NON-COMMUNICABLE DISEASES RISK FACTORS AND THEIR CONTRIBUTION TO NCD INCIDENCES IN KENYA

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Abstract

Although mortality from communicable diseases and poor nutrition have been declining, non-communicable diseases have been on the rise in developing countries. Consequently, this poses a serious challenge to health programming. There are predictions that NCDs will continue to rise in the coming years resulting to at least 9 million deaths every year. This death rate would occur among people who are below 60 years of age in sub-Saharan Africa. NCDs are associated with some underlying risk factors of which most of them can be tackled through clear policy intervention. Notably, many risk factors are also known to be country specific which requires country specific studies. The efforts towards the prevention of NCDs in Kenya are inadequate. This could be attributed to inadequate understanding of the contribution of suspected risk factors to NCDs. In addition, addressing the risk factors associated with these diseases may present a cheaper and long-term solution to the problem of rising cases of NCDs in Kenya. This paper uses household national survey data to estimate the influence of risk factors associated with NCD in Kenya. A probit binary model was used while controlling the econometric problem associated with endogeniety and heterogeneity assumptions. The key finding is that income, distance, peer, effects on area of residence, and education are key risk factors associated with the rising NCD in Kenya. Age and gender are non-policy variables that increased the likelihood of one getting a NCD. This study has pointed out that the health care system in Kenya needs to develop mechanisms for promoting preventive care for NCDs. Also, effective prevention methods that address the NCD risk factors are preferable for treatment. However, these prevention methods are not only expensive, but are also protracted.

Keywords: Risk factors, Endogeniety, Non-Communicable Disease, Promotive care

Introduction

In the second half of the 20th century, big milestones were achieved in healthcare provision globally (WHO, 2008). Nguyen et al. (2011) argue that with the progress in industrialization and urbanization, the incidence and mortality from communicable diseases and poor nutrition were declining. However, in the same period, NCDs have been more on the rise in developing countries posing a challenge in health programming (Murray and Lopez, 1996).

There are predictions that NCDs will continue to rise in the coming years causing at least 9 million deaths every year among people aged below 60 years in sub-Saharan Africa (Mbanya, 2010). Gaziano (2005) stated that at least 21 million productive years have been lost due to Cardio-vascular diseases (CVD) within sub-Saharan countries. Alberti et al. (2006) projected that Diabetes Mellitus (DM) will double by 2025. Subsequently, NCDs account for 23 percent of ailment-related deaths in African economies (Meusel, 2008). According to a WHO (2005) study, seven out of every ten deaths in poor nations will be as a result of NCDs by 2020. Also, the death toll from NCDs in Africa will be higher than from communicable diseases in the future.

Olshansky and Ault (1986) and Bonita et al. (2001) indicated that more individuals, populations, and communities are adopting unhealthy lifestyles which promote the development of NCDs. As households become stable financially, they become more exposed to NCDs. WHO (2002a) projects that deaths caused by NCDs will rise by 77 percent between 1990 and 2020. However, this will be on the account of urbanization and life style changes in developing countries of the world. Also, Abegunde et al. (2007) linked NCDs prevalence to low physical activity and low intake of vegetables.

Unwin et al. (1999) and Alberts et al. (2005) attributed the rise in NCDs to low incomes and poor nutrition. Food rich in saturated fats, salt, and calories is unhealthy. Consequently, Elgoni et al. (2008) links hypertension to high salt intake. The disease is known to cause at least 59 percent of Cardiovasulars death in poor countries (Dennison et al., 2007).

Furthermore, the lack of physical activity compounds the dangers of unhealthy diets. It encourages cholesterol in the blood. Cardiovascular deaths are associated with rising blood glucose. Thus, increased consumption of tobacco and alcohol products is associated with High Blood Pressure (BP) (Unwin et al., 1999). These are lifestyle behaviours that may explain the

increase in the prevalence of NCDs. WHO (2002) and Boutayeb (2006) noted that these risk factors together explains close to 95 percent of NCDs prevalence. Socio-demographic factors such as gender, age, ethnicity, level of education, and work status are also a major contribution to NCDs. Unfortunately, most of them are outside the control of an individual.

Boutayeb and Boutayeb (2005) argue that NCD risk factors are country specific and vary in forms and presentations. Unwin (2006), Yusuf et al. (2004), and Gupta et al. (2006) show that major NCDs operate through a cluster of common risk factors. For instance, poverty predisposes individuals to chronic NCDs (Hussain et al., 2005; Rugg, 2008). However, an underweight born child is likely to develop NCD later in life (Barker, 2004). Harding (2001) observes that the poor nutrition of a mother during foetal development makes the born child to develop NCD later in life.

The effort towards the prevention of NCDs in Kenya is inadequate (Maina, 2009). This could be attributed to inadequate understanding of the contribution of suspected risk factors to NCDs. Addressing the risk factors associated with these diseases may present a cheaper and long-term solution to the problem of the rising cases of NCDs. Thus, an analysis of NCD risk factors may present an entry point for policy solutions aimed at taming these diseases. Narayan et al. (2006) observes that most deaths among persons with diabetes could be avoided if governments addresses the risk factors in developed countries. This requires adequate understanding of the contribution of the known risk factors to NCDs.

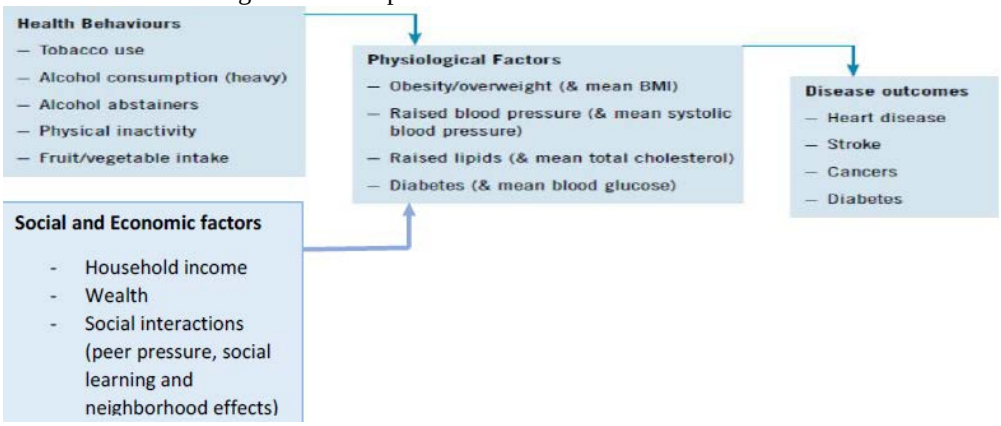
The objective of this paper is to use household level data to investigate the risk factors of NCDs in Kenya using an econometric approach that controls endogeneity and heterogeneity estimation problems.

Methodology and data

Analytical Framework

The analytical framework starts with a simple conceptual framework. Thus, it was developed from the Framingham Offspring studies and Bhargava (2003) with some modification (see Figure 1).

Figure 1. Conceptual framework of NCD risk factors



Source: Adopted from the Framingham Offspring studies and Bhargava (2003) with modification.

Estimation Technique

The study uses a health production function to estimate the effect of the identified risk factors on NCD prevalence. The interest was in whether the presence of a NCD can be explained by the identified risk factors which controls other factors that may cause variation in NCD prevalence. Therefore, the controls variables include household income and household social environment.

The study also considered the effects of social interactions on NCDs prevalence following the study of Becker (1974) and Bandura (1977, 1986). Social interactions were hypothesized to take place in social networks based on geographic proximity and other vicinity factors (Balsa et al., 2014, 2010; Bandiera and Rasul, 2006). Consequently, a household takes actions on the basis of dominant opinions and behaviours in the neighborhood or among peers (DeGiorgi, Pellizzari and Redaelli, 2009; Eisenkopf, 2010). In the health production specification, we include neighbourhood variables. The coefficients of these variables show the effect of the average exposure to behaviour on a household's health status. Following Wooldridge (1997), Niringiye (2010), and Green (2012) with appropriate modifications, the estimable models were specified as shown in equations 1 and 2.

$$NCD = c_0 + c_1 Z_i^{'} + \beta_i X_i^{'} + \alpha_i \tilde{W}_{is} + \varepsilon_i \quad (1)$$

$$Z_i = \lambda K_j^{'} + \beta_j X_i^{'} + \alpha_j \bar{W}_{is} + \varepsilon_j \quad (2)$$

Where ncd is non-communicable diseases, $Z_i^{'}$ is a vector of endogenous variables (alcohol consumption, cigarette smoking, and fruits and vegetable intake), and $X_i^{'}$ is a vector of exogenous variables (cluster i.e. urban/rural, gender, household income, and distance to the nearest health

facility). Consequently, $K_i^{'}$ is a vector of exogenous variables which are instruments for $Z_i^{'}$. $\tilde{W}_{is}$ is a vector of social interaction variables in villages (these are district level variable, mean district alcohol consumption, cigarette smoking, and fruits and vegetable intake). Since social interactions are not observable, they were proxied by the means of alcohol consumption, cigarette smoking, vegetables and fruits consumption, which are all measured at the district level[8]. Household observation in each respect is excluded in the calculation of its pertinent mean. c_0, c_1, β, α, and λ are the estimated parameters. Also, ε_i and ε_j are the disturbance terms.

Equation 1 is assumed to have multiple endogenous regressors which include alcohol consumption, smoking, and vegetable intake variables. Equation 2 specifies reduced form equations for all the endogenous variables in the vector $Z_i^{'}$ in equation (1). This paper have assessed the validity of the instruments in line with Nelson and Startz (1990) and Staiger and Stock (1997). Several diagnostics test based on the F-test for joint significance of probable instruments was conducted. Cluster level variables used as identifiers were found to meet key characteristics of a good identifier. By fitting the residuals of the reduced form equations and interaction terms for all endogenous variables in the structural equation, the residuals and interaction terms served as controls for endogeneity and heterogeneity, respectively (Mwabu and Ajakaiye, 2007 and Mwabu, 2009).

Data Source

This study makes use of the 2007 Kenya Household Expenditure and Utilization Survey. Consequently, this data was collected by Kenya National Bureau of Statistic (KNBS) in the year 2005/2006. This survey collected information on a wide spectrum of socio-economic indicators. Hence, it was designed to monitor, analyse, and measure the progress made in improving living standards. The sample consisted of 8,844 households. Thus, 6072 of them is in the rural areas, while 2772 is in the urban areas. Of these, 8,453 were successfully interviewed giving a response rate of 96 percent. The survey reported observations on 39,798 individuals who belonged to 8,423 households out of 8,844 households sampled. Furthermore, the survey covered all provinces with a total of 737 clusters selected and divided into 506 (68.7 percent) rural and 231(31.3 percent) urban.

[8]The district was used as a proxy for village/ neighborhood. Districts have become counties in the new constitutional dispensation.

Discussion of results

Descriptive Statistics

The respondents in the survey had a mean age of 30 years. 52 percent of the respondents were females. However, about 32 percent reported consuming some quantity of vegetables and fruits; 12 percent reported consuming alcohol (beer, wine, and traditional brews); and 8 percent were smokers. About 62 percent were not married, while 79 percent lived in the rural areas. On the other hand, about 69.7 percent reported having attained primary-school education, and only 1.3 percent had acquired university education.

Regression Analysis

Table 1 presents results from the estimation of equation 1. We interpret control function results presented in Column 4 in the result table after controlling for endogeneity and heterogeneity. Thus, they are not controlled in probit and 2SRI estimates. The inclusion of residuals in the regression served as a confirmation test for endogeneity in the specified models, resulting from unobservable factors not known to the researcher. Thus, it affects the likelihood of developing a NCD. To control for heterogeneity, the residuals interacts with its corresponding endogenous variables. Also, it included an additional variable in estimating the structural equation. This significance of interaction terms confirms the presence of heterogeneity arising from the interaction of endogenous variables with unobservable NCD risk factors. Therefore, an example of the unobservable NCD risk factors is genetics which compound the effect of risk factors predisposing a household much more to NCDs.

Table 1. Contribution of specific risk factors to NCDs prevalence in Kenya (Dependent variable is NCD dummy)

	Estimation Method		
Explanatory Variable	**Probit (1)**	**2SRI (2)**	**Control function approach (3)**
Age	0.0265** [0.0016]	0.0058* [0.0120]	0.0053* [0.0064]
Age squared	-0.0102* [0.0142]	0.0141** [0.0120)	0.0243*** [0.0112]
Urban	0.0387** [0.0034]	0.0915** [0.0404]	0.0542** [0.0269]
Female	0.0162** [0.0026]	0.1099** [0.0446]	0.0741** [0.0373]
Log household income	0.0039* [0.0014]	0.0824*** [0.0197]	0.0420*** [0.0120]
Years of schooling	0.0100* (0.034)	-0.0100* (0.0027)	-0.0101* (0.0283)
Alcohol dummy	0.0166 [0.0185]	-0.0583** [0.0924]	0.2038** [0.0243]
Cigarette dummy	0.0043	0.3674***	0.5139***

Explanatory Variable	Estimation Method		
	Probit (1)	2SRI (2)	Control function approach (3)
	[0.0052]	[0.2095]	[0.3210]
Fruits/vegetable dummy	0.0039 [0.0029]	-0.6210*** [0.0681]	-0.6677*** [0.0646]
Mean district alcohol consumption	-0.0017 [0.0015]	0.0195** [0.0138]	0.0849** [0.0076]
Mean district cigarette consumption	-0.0019 [0.0018]	-0.0418** [0.0148]	0.0303** [0.0096]
Mean district fruits and vegetables consumption	0.0132** [0.0019]	0.1205** [0.0281]	-0.0640** [0.0183]
Distance to health facility	0.0502*** [0.0170]	0.1737** [0 .0885]	0.0775** [0.0328]
Alcohol residual		-0.0670** [0.2127]	-0.0766** [0 .4525]
Cigarette residual		-0.2222*** [0.0913]	-0.1344*** [0.0543]
Fruits and vegetables residual		0.4714*** [0.1181]	0.1363** [0.0640]
Cigarette* residual			0.0229 [0.0233]
Fruits/vegetables* residual			0.3764*** [0.0926]
Alcohol* residual			-0.0945** [0.0675]
Sample size	32721	32721	32721

Source: Author's computation. Note: ***, ** and * represent significance at 1%, 5% and 10%, respectively. Standard errors are in parenthesis.

The probability of getting a NCD is linked to social, behavioral, and biological risk factors. Thus, accurate identification of factors is important in formulating suitable interventions to fight NCDs. The Control function in column 4 in table 1 estimates shows the coefficient on income to be positive and significant. This suggests that high income households have a higher risk of developing NCDs. However, the probability of reporting a NCD increases at a decreasing rate as income increases. Thus, the wealthiest people have a lower risk of developing a NCD. In addition, a one unit change in household income holds a ceteris paribus, and is associated with a 0.42% increase in the odds of reporting a NCD. These findings were supported by Wilensky and Satcher (2009) and North Carolina State Center for Health Statistics 2009 report. Poor households are more exposed to behavioural risks associated with NCDs more than the affluent households. They indulge in behaviours that put their health at risk such as overconsumption of alcohol, eating unhealthy diets, low access to health services, and health information on NCDs prevention and treatment (Williams and Collins, 2009). This led

Pritchett and summers (1996) and Creese (1992) to conclude that "wealthier is healthier".

Smoking and alcohol consumption increase the likelihood of developing a NCD by 51.39 and 20.38 percent, respectively. The result is consistent with that of Shona *et al.*(2011) and Ahmed *et al.* (2009) who highlighted that developing countries are increasingly becoming exposed to behavioural risks associated with NCDs.

Therefore, the consumption of vegetables and fruits reduce the likelihood of developing NCDs by 66.77 percent. The results are consistent with those of WHO (2002b) that found low fruit and vegetable intake to contribute to the development of approximately 41 percent of NCDs such as coronary heart disease and ischaemic stroke. WHO (2005) and Nguyen *et al.* (2011) estimated that a person can reduce the likelihood of developing a NCD by close to 71 percent. This is achieved by increasing the intake of vegetables and fruits.

The estimates further show that the prevalence of NCDs is associated with neighbourhood variables proxied by district mean of alcohol consumption, cigarette smoking, and vegetable and fruit intake. A 1 percent rise in the mean consumption of alcohol and cigarette smoking in a district raises the likelihood of a NCD incidence in a household residing in the district by 8.49 and 3.03 percent, respectively. It is also notable that a 1 percent rise in the mean consumption of fruits and vegetables intake in a district reduces the likelihood of NCD incidence in a household residing in the district by 6.40 percent. Thus, these findings are suggestive of social interactions that exposed a household to behavioural risk factors such as alcohol consumption and cigarette smoking. The social interactions could be in form of peer effects, social learning, or neighbourhood effects. The results are consistent with those of Larsen *et al.*(2010), Caudill and Kong (2001), Suls and Green (2003), and Herman *et al.* (2003).

The study further shows that living in an urban setting is associated with a 5.42 percent likelihood of developing a NCD. The finding is consistent with Tawa et al. (2011) who found that living in an urban setting is characterized by high risk factor clustering which increases the likelihood of having a NCD. The reason is that urban lifestyle is associated with a cluster of risk factors due to low levels of physical activity. Also, it is due to higher incomes which promote risky behaviours such as smoking and consumption of processed foods with high fat content.

Aging as a risk factor to NCD in Kenya is associated with a 2.99 percent increase in the likelihood of developing a NCD. However, the study finding is in conformity with Kabir *et al.* (2003), Dalstra *et al.*(2006), and Ahamed *et al.*(2009). This can be explained by the fact that as age advances, age-related biological risk factors catches up with it.

In Kenya, being a female increase the likelihood of having a NCD by 7.41 percent. The results are consistent with those of Tawa *et al.* (2011), Taylor (2007), and Lima *et al.* (2013) which show a positive link between the female gender and NCD.

Access to health care services proxied by increased distance to the health care facilities was associated with a 7.75 percent increase in the likelihood of a household developing a NCD case in Kenya. This can be explained by the fact that lack of access to health care services bundles like health promotion and prevention of information, increases the odds of a household reporting of NCD. The results are in line with Onokerhoraye (1999), Tanser (2006), and Angel-Urdinola *et al.* (2008). The results also shows that years of schooling are associated with a 1.01 percent reduction in the likelihood of having a NCD in Kenya. Thus, this also supported the study of Minh *et al.* (2009) in Vietnam who found that higher education lowers the probability of getting a NCD. In addition, this is consistent with the fact that higher education increases awareness and capacity to take preventive interventions and actions against NCDs.

Conclusion and policy recommendations

This study assessed NCDs risk factors in Kenya with a view to shed light on the path of households, policymakers, and researchers as they search for interventions to stem the rising cases of NCDs and their toll on households. The assessment indicates that low intake of fruits and vegetables, cigarette smoking, and excessive consumption of alcohol are the major risk factors of NCDs. In addition, NCDs in Kenya are associated with socio-economic and demographic factors including income, age, urban residence, education, and gender.

This study has pointed out that health care system in Kenya needs to develop mechanisms to promote preventive care for NCDs. Effective prevention methods that address the NCD risk factors is preferable to the treatment that is not only expensive, but also protracted. Regulating alcohol and cigarettes consumption merits policy action. The development of interventions that addresses exposure to risk factors at the community level has a positive impact on individual household health status. Hence, there is the need to increase public awareness on healthy lifestyles that include consistent consumption of fruits and vegetables.

Human beings are known to be influenced by the behaviours of others, particularly peers and neighbours. For this reason, awareness campaigns should be extended properly to community groups and organizations. The campaign against NCD risk factors has to be contextualized in a community setting. Behaviours are shaped in community settings. Hence, awareness campaigns in reaching out to community groups

and organizations on NCD are of immense importance. Risk factors call for a comprehensive approach in reducing their cumulative negative effects.

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