The Cost of Treating Chronic Non-Communicable Diseases: Does it Matter?

Conrad, Daren A. and Webb, Marquitta C.

The University of the West indies at St. Augustine

15 June 2012

THE COST OF TREATING CHRONIC NON-COMMUNICABLE DISEASES IN THE CARIBBEAN: DOES IT MATTER?

WORKING PAPER

NOT FOR PUBLICATION

Marquitta C. Webb[1] (marquitta3@gmail.com) and Daren A. Conrad[2] (daren.conrad@sta.wui.edu) -- Human Nutrition and Dietetics, Department of Agricultural Economic and Extension, University of the West Indies, St. Augustine, Trinidad and Tobago[1] Department of Economics, University of the West Indies, St. Augustine, Trinidad and Tobago[2]

Acknowledgement:
The authors would like to thank Mr. Olaniyan Opeyemi, Graduate Assistant, Howard University, Department of Economics, Washington, D.C. and Dr. LaTanya Brown, Associate Professor, Bowie State University, MD for their contributions to this paper.

THE COST OF TREATING CHRONIC NON-COMMUNICABLE DISEASES IN THE CARIBBEAN: DOES IT MATTER?

Abstract

Heart disease and Type 2 diabetes mellitus are among the two leading causes of death in the CARICOM member states with HIV/AIDS a distant sixth. Attention is now being paid to non-communicable diseases which have outpaced communicable diseases as the major cause of death. This paper investigated the link between the public medical cost of treating chronic non-communicable diseases, namely heart disease and diabetes, on national output in Barbados, Guyana, Jamaica, and Trinidad and Tobago. The results provide evidence that the public medical cost of treating chronic non-communicable diseases does have a statistically significant negative impact on national output.

Keywords: Economic Growth, Disease Burden, Human Development.
JEL Classification: **O11; I15;** and **I18**

Introduction

The global pandemic of chronic non-communicable diseases (CNCDs) is palpable and presents a major public health challenge in the 21st century. CNCDs include but are not limited to cardiovascular diseases, diabetes mellitus, and cancers. Extensive clinical and statistical studies have identified several factors that increase the risk of CNCDs (Grundy et al., 2000; WHO, 2008b; Ng et al., 2006). These factors can be grouped into four categories, namely, underlying socioeconomic, cultural, political and environmental determinants, such as globalization, urbanization, and aging population; modifiable risk factors, including unhealthy diet; physical inactivity; and tobacco use; non-modifiable risk factors, such as heredity and age; and intermediate risk factors of elevated blood pressure and glucose levels, abnormal blood lipids, overweight, and obesity (WHO, 2008b). CNCDs no doubt are harming the health of the global population, causing much preventable loss of life, loss of productivity, declines in quality of life, and billions of additional dollars spent each year on health care costs, as well as creating considerable burden for caregivers.

According to the World Health Organization (WHO) (2009), the leading global risks for mortality in the world are hypertension (13%), tobacco use (9%), diabetes (6%), physical inactivity (6%), and overweight and obesity (5%), these global risks are also largely the contributing factors or causes of CNCDs. In 2005, an estimated 35 million deaths occurred as a result of CNCDs, primarily cardiovascular diseases, diabetes, cancers, and chronic respiratory diseases. Globally, this figure accounts for 60% of all deaths, with 80% of deaths in low- and middle-income countries due to CNCDs, and approximately 16 million deaths are individuals under the age 70 years (WHO 2008a; WHO 2008b; WHO, 2005; Daar et al., 2007). Additionally, it is estimated that deaths from CNCDs will increase by 17% between 2005 and 2015 (WHO, 2008b).

With substantial increases in the prevalence of these diseases and the associated costs for treatment, which in most developing countries is the undertaking of the government, and understanding that resources are scarce, we cannot help but ask: do these diseases affect the level

of national output? In this paper, we attempt to answer this fundamental question by focusing on the Caribbean region, with the concentration on four countries, namely, Jamaica, Trinidad and Tobago, Guyana, and Barbados. These countries were chosen because of the varying Human Development Index rankings, with Barbados being ranked as "Very High Human Development," Jamaica and Trinidad and Tobago ranked as "High Human Development" and Guyana is ranked "Medium Human Development." This we believe captures countries at different stages of human development and will allow us to compare the ranking as it relates to economic growth which gives us unique insight. In Jamaica, CNCDs have emerged as the leading causes of mortality and morbidity, accounting for the highest numbers of discharges (including death) from hospitals (Ministry of Health and Environment, 2007). According to reports, chronic diseases comprise over 70% of all deaths in Jamaica (Williams, 2010). Further, deaths from chronic conditions, such as cardiovascular diseases, neoplasms, chronic respiratory diseases, diabetes, and hypertension represent the leading threats to health and well-being in Jamaica (Williams, 2010).

In Trinidad and Tobago like its other CARICOM members, heart disease is the leading cause of morbidity and mortality relative to CNCDs. Diabetes and malignant neoplasms are still the major CNCDs, with the number of deaths attributed to diabetes remaining relatively constant during the 2004-2005 period (Ministry of Health, Trinidad and Tobago, 2005). In the case of Barbados, the leading cause of mortality and morbidity in relation to CNCDs includes diseases of pulmonary circulation and other forms of heart disease, cerebrovascular disease, ischemic heart disease, and hypertension (Report of the Chief Medical Officer 2004-2006, 2006). During the periods 2004-2006, CNCDs account for the top five causes of death in Barbadians. Diabetes mellitus ranked number one as the underlying cause of death in 2004 and 2006 and was second only to diseases of pulmonary circulation and other forms of heart disease in 2005 for the top 10 principal causes of death with rates per thousand population (Report of the Chief Medical Officer 2004-2006, 2006).

Guyana like other countries in the Americas is experiencing an increase in morbidity and mortality from CNCDs, including heart disease, diabetes, cancers, and hypertension leading to stroke and kidney failure (Ministry of Health, Guyana, 2008). An analysis of the 2008 Statistical Bulletin revealed that for the period January to December, the number of deaths due to CNCDs was 3,705, comprising 74.1% of all deaths defined by cause, with females accounting for most of the death. The number of deaths among males from CNCDs was 1,925 (68.6%); for females there were 1,780 (81.0%) (Statistical Bulletin, 2008).

There are many channels though which diseases can have an impact on the economy. Diseases in general, particularly chronic non-communicable diseases deprive individuals of their health and productive potential. The burden of chronic diseases may invariably challenge individual or household income and savings, and compete with investment activities. From countries' perspective, chronic non-communicable diseases reduce life expectancy and ultimately economic productivity, thus depleting the quality and quantity of countries' labor force. This may result into lower national output and consequently lower income. In contrast, good health improves levels of human capital and ultimately has a positive impact on national output.

The paper is structured as follows. First, we present a review of the literature followed by the model and the theoretical underpinning. The final section of this paper discusses the results and makes some concluding remarks. Since the purpose of the study is to examine the

effect of CNCDs on economic growth, we are careful to avoid policy recommendations at this point.

Literature Review

The case of the impact of CNCDs on economic growth is not a new issue to observers; in fact, several researchers (Bloom, Canning, and Sevilla; 2004; Abegunde and Stanciole, 2006; Abegunde, Mathers, Adem, Ortegon and Strong, 2007; and Bakare and Sanmi, 2011) have taken a holistic view of this issue, but have only applied it to certain regions or continents, such as the Latin America and Caribbean region, Asia, and Africa. These continents are usually at the heart of this issue because they are regarded as peripheral regions or continents. The unanimous assertion concerning the concentration of these regions or continents to this issue is that the effect of these diseases can easily be measured given the weakened health care structures in these regions or continents. Another reason is that there is a clear correlation between the prevalence of these diseases (as a result of their environments) and their overall economic output.

Acemoglu, Robinsion, and Johnson (2003), applied a historical perspective to examine the effect of health conditions, diseases and life expectancy on economic development from a historical perspective using pre-colonial and colonial Europe as a reference point. The authors began by posing a striking question as to whether the differences in health conditions and disease environments are a major cause of the huge gap in income per capita between rich and poor countries (Acemoglu, et al., 2003). They addressed the question they raised by asserting that although health conditions, diseases, and life expectancy adversely affect economic development, they cannot be considered as the major predictor of economic development; rather based on their previous work, they cite institutional differences as having a major effect on economic development (the major reason for the huge gap in income per capita between rich and poor countries.

Acemoglu et al. (2003) cite three reasons why countries with unhealthy populations are confined to the label of "poor." According to their analysis, the first reason is that "unhealthy people are less productive" (Acemoglu, et al., 2003). The reasoning behind this is that unhealthy people would usually miss work which would directly cut into their productivity, and when this is viewed in a general aspect the overall effect is a country whose overall workforce productivity has dwindled and this would invariably lead to low output. The second reason is that "poor health conditions reduce life expectancy, which may reduce human capital investments because agents have shorter horizons" (Acemoglu, et al., 2003). The third reason is that poor health may directly reduce human capital investments (Acemoglu, et al., 2003). The authors then go on to provide evidence that suggests that there is "a strong correlation between measures of general health status of the population and economic performance" (Acemoglu, et al., 2003). While their study of the effect of health on economic development was done on an individual level, the issue is that it still does not make a strong case for health to be a first order determinant of economic development. The author consequently explored the possibility of an improvement in life expectancy and its effect on economic growth; this also leads them to the same conclusion. Finally the authors take an historical approach by looking at this issue from the perspective of pre-colonial and colonial Europe. In these sections, the authors look at how diseases that the Europeans spread around during their conquests affected the regions they targeted and they concluded that "the diseases that Europeans brought specifically, the difference between American and European disease environments played a first order role in allowing rapid and

through European domination" (Acemoglu, et al., 2003). They also looked at the diseases such as malaria and yellow fever that the Europeans encountered while colonizing certain regions. They concluded that this made European colonists establish institutions that were aimed at creating colonies habitable for them in which this invariably had a first order effect on economic development.

Another paper that sheds light on the impact of health on economic development is the work of Abegunde and Stanciole (2006), where they examine "the economic impact of chronic diseases at a national level." The authors start by looking at the linkages between diseases and the economy. In this section of the paper, they reveal that there is a direct relationship between health and the economy of a country. This means that if a country is disease free, then its economy would flourish as it would invariably possess a healthy workforce which would translate into higher productivity and Gross Domestic Product (GDP) and vice versa. The authors also cite that there are two approaches which the economic impact of chronic diseases can be explored, and they are "the cost perspective, that is exploring the economic cost of failing to intervene; and the benefit perspective, that is exploring the accruable gains from timely interventions" (Abegunde & Stanciole, 2006). The authors then go into the model in which they want to use to support their thesis and estimate the impact of chronic diseases on the economic growth. In this paper, the researchers use the Solow model which "combines the Cobb-Douglas function with the capital accumulation function to estimate the long run impact of chronic diseases on economic growth" (Abegunde & Stanciole, 2006). The authors utilized GDP and medical cost data of 9 countries (Brazil, Canada, China, India, Nigeria, Pakistan, Russia, United Kingdom, and United Republic of Tanzania) over a specified period of time (i.e., 2005-2015) from the World Bank, WHO, and EIP. The results of the author's calibrations and estimations reveal that there would be a substantial loss in national income which is as a result of the consequences of chronic diseases. Results also show that over time this loss in national income would more than double significantly if something is not done to combat this issue of chronic diseases. The author's results also indicate that "the burden of chronic disease poses appreciably greater constraints to economic performance in low and middle income countries" (Abegunde & Stanciole, 2006). To support this assertion, results show that loss of national income in countries like China, India, and Pakistan are greater than those in countries like Canada and the United Kingdom.

The work of Weil (2010) is another example of the effect health has on economic development. This paper focuses specifically on the economic effects of diseases using a more quantitative approach in the African continent. The author begins by shifting from the conventional medium through which the economic effect of diseases is measured, which is through its effect on GDP and instead explores its effect through utility. This then leads the author to assert that "changes in health in developing countries have effects on utility that are quite significant" (Weil, 2010). According to the author, there are three channels in which diseases affect economic development; one is the proximate effect which is the direct effect one feels in relation to productivity. For instance it is how one's productivity is affected as a result of being sick. This proximate effect can also be viewed from the standpoint of its effect on human capital accumulation. The second one is through the size, growth rate, and age structure of the population. Here one looks at how the diseases affect a certain demographic of the population and its size. For instance, how a disease which affects only infants could give insight into how the whole economy could be affected as a whole. The third one is the indirect channel through which diseases affect labor supply. Next, the author uses the examination of regression

results from Gallup and Sachs as a guide to support his claim. The author then compares the results of two works to determine the effect of diseases on life expectancy and invariably its effect on the economic outcome of the country. The author also explores the use of instrumental variables to deal with the shortcomings of previous works. He also looks at the possibility of aggregating the effect of diseases on economic outcome through individual channels. This strategy, however, suffers the same problem similar to that discussed by Acemoglu, et al. (2003). The author also conducts a simulation which draws the conclusion that "while disease eradication or health improvements in general do have positive economic consequences, they are relatively small and long in coming" (Weil, 2010). The author concluded his work by stating research priorities and lessons for policy makers. He also concludes that if health improvements are coupled with positives phenomena that affect population such as access to education on family planning and openness to foreign direct policy, then its effect on economic development or outcomes could be substantial.

The issue of health and its effect on economic development is one that has been of great concern to a lot of researchers, as evidenced from the literature. While the economic impact of CNCDs, NDCs, and infectious diseases have been studied for the various regions in the world by international organizations, such as WHO and independent researchers, little is known about the relevance of the findings of those studies and little attention is paid to country specific analysis especially those in the Caribbean, and this thus lays the foundation of our research.

The Macroeconomic Effect of Chronic Noncommunicable Diseases

The macroeconomic cost of CNCDs to a country can be estimated using the accounting or cost of illness method in which the monetary cost of illnesses, the value of lost productivity, and death are all summed up; economic growth models, which are used to assess the causal relationship between key input factors and output; and the full income method, which attempts to measure the societal welfare loss associated with ill health in money terms added to the loss of GDP (Abegunde, Mathers, Adam, Ortegon, & Strong, 2007). While these three approaches have been used with great sophistication, the empirical results have neither been unanimous nor conclusive.

In the case of the value of loss of productivity, there is an enormous financial impact of CNCDs on the economy. Researchers have shown that indirect factors, such as absenteeism, disability, and job impairment can be two to three times that of direct health costs (Edington & Burton, 2003; Loeppke et al., 2003). Additionally, CNCDs, such as heart disease and diabetes and/or associated risk factors such as obesity, tobacco use, and physical inactivity are clearly linked with higher direct health costs, greater job impairment (e.g., presenteeism), higher rates of disability, more sick days and absenteeism, higher workers' compensation claims, and increase injury rate (Edington & Burton, 2003; Davis et al., 2005).

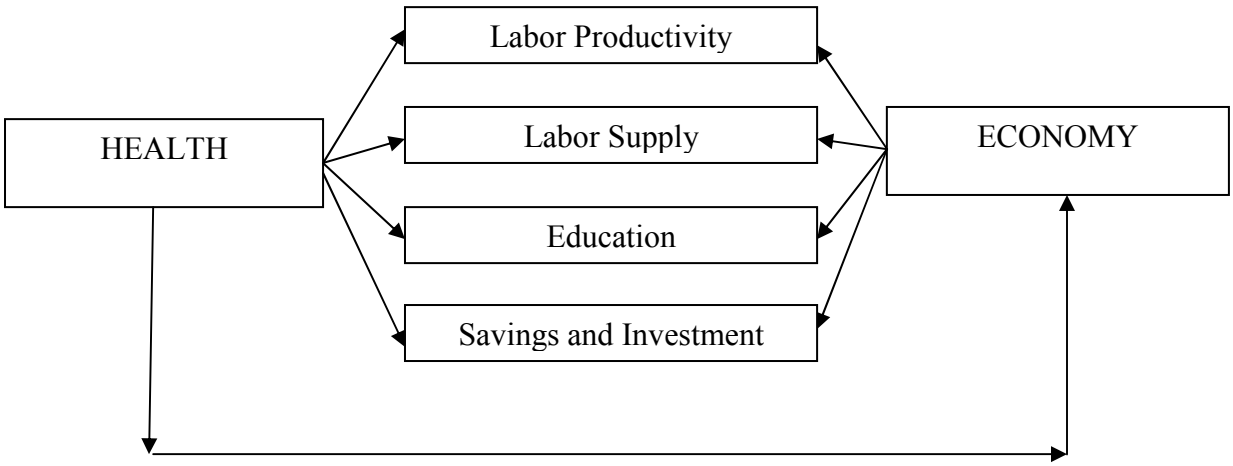
The cost of illness approach produces misleading results at best. The results using the cost of illness approach measures the non-medical costs, commonly called the indirect costs or the loss of production associated with disease. Those costs are simplistically assumed to be the total time lost through death and illness multiplied by the wage rates and some accounting measure for unemployment. This crude measure results in overestimation of lost income. The full-income approach assigns a monetary value to welfare loss which is generally assumed to fall within the range of 100 and 200 times the level of per capita GDP. These results in overall economic losses are very high and not necessarily reflective of the actual losses. The growth

method, while straightforward yields the lowest effects. In this paper, we utilize the growth effect which will establish the link.

Baldacci (2004) explored the role of health expenditures in economic growth using panel data for one hundred and twenty developing countries and found that for the period 1975-2000 health expenditure had no effect on economic growth. For his results, Baldacci inferred that health was a flow variable and not a stock variable. Bloom et al., (2004) estimated a production function of aggregate economic growth as a function of capital stock, labor, and human capital. Their results, while it showed a positive link, did not consider how health is created.

Figure 1.1 shows the channels through which health could contribute to an economy and ultimately economic growth. Four channels are shown, though other may exist: enhanced labor productivity, higher labor supply, higher skills from better education and training, and savings available for investment in intellectual capital. Our analysis proceeds on the basis of these interactions.

Figure 1.1: From Health to Wealth (and Back)



Source: Modified from Bloom, Canning, and Jamison, 2004

The relative lack of convincing, unanimous and conclusive economic arguments for investing in policies that will combat CNCDs may also help to explain why the conditions have not been placed on the high priority of initiatives to be funded.

Methodology of the Study

This section addresses the issues that relate to the methodology of the study and specifies the model.

The Data and Methods

Data were obtained from the World Bank, the United Nations Global Disease Burden Reports, and from the United Nations' Human Development Reports to estimate the effect of health care expenditure on CNCDs on economic growth. The variables include Gross Domestic Product (GDP) and the public medical cost of treating CNCDs, which were obtained from the national health accounts of the WHO, and capital per worker. Since the primary provider of

health care is the government in the select countries, we assume that (x%) of the cost would be met through personal savings by the individuals and the remaining cost (y%) is borne by the government. This was assumed to be 10% and 90% respectively. Time series data were used in the study and are entirely secondary data covering the period 1990–2009. We utilized ordinary least squares multiple regression analysis the generate result for the secondary data.

The Hypothesis

This study verifies the null and the alternative hypothesis stated below:

Ho: There is no significant relationship between the public medical cost of treating chronic non communicable diseases and economic growth in the sample countries.

Ha: There is a significant relationship between the public medical cost of treating chronic non-communicable diseases and economic growth in the sample countries.

The Model

The model in this study adopts the approach used by Bakare and Sanmi (2011) derived from the Solow production function but with slight modification. According to the Solow growth model and as highlighted in Bakare and Sanmi (2011) study, economic growth is the function of capital accumulation, and expansion of the labor force, and "exogenous" factor, technological progress which makes physical capital more productive. The production function is specified as follows:

$$Y_t = K_t, A_t, L_t \qquad (1)$$

Where Y is real output, K is capital stock, A is technology, t is time dimension, and L is labor.

Following Odusola (2002) and Bakare and Sanmi (2011), the model can be modified by adding human capital (H) such that:

$$Y_t = K\alpha_t, H_t^{\beta}, (A_t L_t) \qquad (2)$$

From equation (2) the linear form is expressed as:

$$Log\mathrm{Y}_t = \alpha_0 \log \mathrm{K}_t + \alpha_1 \log \mathrm{H}_t + \alpha_2 \log(A_t L_t) \qquad (3)$$

Where $\mathrm{K}_t =$ capital stock and $\mathrm{H}_t =$ human capital

For estimation purposes, we restated equation (3) as:

$$LGDP = \alpha_0 + \alpha_1 LGCF + \alpha_2 LHCE + \alpha_3 LCPW \qquad (4)$$

Where

Log Y_t = log of real output proxied as log of Gross Domestic Product (LGDP)

Log K_t = log of capital stock proxied as log of Gross Capital Formation (LGCF)

Log H_t = log of human capital proxied as log of public medical costs of treating CNCDs (LHCE)

Log L_t = log of capital per worker proxied as log of Capital per Worker (LCPW)

The *a priori* expectations are:

$\alpha_0 > 0,\ \alpha_1 > 0,\ \alpha_2 < 0,\ \alpha_3 > 0$

Equation (5) is the equation estimated in this study.

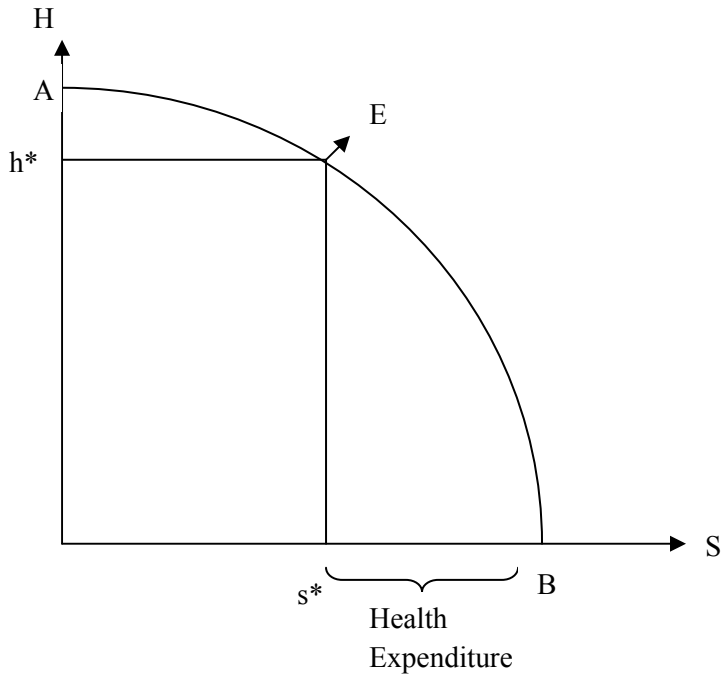
The Theoretical Proposition of the Model

This model makes use of three variables (public medical costs of treating non-communicable diseases, capital formation, and capital per worker) that have an impact on GDP. The coefficients explain the relationship each variable has with GDP and ultimately its impact on economic growth. The original GDP equation was re-written to examine the effect of the cost of treating CNCDs on economic growth. Public medical costs of treating CNCDs is expected to have a negative sign since an increase in CNCDs and consequently public spending on such diseases will have a negative impact on GDP. While it is difficult to trace effect of CNCDs on profitability, we the sign of the coefficient(s) provide useful insight regarding the sources that can impede economic growth and development. It is shown that CNCDs have a negative effect on labor productivity and consequently a negative impact on GDP. The other variables are expected to have a positive sign.

At this point, it is important to emphasize that spending on health care, particularly to treat CNCDs is not 'bad' spending *per* se. Figure 1.2 helps us to understand what this means. In Figure 1.2, the government has to allocate resources between the provision of health care (H) on the Y-axis and all other services (S) on the X-axis. Let the total amount of services available to the society be denoted by s*. The curve AB describes how health expenditure on health care services affects the provision of other services much needed by the society. To understand how this works, if the amount of spending on health care is zero, then the government can provide B level of services to the society. However, if spending on health care is at A, then the government cannot provide any other services. This implies, rooted in production possibility theory, that there is some optimum level of government spending on health care and all other services. Presumably, for illustrative purposes, we can choose an intermediate level such that h* and s* is the amount of health services and other services provided by the government. The expenditure on health care is now given by the segment s*B. This serves to highlight the effect of additional spending on CNCDs in the health arena, which means resources will have to be diverted from other uses or competing uses. In this context, we expect that spending on CNCDs can have a negative impact on economic growth.

Our analysis does not consider other factors that might also influence national input. Specifically, it underplays the demand-side factors, such as the fact that increased health spending may lead to raising incomes through the multiplier. The reason for doing so is the reliance on the empirical counterpart of the neoclassical Solow growth model of economic growth that assumed full employment via flexible prices. Bringing in health expenditure as a demand factor in this model will essentially result in health spending influencing prices and the composition of national output. This possibility is probably best modeled in terms of computable general equilibrium (GCE) models that have their own specification problems. In the presence of a demand-side effect, the method of calculating aggregate economic impacts in this study will probably result in an overestimate of the true effect of CNCDs on national output.

Figure 1.2: The Health Trade Off



Results and Analysis

Econometric estimation determines the country specific link between government spending on CNCDs and output. The results are presented in Table 1.

The values of the adjusted r-squared for the model range from 74% to 86% and implies that the variations in GDP for the period under consideration is explained by the independent variables and the remaining variation is explained by variables not considered in the model. These adjusted r-squared values show the goodness of fit of the regression model. The standard errors are less than half of the value of the coefficients which means the variables in consideration are statistically significant.

Drawing from the theoretical propositions, a negative coefficient for LHCE means that CNCDs have a negative impact on GDP. The Durbin-Watson values all fall within the determinate region and this indicates that there is no problem of auto correlation among the explanatory variables.

Emphasis is placed on the negative coefficient for health care expenditure in Barbados, Jamaica and Trinidad and Tobago. This means that expenditure on CNCDs, as measured, has a negative impact on the economy. However, in Guyana, the variable carries a positive sign which points to some differences on the effect. Taking a closer look at the data sets for Guyana, we observed that 74.1% of all deaths are due to CNCDs and females account for most of the deaths. In Guyana, the unemployment rate among females is the highest which means that women are largely underrepresented in the workplace. What we propose here as a plausible explanation is that since most of the CNCD deaths are female and since women are not largely part of the workforce, then their falling productivity levels, due to CNCDs are not sufficiently high enough to have a negative impact on economic growth of course research on other dependent variables would have to be conducted to confirm this conclusion.

Table 1: Regression Results and Analysis

Variable	Barbados	Guyana	Trinidad & Tobago	Jamaica
LHCE	-0.0055*	0.0012**	-0.0005*	-0.0003*
LGCF	0.0059**	0.0025***	-0.0014**	-0.0003**
LCPW	0.0031**	0.0003	1.1432**	0.1435**
R^2	0.86	0.75	0.74	0.79
Durbin Watson Statistic	1.983345	1.976544	1.998765	2.000541

*p < .1, ** P< .05, ***P< .01

In summary, the econometric results satisfy all tests of validity and show a statistically relationships between the dependent and independent variables ceteris paribus. Thus, we accept the alternative hypothesis that states: there is a significant relationship between public medical cost of treating CNCDs and economic growth in the sample countries.

Conclusions

This paper investigated the link between public medical costs of treating CNCDs on economic growth in Barbados, Guyana, Jamaica, and Trinidad and Tobago for the period 1990–2009. In Barbados, Trinidad and Tobago and Jamaica, the public medical costs of treating CNCDs have a negative effect on output while in Guyana it has a positive impact. It can be concluded that public expenditure on health care, particularly CNCDs has a vital role to play in economic development in the Caribbean and governments should focus on addressing any shortcomings within the health care system to ensure provision of effective and efficient health care, as well as allocating resources for preventive health care since most CNCDs are preventable or at least the effects of which can be mitigated with proper dietary choices and regular exercise. Provision of adequate health care normally improves the health, life expectancy, and the productivity of labor which will have positive effects on economic growth, as well as overall quality of life.

Policy Implications

These conclusions present some clear implications for policies needed to address CNCDs. These policies should to be comprehensive in order to address needs from farm to fork and to promote healthy lifestyles for any given population. The determinants of CNCDs are

complex, numerous, and operate at the social, economic, environmental, and individual levels. CNCDs inflict a significant economic burden on the entire population of a country, i.e., CNCDs have tremendous impact not only on patients, but also on households, communities, employers, and health care systems, as well as government budgets. Currently, many CNCD interventions are not widely available in low- and middle-income countries. Hence, long term sustainability of financing mechanisms that governments of Barbados, Guyana, Jamaica, and Trinidad and Tobago have established requires the diffusion of more primary effective prevention methods. These methods should be specifically designed to stem the early onset of CNCDs, thereby limiting their effects on life expectancy, productivity of labor, and quality of life, and supporting economic growth. Additionally, public health approaches that affect large numbers of different populations, especially children and adolescents are needed.

Given that poor dietary habits, physical inactivity and tobacco and alcohol consumption are the four (4) primary denominators in most CNCDs, governments should also implement primary preventative methods targeting these areas. Thus far, legislation prohibiting smoking in public places and spaces as a means to alleviate some of the economics burden of health care associated with unhealthy lifestyles has been established in the aforementioned countries. However, more work needs to be done. Unhealthy dietary habits could be targeted by means of higher taxes on fast foods, i.e., less nutritional dense food and implementing legislation on *trans* fat in foods. Governments can offer incentives at the community level to encourage physical activity, such as no taxes on gyms. In terms of alcohol, legislation should be established to increase the age of access to alcohol.

In addition to addressing the four (4) major causes of CNCDs, governments must evaluate the health care system in terms of providing a more efficient and equitable system. We have stated that CNCDs is a crucial public health challenge, therefore in an effort to help control this problem, governments must examine the services offered by the health care sector and consider, putting policies in place that will improve the quality of care, efficiency, and access of the healthcare system.

Finally, health sector policymakers should seek to collect data that would establish the following relationships: (1) as health increases then the cost of medical care decreases and (2) as health increases then the level of productivity increases. This will define a sound basis for what may appear to be harsh policy measures relating to the four major determinants of CNCDs.

References

Abegunde, D. & Stanciole, A. (2006). An estimation of the economic impact of chronic noncommunicable diseases in selected countries, *WHO WORKING PAPER*

Abegunde, D., Mathers, C.D., Adam. T., Ortegon. M., & Strong. K. (2007). The burden and costs of chronic diseases in low-income and middle-income countries. Lancet, 370,1929-38.

Acemoglu, D., Johnson, S. & Robinson, J. (2003). Disease and development in historical perspective. Journal of European Economic Association*,* 1(2-3), 397-405

Bakare, A. S., & Sanmi,O. (2011). Health Care Expenditure and Economic Growth in Nigeria: An Empirical Study. The Journal of Emerging Trends in Economics and Management Sciences, 2(2), 83–87.

Baldacci, E. B. (2004). The impact of poor health on total factor productivity. The Journal of Development Studies, 42(6), 918-938.

Beagrie, S. (2005). How to improve productivity through employee health management. Personnel Today, 7 June 2005: 25.

Bloom, D. E., Canning, D., & Sevilla J. (2004). The effect of health on economic growth: A production function approach. World Development, 32 (1), 1-13.

Daar, A. S., Singer, P. A., Persad, D. L., Pramming, S. K., Matthews, D. R., Beaglehole, R., et al. (2007). Grand challenges in chronic non-communicable diseases. Nature, 450, 494-496.

Davis, K., Collins, S. R., Doty, M. M., Ho, A., & Holmgren, A. L. (2005). Health and productivity among U.S. workers. Commonwealth Fund pub. #856.

Edington, D. W. & Burton, W. N. (2003). Health and productivity. In: McCurneu R. J. A Practical Approach to Occupational and Environmental Medicine. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 140-152.

Grundy, S. M., Bazzarre, T., Cleeman, J., D'Agostino, R. B. Sr., Hill, M., Houston-Miller, N., et al. (2000). Prevention conference V: beyond secondary prevention: identifying the high-risk patient for primary prevention: medical office assessment: Writing Group I. Circulation [serial on the Internet] 2000; 101:e3. Available at http://circ.ahajournals.org/cgi/content/full/101/1/e3). Retrieved March 10, 2011.

Loeppke, R., Hymel, P. A., Lofland, J, H,, Pizzi, L. T., Konicki, D. L., Anstadt, G. W., et al. (2003). Health-related workplace productivity measurement: general and migraine-specific recommendations from the ACOEM expert panel. J Occup Environ Med, 45(4), 349-359.

Ministry of Health and Environment. Jamaica, Annual Report 2007.

Ministry of Health, Guyana, April 2008, National Health Sector Strategy 2008-12. Available at http://www.health.gov.gy/pub/moh_nhss_0804.pdf. Retrieved March 26, 2011.

Ministry of Health, Trinidad and Tobago, Annual Statistical Report 2004-2005. Available at http://www.health.gov.tt/sitepages/default.aspx?id=122. Retrieved March 26, 2011.

Ng, N., Stenlund, H., Bonita R., Hakimi, M., Wall, S., & Weinehall, L. (2006). Preventable risk factors for noncomunicable diseases in rural Indonesia: prevalence study using WHO STEPS approach. Bulletin of the World Health Organization, 84, 305-313)

O'Reilly, S. (2006). Eating the profits. Personnel Today 4 July 2006: 26.

Report of the Chief Medical Officer 2004-2006. (2006). Ministry of Health, Barbados.

Statistical Bulletin 2008. Health Statistics Unit, Ministry of Health, Guyana.

Wanjek, C. (2005). Food at work workplace solutions for malnutrition, obesity and chronic diseases. New York: International Labour Office, 2005.

Weil, D. N. (2010), Endemic Diseases and African Economic Growth: Challenges and Policy Responses. Journal of African Economies (AERC Supplement 3), 19, 1-29

WHO (2005). World Health Organization Preventing Chronic Diseases: A Vital Investment. WHO, Geneva, 2005. Retrieved February 7, 2011.

WHO (2008a). 2008-2013 action plan for the global strategy for the prevention and control of noncommunicable diseases: prevent and control cardiovascular diseases, cancers, chronic respiratory diseases and diabetes. Retrieved February 7, 2011.

WHO (2008b) Facing the Facts #1: Chronic diseases and their common risk factors. Available at www.who.int/chp, Retrieved February 4, 2011).

WHO (2009). Global health risks: mortality and burden of disease attributable to selected major risks). Department of Health Statistics and Informatics in the Information, Evidence and Research Cluster of the World Health Organization.

Williams, E. (2010). Statement by Mr. Easton Williams, Delegate of Jamaica at the 43rd Session of the United Nations Commission on Population and Development on Agenda Item 4: "General Debate on National Experience in Population Matters: Health, Morbidity, Mortality and Development." New York, April 14, 2010. Available at http://www.un.org/esa/population/cpd/cpd2010/Country_Statements/AgendaItem4/JAMAICA.PDF. Retrieved May 2, 2011.