Demand for Health as an Investment in Zimbabwe

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Abstract

We estimate demand for health as an investment in Zimbabwe using eight economic, environmental and social factors that health economists have identified as fundamental components of demand for health and medical services. Our main results indicate that education, teenage pregnancy ,high dependency ratio, mortality rates of children under five years and overseas development assistance inflows have statistically significant effect on the demand for health in Zimbabwe. In order to improve health status, we recommend adoption of policies that consider health as an investment rather than consumption good. Health education campaigns should be targeted to population groups with lower educational attainment including teenagers and that Zimbabwe must urgently address health production expenditure constraints by engaging externally health oriented donors. Adopting these strategies will improve new-born mortality, child health and nutrition; increase the availability of medical products, vaccines and technologies; increase human resources for health; and improve current health policy, planning and implementation

Keywords: Demand, Investment, Health, Production, GDP, Education, Productivity, Zimbabwe

1.0 Introduction and Background

After independence in 1980, Zimbabwe introduced redistributive strategies that compelled a large public sector and increased investment on health infrastructure. Primary health care and health education were offered for free and this led to a significant improvement in literacy levels and health standards. By 1985the country achieved impressive results in the area of primary health and was the envy of many other post-colonial states. Most of the health expenditure and investment was reliant on overseas development assistance especially from UNICEF, WHO and UNESCO among other developmental oriented external agencies. Towards 1990 external overseas assistance dried up and Zimbabwe under pressure from World Bank liberalised the economy. In order to reduce the budget deficit Zimbabwe was forced to cut health and education expenditures (World Bank, 2005). The immediate social outcomes after the economic liberalisation were a severe deterioration in social service and contraction in health delivery caused by the introduction of user fees at all health centres in an environment characterised by declining employment (UNDP, 2010). Government allocation to the health sector under economic liberalisation fell from 2.6% of GDP in 1980 to about 2.2% by 1997. This decline coincided with the emergence of HIV/Aids pandemic and other communicable diseases like tuberculosis, cholera and polio. Donor fatigue which reached its lowest ebb in the late 2000 further reduced health funding particularly for drugs and health infrastructure.

The child health status indicators worsened as infant mortality and under-five mortality rose from 53 percent to 77 per 1000 live births in 1994 to 67 and 94 per 1000 live births respectively in 2009(GOZ, 2010). About 20% of Zimbabwean households lacked access to safe drinking water and 35% failed to access improved sanitation. According to UNICEF (2010), 54 percent of the rural population had access to dry latrines whilst the remainder of the rural population continued to practice open defecation. UNDP (1998) reports the children were regularly exposed to water-borne diseases and an underlying factor in most of the deaths were nutrition, neonatal problems, pneumonia and diarrhoea. The World Bank (2008) estimates that a new infant born in Zimbabwe was expected to live for 50 years whereas the same infant would be expected to live at least 70 years if he or she were born in a high-income country during the same period. Maternal health-related issues were responsible for the death of 12% of women aged 15-49 as of 2010–2011.

According to WHO (2010), even though there was a significant decrease in the proportion of births attended by skilled health personnel, especially in rural areas, major challenges remained, unaffordable maternity fees, reduced attendance of expectant mothers at antenatal clinics due to associated costs or distances to clinics and the inability of some women to make choices on reproductive health issues due to social or cultural pressures. By 1995, Zimbabwe was one of the country's most affected by HIV with an estimated 1,168,263 people living with HIV at the end of 2010. HIV and AIDS was a feminised epidemic, with HIV prevalence among women at 18% and men at 12%. The prevalence rate for 15 to 24 year olds was 5.5%, again much higher in women (7.8%) than in men (3.6%) (GOZ, 2014). In general, people with better education and socio-economic status had lower HIV prevalence (UNDP, 2014). The Human Development Index dropped to 0.338 by 2008, from a high of 0.425 in the years 1985 and1990, started to rise steadily from 0.349 in 2009, and rebounded to 0.376 by 2011, even though well below the sub-Saharan Africa average HDI of 0.463 (World Bank, 2014). Since 2013, there has been a steady decline in real per capita spending on health. Consequently, the decline in real per capita income health care resulted in reduced maintenance of health facilities, shortages of essential drugs yet at the same time chronic disease like typhoid, cholera, HIV/Aids and polio were re-emerging. In 1990 health allocation constituted 3.6 percent of the budget yet by 2013 it constituted less than 2 percent of the GDP.

The purpose of this study is to provide emerging insights on the demand for health as investment in Zimbabwe in order to guide government policy formulation and implementation. This study is significant in that most studies in developing countries place strong emphasis on health consumption as well as on education and human capital as critical ingredients for achieving rapid economic growth. This convention ignores robust reasons for considering health as investment - a crucial aspect of human capital, and therefore a more critical ingredient of economic growth. According to Grossman (1972) and Frankel, (1952), sick time, illness and disability reduce hourly wages substantially, with the effect especially strong in developing countries, where a higher proportion of the work force is engaged in manual labour than in industrial countries. Investing in health increases productivity, wages and economic growth. Secondly, Zimbabwe is faced with major developmental challenges, manifested by high unemployment, changing lifestyles, food insecurity, rising poverty levels and inequality and low savings-challenges which end up metamorphosing as serious health issues. The basic health infrastructure in Zimbabwe has deteriorated considerably hence constraining the pace of health delivery and economic and recovery. Mushkin (1962), Becker (1964), and Fuchs (1966) affirm that health capital is one component of the stock of human capital and is critical for economic growth.

Despite the existence of useful theoretical frameworks, no major attempts have been made in Zimbabwe to examine the demand for health as an investment using a health production function derived empirically in a comprehensive manner. Whilst most studies on the demand for health in developing countries were done at cross-country level, this paper attempts to examine the demand for health at country level using time series data over the period 1980-2013. We believe this study can help policy makers in Zimbabwe to formulate and implement cost effective mechanisms for providing health services and the reallocation of health resources in such a way that the gains from health expenditure could be enhanced. The article is made up of five sections: section one is the introduction and explains the health issues in in Zimbabwe. Section two covers theoretical consideration and empirical literature; Section three presents the methodological framework. Findings and discussions are on section four whilst section five is concerned with the conclusions and recommendation.

2.0 Literature Review

Zweifel et al (2004a and 2004b) assert that if health is an asset capable of being produced, then health production can be regarded as an investment which makes up for the capital consumption owing to aging and lifestyle, possibly even resulting in a net increase of the capital stock health. Investment in health is achieved by the input of curative medical services and of one's own effort, in particular on preventative effort and consequently, the return on the stock of health capital is spending less time in bad health (Cropper, 1977; Mushkin, 1962; Fayissa and Gutema, 2005). Healthy time gained can increase utility directly or indirectly due to higher labour income and thus higher consumption (see Zweifel, et al (2004b; Muurinen, 1982a; Rosen and Tauben, 1981; Ettner, 1986). Zweifel et al, (2004b) posit that specifying health production functions determine how to allocate limited resources among alternative health input to produce the largest possible increase in health levels. Desai (1987) and Oliveria et al (2003) concur, a demand for health production function shows how health inputs interact to produce a particular level of health, and how health status changes if health inputs used and their combination change.

Therefore it follows that rational individuals will maximize utility by the optimal management of their stock of health over lifetime (Grossman, 2000). An individual derives positive utility from purchasing medical services whilst deriving disutility from sick time and the marginal rate of substitution between sick time and consumption does not change with aging (Zweifelet al, 2004a; Muurinen, 1982b; Bloom et al, 2000). Ettner (1986) concurs, improved health investment results in higher labour productivity due to increased physical and mental fitness and fewer productive days lost to illness. Good health also results in increased wealth through declining relative medical expenditures (Ehrich and Chuma, 1990); a greater incentive to invest in education because of longer life spans (Felder and Meier, 1996b); and access to more capital through increased saving and investment (Bloom 2000, 2004; Hamoudi, 1999). Smith (1999) avers, the relationship between economic development and health is not unidirectional, but bi-directional and complex. The reduction of sick time has an immediate impact on wealth through the real wage rate and hence, the marginal utility of holding an extra unit of the stock has a consumption and an investment component (Grossman, 1972; Mushkin, 1962, Cropper, 1977). There is increasing recognition that improved health status contributes significantly to poverty reduction and economic growth (Carr, 2004; Lopez-Casasnovas et al. 2005; Ettner, 1986).

In the Grossman (1972) seminal model, individuals act as both consumers and producers of health. Hence, production of health occurs through a health production function where health is determined by the consumption of medical care and other goods where health inputs act as investments that influence the rate of depreciation of the health stock. The multi-period Grossman model envisages that the demand for health declines in the course of aging whereas the demand for medical services increases because optimizing individuals substitute medical care for their own efforts.

The Grossman type of deterministic health capital model have been criticised on the basis that it neglects the influence of uncertainty. For instance, Zweifel and Breyer (1997) pointed out that ignoring the possibility of stochastic shocks, such as accidents or major illnesses which may result in large and permanent decreases in the level of health capital leads to over estimates of an individual's control of his own health in the long run. These shocks may constrain individual's choice of the means for any further health improvements or even dramatically reduce the length of the whole planning horizon (Zweifel and Breyer, 1997). Doessel and Wibowo (1991) and Goss (1990) pointed out the high level of uncertainty faced when estimating the causal connection between health inputs and outputs. Muurinen (1982a) disagrees, Grossman's model is unspecific about the role of education and suggests that education has an effect on the rate at which health stock is used up in order to produce services, and hence links the allocative efficiency gains of education to the concept of use-related depreciation of health stock. UNICEF (2014) finds the level of education of the mother having a correlation with both infant and child mortality. Thus the more educated the mother, the lower the infant or child mortality rate.

In the last two decades several researchers have estimated empirical health production functions that attempt to capture the impact of health investments in the form of lifestyle behaviours like smoking, drugs, prostitution, unprotected sex, teenage pregnancy and exercise and alcohol consumption (see Contoyannis and Jones, 2004); mortality (see Balia and Jones, 2008), and obesity and weight gain (see Rashad, 2006; Ng et al., 2012). Kenkel (1995) using cross-sectional analysis, estimated health as a function of several lifestyle factors including smoking, drinking, eating breakfast, and stress and found that that excess weight, smoking and heavy drinking are detrimental across all measures of health.

Fayissa and Gutema (2005) estimated a health production function for 31 Sub-Saharan African countries over the period 1990–2000 using medical, lifestyle and environment factors as input variables. They found demand for health as being influenced by GDP per capita, rate of literacy and food availability in sub-Saharan countries. However if health is seen as a consumption good then more education lowers the marginal cost of health through its productivity-increasing effect on investment in health, resulting in more demand (Grossman, 1996). In developing countries such as Zimbabwe, schooling is a causal determinant of occupation and income, so that the gross effect of schooling on health reflects in part its impact on socioeconomic status. Grossman (1972), Berger and Leigh (1989), Rosen and Taubau (1982) have argued that education influences many decisions such as a choice of job, ability to select a healthy diet, and avoid unhealthy habits, avoid environmental pollutants, efficient use of medical care which impacts the quality of life. The demand for health and medical care are both predicted to depend on the real wage rate, the real price of medical care, education, and wealth (Grossman, 1972; Nocera and Zweifel, 1998). The relationship between development and health is well accepted, increasing the economic wealth of a country is associated with improved health outcomes (Preston 1975; Smith 1999).

3.0 Methodology

3.1 Theoretical Model Framework II. The Framework

According to Grossman (1972) a theoretical demand for health can be specified as the following general equation.
H=F(X)…… (1)

Where H is a measure of individual health output and X is a vector of individual inputs to the health production function F**.** Using the eclectic approach, the elements of the vector includes: medical care utilization, diet, illiteracy rates, carbon emissions, GDP per capita, availability of food, urbanisation, exercise, cigarette, smoking, and alcohol consumption, nutrient intake, income, consumption of public goods, education, time devoted to health related procedures, initial individual endowments like genetic make-up, and community endowments such as the environment (see Marmot and Wilkinson, 2000; Wilkinson,1992; Ippolito, 1981; Berger and Leigh, 1989; Case,2000; Bobak et al 2000; Kenkel ,1991;Jensen et al ,1986; Cohen and Mooney,1984; Desai,1987). We postulate that the demand for health in Zimbabwe is affected by the efficiency or productivity of a given consumer as reflected by his or her personal characteristics. Here we define efficiency as the amount of health obtained from a given amount of health inputs, for example, years of formal schooling completed play a large role in this context. Whilst Grossman (1972) model was designed for analysis of demand for health at micro level, our motivation is to analyse the demand for health at macro level. We therefore adopt Auster et al. (1969) model suitably modifying it as was done by Fayissa and Gutuma (2005) model of sub Saharan Africa to switch from micro to macro analysis, without losing the theoretical background. Thus we regroup the elements of the vector X into sub-sectoral vectors of economic, social, and environmental factors as follows:

H=H(Y, S, E) (2)

Where *Y* is a vector of per capita economic variables reflecting the joint effect of social and economic factors income, relative prices of medical services, wage rates, economic growth, health care expenditures and *S* is a vector of per capita social variables like education, illiteracy rates and levels of poverty and *E* is a vector of per capita environmental factors such as air and water quality. Therefore we can rewrite equation 2 as follows:

$$h = f(y_1, y_2, y_3 \ldots . y_n \; ; s_1, s_2 .. s_m; e_1, e_2 \ldots . e_g) \quad (3)$$

Where: n, *m*, and *g* being the number of variables in each sub-group, respectively. *H* is individual's health status proxied by life expectancy at birth (see Zweifel, 2009; Fayissa and Gutuma, 2005; Montgomery et al, 2000). We further decompose (3) as shown below in order to show the number of variables in each sub category.

$$Y = y_1, y_2, y_3 \ldots \ldots y_n \quad (4)$$

$$S = s_1, s_2, s_3 \ldots \ldots s_n \quad (5)$$

$$E = e_1, e_2, e_3 \ldots . . e_n \quad (6)$$

Using the Cobb-Douglas production function, we further transform equations (3, 4, 5, and 6) to get this equation:

$$h = \forall \Sigma y^{\eta} \Sigma s^{\rho} \Sigma y^{\beta} \quad (7)$$

Where:

η, β and ρ are elasticities and $\forall$ estimates the initial health stock as pointed out by Grossman (1972). It measures the health status that would have been observed had there were no health depreciation, or health improvement due to changes in socioeconomic and environmental factors used in the production system. Rational individuals will maximize utility by the optimal management of their stock of health over lifetime. Similarly, $(\forall \Sigma y^{\eta} \Sigma s^{\rho} \Sigma y^{\beta} - 1) * 100$ estimate the percentage change in the health status due to social, economic and environmental factors. Care was taken by considering an appropriate range of the inputs and not just those that are identified with public health measure or curative medicine in advanced countries (see Behrman and Deolalikar, 1988). Due to the unavailability of quality data on the necessary variables, we limit our empirical analysis to aggregated variables like GDP per capita ***(y_1)***, overseas development inflows per capita ***(y_2)*** and food production ***(y_3)***; variables representing social factors are limited to illiteracy rates a proxy for education ***(s_1)***, under five mortality rate ***(s_2)***, life style which is represented by teenage pregnancy, ***(s_3)*** mortality rate under five***(s_4)*** dependency ratio ***(s_5)*** and population density***(s_6)*** and carbon dioxide emissions per capita ***(e_1)*** a variable representing environmental factors.

Taking the logarithm of equation ***7*** and re-arranging it yields the following linear aggregate health production function:

$$lnh = \alpha_0 + \eta YlnY + \rho SlnS + \beta ElnE + \epsilon \qquad (8)$$

Where *Y* denotes the income vectors; S is a vector of socioeconomic variables, *E* is a vector of environmental variables and ϵ is the classical error term.

We can therefore expand equation 8 to a regression equation in the form of:

$$lnH = a_0 + \eta lnGDP + \eta lnODI + \rho lnILLIT + \rho lnDEPR + \rho lnMORT + \rho lnLIFE + \rho lnPOP + \beta lnCO2 + \varepsilon \quad (9)$$

Where:

H represent Health Investment; GDP - Income per Capita, ODI-Overseas Development Assistance inflows per Capita; ILLIT- illiteracy rates (an education variable); DEPR-dependency ratio and MORT- mortality rate; LIFE-lifestyle; POP population density (an urbanisation variable), CO2- Carbon emission. Selection for variables like mortality rates of children under five years and illiteracy rates of people above 15 years who cannot read and write were biased selections. The biases inherent in ordinary least squares estimates of health production functions were first emphasized by Auster et al. (1969). They were also considered in much more detail in the context of health by Rosenzweig and Schultz (1983, 1988, and 1991), Corman et al. (1987), Grossman and Joyce (1990), and Joyce (1994).

3.2. Description of variables.

3.2.1 Health Investment (H).

The dependent variable is health investment proxied by life expectancy at birth which indicate the number of years a new-born infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life (Zweifel et al, 2009; Fayissa and Gutema, 2005). This indicator is an aggregate of all possible states of health with the exception of death. It simply sums the amounts of time the individual finds himself in one of these states, thus mirroring the fact that the attainment of a particular age depends not only on the current survival probability but on the entire sequence of survival probabilities since birth (Zwaiffel et al 2009). An important implication for health is that health status and the demand for medical services are positively correlated because medical care serves as an input to produce the optimal stock of health. The empirical results of Wagstaff (1986b) and Leu and Gerfin (1992) find a negative correlation. On the one hand, higher levels of time seeking health by exercising, going to gymnasium or seeking preventive health care may contribute to life expectancy, while on the other hand, such activities may squeeze out outlay on food, clothing, water- things that are crucial for survival in Zimbabwe's subsistence society.

3.2.2. Economic Variables -Y

3.2.2.1. GDP per capita (Y_1)

A higher level of income permits more access to consumption of higher quality goods and services, better housing, and medical services, all of which positively results in good health status. In addition, as income increases, there is a general propensity to move away from jobs with higher stress which may adversely affect health status (Fayissa and Gutema, 2005). Rising real incomes is expected to result in improved nutrition and developments in public health which lead to declines in death-rates and rapidly rising population levels (Case, 2000). However, some researchers argue that, beyond some threshold level of affluence, increasing income may no longer buy better health (see for example Fuchs, 1994; Auster, Levenson, and Sarachek, 1969; Rodger, 1979; Wilkinson, 1992; and Christiansen 1994). Therefore, the sign of the income coefficient cannot be determined a priori. On the one hand, higher levels of national income per capita in Zimbabwe may contribute to longer life expectancy by reducing poverty levels and raising standards of living provided it is shared equitable, while on the other hand, it may also lead to heart disease and obesity which may lower life expectancy (see for example Kannel and Thom, 1984). Much of Zimbabwe's health expenditures on sanitation, drugs and provision of clean water in rural areas are donor funded, we will therefore use overseas development inflows per capita (Y2) to capture this source of important health funding as an additional economic variable.

3.2.3. Social-economic factors (S)

3.2.3.1. Adult illiteracy (S_1)

Education has been a commonly included variable in health production models, probably due to its well-known strong empirical association with health status (Auster et al, 1969; Grossman, 1972, 1972b, 2000; Gupta, 1990; Fayissa and Gutema, 2005). According to Zweifel et al (2009) education increases the productivity of medical services by consuming medical services which are only necessary to maintain a given stock of health capital. Grossman (1972b) and others have argued that education influences many decisions such as a choice of job, healthy diet, avoidance of unhealthy habits, and efficient use of medical care which impacts on the quality of life. We use adult illiteracy as a proxy for lack of education. It is measured as the percentage of people above 15 years who cannot read, write, and understand a simple statement concerning their daily activities. The prior sign is positive. In the Grossman model more education lowers the marginal cost of health through its productivity-increasing effect on investment in health, resulting in less demand. Those with a higher level of health education seem to be willing to invest more in their health by going to the gymnasium or living a healthy lifestyle.

3.2.3.2. Population density (S_1)

A larger population density especially in urban areas is hypothesized to increase health expenditure and reduced food availability. In rural areas reduced food availability due to recurrent droughts, low yield crops, political and economic instability and general low agricultural productivity leads to high competition for food, increased rural-urban migration and reduced life expectancy. A huge urban population density, a direct cause of rural to urban migration may consequently lead to high incidences and transmission of communicable diseases like tuberculosis, cholera and dysentery resulting in reduced life expectancy. In addition with increased population density, health care expenditure is spread over a large population resulting in a decreased life expectancy and health status (UNPD, 1998; UN, 1996). We therefore anticipate a negative coefficient for the population density variable. Whilst some empirical studies use stock of facilities like hospital beds per 1000 people or number of physicians per 1000 people to reflect health care expenditure due to growing population (see Jensen et al, 1986), we use the number of people per square kilometre of land to measure population density(Montgomery et al, 2000)

3.2.3.3. Lifestyle (S_2)

Worsening economic conditions and abject poverty in male-controlled societies can contribute to young girls living school early, marry early or engage in prostitution as survival strategies or to supplement meagre family income. Life style is traditionally measured by alcohol consumption and number of smokers (Bobak et al 2000; Choquet and Ledoux, 1989). Due to lack of data on these variables, we proxy lifestyle by the number of teenage mothers, a variable also identified as important in the determining health production function (see Chick et al (1986); Narendrathan, et al, 1985,Wilkinson and Marmot, 2003, Montgomery et al, 2000). We believe the number of teenage pregnancy reflects a lifestyle which has negative externalities like the spreading of infectious diseases, an increase in infant mortality rates, illegal abortions, child-headed families and high dependency ratio. We therefore use mortality rate of children (S_3) and dependency ratio (S_4) as additional variables. The study suggests that, a mortality rate that is not age-specific makes little sense as an output measure, as the long-run probability of death equals one. It is only slightly more informative if defined for a particular subset of the population, hence we use children under five year's mortality rate measured per 1000 live births

3.2.4. Environmental factors (E)

3.2.4.1. Carbon emissions (E_1)

The sign of carbon emissions cannot be determined priori. On the positive side, rural areas emit low carbon emission whilst urbanization is associated with pollution, acidification of domestic water supplies and congestion, which have adverse effects on health. In particular, we use carbon dioxide emissions per capita (*E*2) as a measure of environmental factors which impact on health. Muurinen (1982a) proposed that environmental and life-style variables could be included as determinants of the "user-defined "depreciation rate. Carbon dioxide emissions affect jointly both human health and life expectancy. Viscusi (1996) examines a number of command and control regulations designed to save lives and protect health and found that the processing and consumption of environmental resources yields residuals such as carbon emissions which have undesirable economic, social or health effects.

Specifically, a 50% cut in emissions in the developing world was estimated to create long-term benefits in the form of avoided cancer damage and considerable savings in the long-run abatement costs which can then be channelled to health expenditure. (Dixit and Nalebuff, 1991).

4.0. Results and Discussion

Stationary

All the probability value of ADF statistic were compared to 0.01, 0.05 and 0.1^2 and any probability value of a variable below these three values was considered to be stationary. As per Appendix A, all variables except literacy rates and GDP per capita were stationery at 1% level of significance level. All other variables were stationery at 5 % level of significance. After first differencing, population density, mortality rate under 5 years, overseas development inflows (ODI per capita) teenage pregnancy, carbon emissions became stationery at 5 % level of significance and integrated of order 1. Dependency ratio variable became stationery at 10% level of significance and integrated of order 2. Appendix B for multicollinearity test shows that most of the absolute partial correlation coefficients are less than 0.8 implying that there is no multicollinearity among the variables. The highest relationship that is collinear is that between teenage pregnancy and population density which is -.979731 implying that these two variables move together in systematic ways and thus individual effects on the both variables have not been isolated. The reason being that most health variables have joint outcomes and multi-causal relationship making impossible to completely rule out correlation of some variables.

Results of the regression model are shown in Appendix C. The lifestyle proxied by teenage pregnancy were found to be statistical significant at 1 % level of significance. The coefficient of teenage pregnancy is -5.801911 suggesting that a decrease in teenage pregnancy will have a strong effect on life expectancy (health) and this is more likely since teenage pregnancy imply non-protected sex behaviour which may also increase HIV/AIDS prevalence Dependency ratio was found to be negative and statistically significant at 1% level of significance.The coefficient of dependency ratio is -28.44414 implying that a unit decrease of people who otherwise are able to fend for themselves but now depends on others due to poor state of the economy will lead to high life expectancy. The negative sign might have arisen from the actual nature of the relationship existing between dependency ratio and health. Zimbabwe has inadequate or no savings, and the health expenditures of the most of the population are dependent on few working class, hence an increase in the dependency ratio will have a consumption reducing effect of life nurturing and sustaining goods such as drugs, nutritious food, clothing, medical services, ambulatory care, housing etc.

Overseas development assistance per capita was found to be positive and significant at 5% level of significance indicating increases in external assistance in the provision of drugs and other heath requisites will increase life expectancy by 2 %.There is increasing recognition that overseas development assistance in terms of funding health in developing countries contributes significantly to improved health care (Carr, 2004; Lopez-Casasnovas et al. 2005). Level of education proxied by literacy rates was found to be positive and statistically significant at 5% level of significance. The coefficient of literacy is 0.228212 suggesting that a percentage increase in literacy rate will have a 22.8 % increase in life expectancy and as previously discussed, this is possible as more education gives the people more awareness about their own health status and of what preventive measures would increase their own health. In other words, better education may help to prevent unnecessary use of medical care services. The results are consistent with Grossman (1972), Berger and Leigh (1989), Rosen and Taubau (1982), Fayissa and Gutema (2005); Bloom and Canning (2003); Kenkel (1991) who found that high education influences many decisions such as a choice of job, seeking medical care, immunisation, and ability to select a healthy diet, and avoid unhealthy habits, efficient use of medical care which impacts the quality of life. The results indicate that more years of formal schooling increases efficiency in production of health knowledge.

Mortality rates of children under-five years was found to be negative and significant at 10% level indicating that decreasing mortality rates of children under five years improves life expectancy and health status. The parameter estimate of this variable suggests that successful policies that aim at decreasing child mortality in Zimbabwe can have an impressive impact on the health status of the country. Reducing the existing trend of child mortality is one of the areas that deserve special attention in efforts directed to the improvement of the health status of the country. The results confirm Yamada et al. (1989 who found increased price of milk and meat leading to higher infant and neonatal mortality rates due to protein and vitamin deficiencies characterised by low inflation promotes FDI.

Our empirical investigation does not confirm GDP per capita, and this is consistent with finding by Auster et al (1969). Carbon emission was also insignificant; however its effect has expected sign. Of particular interest is population density, a variable which may be classified either under economic and environment factors since it may assume the role of both an inverse income indicator and an environmental factor favouring the spreading of communicable disease. This is probably the reasons for the instability of estimated coefficient and or even these implausible results. The R-Squared is 0,891316 showing that 89% of the variations in life expectancy can be explained by the combinations of variations in the regressors as used in the model. The F-statistic test probability, 0.0000 is less than 0.05 implying that the whole model is valid at 1% levels of significance.

5.0. Conclusions and Policy Recommendations

The paper estimates the demand for health as investment in Zimbabwe for the period 1980 to 2013. The main source of data is the World Bank (2014) data set. The results indicate that teenage pregnancy a proxy for lifestyle, literacy rates (people above 15 years who are able to read and write) a proxy for education, mortality rate of under five children per 1000 live births, overseas development inflows per capita and dependency ratio impact on health demand in Zimbabwe. Policies reducing the impact of dependency ratio, teenage pregnancy and mortality rates should be enhanced in order to increase health status. The study have two policy implications for improving health in Zimbabwe. First, the results suggest that health policy which focuses on provision of health services, health knowledge, and family planning programs, attracting adequate overseas developmental aid improve the existing health status of the country. Second, a decrease in population density, a decrease in all kinds of emissions and increasing GDP per capita are found to improve life expectancy, though this argument cannot be sustained based on the statistical significance of the tests.

Appendices

Appendix A: Results of the Unit Root Test

Variables	t-ADF	Critical-1%	Critical-5%	Conclusion
DLiteracy rates	-6.506509	-3.670170	-2.963972	I(0)
DMortality	-3.536736	-3.679322	-2.967767	I(1)
ODI_Capita	-7.093720	-3.670170	-2.963972	I(1)
DPOP Density	-3.258146	-3.699871	-2.976263	I(1)
DTeen mothers	-2.964245	-3.699871	-2.976269	I(1)
DDpendency	-4.268035	-3.752946	-2.998064	I(2)
DGDP_CAPITA	-7.535330	-3.67017	-2.963927	I(1)
DGDP_CO2	-4.789159	-3.670170	-2.96397	I(0)

Source: Own Computation

Appendix B: Correlation Matrix

	MORTALITY	LITERACY_RATES	ODI_CAPI	POP_DENSIT	TEEN_MOTHERS	GDP_CAPITA	DEPENDE_	GDP_CO2
MORTALITY	1.0000							
LITERACY_RATES	-0.049889	1.0000						
ODI_CAPITA	-0.194805	0.074743	1.0000					
POP_DESITY	0.457695	0.73387	0.163336	1.0000				
TEEN_MOTHERS	-0.573427	-0.624424	-0.08682	-0.979731	1.0000			
GDP_CAPITA	-0.062293	-0.258154	0.099323	-0.270367	0.289299	1.0000		
DEPENDE_OLD	0.485536	0.039149	0.294345	0.572002	-0.6762	-0.123626	1.0000	
GDP_CO2	-0.783108	-0.0033	0.418542	-0.354957	0.470481	0.162918	-0.41222	1.0000

Source: own computation

Appendix C: Regression Output

Dependent Variable: DLIFE EXPECTANCY
Method: Least Squares
Date: 07/25/16 Time: 11:39
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLITERACY_RATE S	0.228212	0.119312	1.912725	0.0695
DMORTALITY	-0.073714	0.040027	-1.841597	0.0797
DODI_CAPITA	0.024568	0.011552	2.126716	0.0455
DPOP_DENSITY	-0.038885	0.441504	-0.088073	0.9307
DTEEN_MOTHERS	-5.801911	0.914623	6.343498	0.0000
DGDP_CO2	-0.480363	0.513886	-0.934767	0.3605
DDDEPENDE_OLD	-28.44414	3.097103	-9.184111	0.0000
DGDP_CAPITA	0.000584	0.011468	0.050921	0.9599
C	1.302714	0.188607	6.907031	0.0000

R-squared	0.921297	Mean dependent var	-0.133291
Adjusted R-squared	0.891316	S.D. dependent var	1.338874
S.E. of regression	0.441391	Akaike info criterion	1.445554
Sum squared resid	4.091346	Schwarz criterion	1.865913
Log likelihood	-12.68330	Hannan-Quinn criter.	1.580030
F-statistic	30.72844	Durbin-Watson stat	0.828615
Prob(F-statistic)	0.000000		

Source: on computation

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