutrition on Non-Communicable Chronic Illnesses

In regards to diet and nutrition, table 4.1 shows that meat (specifically bacon, ham salami, and minced meat) has a positive and significant effect on chronic NCDs at the 5% level of significance, similarly cereals (rice grade I) positively and significantly affect NCDs at the 5% level. Further analysis reveal that NCDs is also positively influenced by consumption of dairy products (cheese, and butter); and drinking beverages and non-alcoholic beverages (mineral water, tea bags, coffee instant, drinking choco, and sodas) at the 5% level of significance. A negative sign in pulses and fruits indicates that NCDs is negatively related to consumption of pulses (grams, njahi black grams, and peas); and fruits (banana ripe, oranges, melons, apples, grapes, and strawberries). However, the coefficients are not statistically

[4] father died
[5] mother died
[6] Currently known as Kenya National Bureau of Statistics (KNBS)

significant, hence in the model pulses and fruits have no effect on NCDs. The test for joint significance of the regression coefficients for the 6 variables under diet and nutrition produced an F- statistic of 14.78 which was statistically significant. This indicates that diet and nutrition affects household health status.

Consumption of rice grade I; bacon, ham salami, and minced meat; cheese, and butter; and drinking mineral water, tea bags, coffee instant, drinking choco, and sodas led to an increase on the presence of chronic NCDs. Consumption of grams, njahi black grams, and peas; and ripe banana, is negatively related to NCDs.

Table 4.1: Regression Model

Dependent Variable (Blood Pressure/ Heart Problem)	Coefficient	t-value
Cereals (Rice Grade I)	0.0252*	4.51
Pulses (Grams, Njahi Blackgrams, Peas)	-0.0028	-0.69
Meat (Bacon, HamSalami, Mincedmeat)	0.0376*	2.48
Dairy Products (Cheese, Butter)	0.0661*	4.35
Beverages for drinking and non-alcoholic beverages	0.0078*	2.05
Fruits (Ripe banana)	-0.0008	-0.24
Reduced expenditure	-0.0031	-0.90
Help from government and non-governmental institutions	-0.0122*	-2.25
Borrow money from relatives and friends	0.0087	1.42
Help from religious institutions and family	0.0062	0.96
Borrowed money from institutions/ spent cash savings/ Sold assets	0.0048	1.46
Other sales (Rented farmland/ Sold animals/ Sold more crops)	-0.0027	-0.71
Removed children from school to work/ sent children to live with relatives	0.0044	0.51
Worked more or for longer hours	-0.0063**	-1.73
Size of household	0.0034*	5.63
Paternal orphan	0.0115*	3.35
Maternal orphan	0.0063	1.52
Completed primary education	-0.0024	-1.06
Constant	-0.0001	-0.03
Number of observations =13,211		
Tests for Joint Significance		
Model F(18, 13192)		9.13*
Diet and Nutrition F(6, 13192)		14.78*
Household response to shocks F(8, 13192)		3.39*
Socio-economic characteristics F(4, 13192)		13.59*

* denotes statistically significant at the 5 percent level

4.2 Effect of Household Response to Shocks on Chronic Non-Communicable Illnesses

Pertaining to the effect of household response to shock on NCDs, table 4.1 illustrates that responding to shocks through seeking help from government or non-governmental institutions produces a negative and significant coefficient at 5% level. Further analysis reveals that responding to household shocks through working more or for longer hours has a negative and significant effect on NCDs at the 10% level of significance. Table 4.1 also shows that NCDs is negatively related to household who responds to shocks through reduction of expenditure and those who responded by either renting farmland, selling animals or selling more crops, even though the effect on NCDs is not supported by statistical test of significance. Moreover, responding to shocks by either borrowing money from institutions/ spending cash savings or selling assets is positively related to NCDs; similarly removing children from school to work / sending children to live with relatives is positively related to NCDs, even though their effect on NCDs is not supported by statistical test of significance. In addition, responding to shocks through seeking for help from religious institutions or family is positively related to NCDs, even though not statistically significant. The test for joint significance of the regression coefficients for the 8 variables under household response to shocks produced an F- statistic of 3.39 which was statistically significant. This shows that way household responds to shocks have an effect on the health status of the household.

4.3 Socio-Economic Characteristics and the Effect on Non-Communicable Chronic Illnesses

Regarding the effect of socio-economic characteristics on NCDs, table 4.1 further shows that household size has a positive and significant effect on NCDs, and likewise in households where there is paternal orphan, there exists a positive and significant effect on NCDs. However, in households with maternal orphan, there exists a positive relation to NCDs even though not statistically significant. Furthermore, the number of individuals in a household who have completed primary education is negatively related to NCDs, though not supported by test for significance. The test for joint significance of the regression coefficients for the 4 variables under socio-economic characteristics of the household produced an F- statistic of 13.59 which was statistically significant. This means that socio-economic characteristics of the household do indeed influence the household health status.

5. Conclusions and Recommendations

5.1 Conclusions

Diet and nutrition affects household health status. Consumption of meat, dairy products, and drinking beverages and non-alcoholic beverages do increase the presence of NCDs. NCDs will increase due to consumption of bacon, ham salami, and minced meat; cheese, and butter; and drinking mineral water, tea bags, coffee instant, drinking choco, and sodas.

When households responds to shocks by seeking help from government or non-governmental institutions it leads to a decline in NCDs. NCDs also reduced in households who respond to shocks through working more or for longer hours.

Socio-economic characteristics of the household do indeed influence the household health status. Specifically, the presence of NCDs would be higher in households where there is paternal orphan.

5.2 Recommendations

1) Households ought to be informed through health education on the risks posed by continual consumption of bacon, ham salami, and minced meat; cheese, and butter;

and drinking mineral water, tea bags, coffee instant, drinking choco, and sodas.

2) In cushioning households against non-communicable diseases, the government; local and international non-governmental organizations ought to rapidly respond to shocks on households. In addition, individuals in any households ought to encouraged and motivated to worker more or for longer hours.
3) Increased attention by both the government and non-governmental institutions, need to be given to households who have paternal orphans. This is the case since; the father figure protects both the children and their mother against abuse and exploitation by relatives from infringing on their rights and possessions.

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Author Profile

Thomas Mutinda Muthama received his B.A (First Class Hon's) in Economics & Double Mathematics and M.A (Economics), from University of Nairobi, Kenya in 2001 and 2005, respectively. Muthama is a Statistician, Econometrician and Health Economist whose field of interest and specialization are Health Economics, Quantitative Research, Applied-econometrics and Production Economics; and with a special bias in Database management and statistical analysis, econometric analysis and modelling, health and education production and promotion, and Drug and substance abuse, among others. Muthama has several years of experience in quantitative research and in economic analysis using econometric/statistical tools. He has done research and policy analysis work at Institute of Policy Analysis and Research (IPAR)-Kenya; African Medical and Research Foundation (AMREF)-Headquarters; Economic and Social Research Foundation (ESRF)-Tanzania and Christian Michelsens Institute (CMI)-Norway. In addition Muthama has taught at high school and lectured Econometrics, Mathematics for Economists, Operations Analysis and Advanced Microeconomics in the School of Economics, University of Nairobi. Moreover he is one of the Directors of the Centre for Statistical and Econometric Analysis, The Nog Akudos Searchtripp and has undertaken consultancies with various institutions like the World Bank, National Gender and Equality Commission (NGEC), IPAR, Brookings Institution USA, and Ministry of Labour.