

Original Article

The Role of Corruption and Healthcare Expenditure in the Persian Gulf Region's Health System

*Maryam Asghari¹

1- Department of Economics, School of Economics and Administrative Sciences, Shahid Ashrafi Esfahani University, Isfahan, Iran

*maryam.asghari@ashrafi.ac.ir

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Abstract

Background and Purpose: More than a third of the world's population lack access to essential medicines, despite the presence of several international agreements that proclaim health as a human right. Corruption, in its many forms, such as bribery and embezzlement, causes several detrimental effects on the health sector and access to medicines including economic, health, and government image and trust issues. Global health corruption remains a serious, ongoing, and under-recognized threat to global health progress. This paper aim is examination how global corruption and health-care expenditure (HE) affect health statue in the Persian Gulf countries over 1980-2014 and what can be done to combat corruption in the health sector.

Materials and Methods: This study is an experimental and applied research. To verify the consistency of the results of the model, this study used the appropriate panel data analysis methods such as feasible general least square method for the nine Persian Gulf countries over 1980-2014. I employ different panel data procedures to avoid estimation problems, namely, autocorrelation and heteroskedasticity. The used package id Stata version 14

Results: The level of gross domestic product per capita, the level of corruption in the country, per capita HE, the quality of air and water, population density levels have negative effect on region people's life expectancy, but the index of environmental policy and the education, measured as years of education obtained, have positive effect on region people's life expectancy over 1980-2014.

Conclusion: The results indicate that corruption and HE have negative effect on the Persian Gulf region people's life expectancy.

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1. Introduction

Corruption is one of the oldest and most prevalent social evil that has existed throughout the history of humankind and will remain a permanent reality. Corruption can be broadly defined as “abusive use of power with the purpose of satisfying personal or group interests” (1). The consequences of corruption not only hurts individual but also affects societies and national and international economies. When corruption is viewed at a macro level, it poses an obstacle to organization, government or state to deliver or fulfill its functions and obligations in resource allocation, policies and service delivery (2).

Health being one of the most essential and basic needs of an individual makes it a lucrative target for corruption. Health having unique dimensions is susceptible to both economic and political influences and its corruption not only involves monetary incentives but also involves corruption of knowledge (3).

Health systems across the globe are vulnerable to abuse because they are complex in character and because they face many uncertainties. There are countless examples of actions that reveal a lack of transparency and integrity, and that may ultimately be defined as health sector corruption.

Corruption varies across health systems. Although health care providers, payers, consumers, regulators, and suppliers are active in all health systems, the actual relationships, responsibilities and payment mechanisms will vary. Some countries have relatively well financed public health services that are directly provided by national or local governments (Sweden,

Spain) (4). In other high-income countries, the public sector pays for health services that are provided by private and public health care providers (Canada, Germany). In most low- and middle-income countries, the health system is fragmented. It may include a public insurance scheme for formal sector workers; direct public provision of health care for the indigent; private insurers and providers contracted by wealthier households; and a large share of private practitioners who are paid directly by their patients, both rich and poor (Mexico, South Africa) (5).

Much of the corruption found in the health sector is a reflection of general problems of governance and public sector accountability. A health finance system will be more vulnerable to corruption in procurement and abuses that undermine the quality of services. Examples of abuse are illegal fees, theft, absenteeism, and kickbacks in grants procuring medical supplies. A system that relies on billing an insurance institution is generally more vulnerable to diverting funds by inducing treatment not required medically, and billing the government for services not provided. The first system is known as an integrated system, while the other, with a separation between finance and provider, is called a “finance/provider system.” Integrated health systems are the most common form of public health systems in developing countries (6,7).

Abuses in the health system aimed at a personal gain are not exclusive to any particular country or health system. However, the forms of abuse may differ depending on how funds are mobilized, managed and paid. For this reason, it is

useful to classify health systems into two broad categories based on their institutional structure: systems in which the public sector finances and directly provides health-care services and systems that separate public financing from the provision.

In the case of direct public provision of health-care services, the most common forms of abuse involve kickbacks and graft in procurement, theft, illegally charging patients, diverting patients to private practice, reducing or compromising the quality of care, and absenteeism. In systems that separate public financing from the provision, the most common forms of abuse involve excessive or low-quality medical treatment, depending on the payment mechanism used, and fraud in billing government or insurance agencies.

Indeed, health corruption at the domestic level represents a severe impediment to global health efforts in resource-poor settings and developing economies. Corruption can drain resources from already impoverished and fragile health systems, precluding access to life-saving treatment for vulnerable patient populations. This paper examines whether global corruption and health-care expenditure (HE) effect on the Persian Gulf countries' health system over 1980-2014.

2. Materials and Methods

In this paper, we are interested in how the interplay between corruption and the HE affect the health outcomes of a population. In general, it is assumed that health outcomes for a population improve as the economy grows and develops. Such improvements are facilitated by the rise in

general standard of living including improved access to health services.

The dramatic increases in health system improve to increase life expectancy, and life quality (especially for people with chronic conditions) has made disparities in access to health care more troubling. There is no doubt that poverty is a contributing factor to poor health outcomes. Poor people have lower life expectancies, higher prevalence of chronic illnesses and health conditions, and more unmet health needs than people with middle-class and high incomes. However, the causal path between poverty and poor health outcomes is complex. Other factors that are correlated with low income such as low education, the inability to speak English, high corruption, low HE and residence in areas with high levels of pollution, also contribute to poor health. Equally important, the link between poverty and poor health does not go in just one direction. Poor health is a contributing factor to low incomes and poverty. People with chronic medical conditions frequently are poor because they cannot work, and people who suffer a sudden decline in health often become poor after losing their job. Moreover, people with chronic illness often have difficulty accessing medical care because they are not good advocates for themselves and too few medical providers are nearby, and they then remain poor because they cannot work. One's health is also seen as dependent on the quality of his or her physical environment — such as the amount of air pollution or the quality of drinking water. Air pollution levels are also bound to increase as production levels rise. An increase in population numbers is another important factor in this context.

The relationships discussed above are summarized in the following general model:

$$H_{it} = \theta_{it} + \alpha_0 \text{GDPP}_{it} + \alpha_1 \text{CO}_{it} + \alpha_2 \text{HE}_{it} + \alpha_3 \text{C}_{it} + \alpha_4 \text{BOD}_{it} + \alpha_5 \text{POP}_{it} + \alpha_6 \text{EP}_{it} + \alpha_7 \text{E}_{it} + \mu_t + \varphi_i + \varepsilon_{it} \quad (1)$$

Where states that an economy's health status (H_{it}) depends on its level of gross domestic product (GDP) per capita (GDPP_{it}), the level of corruption in the country (CO_{it}), per capita health-care expenditure (HE_{it}) was chosen to measure total health-care spending including government and private spending, the quality of air as level of CO_2 emission (C_{it}), the quality of water as level of biological oxygen demand (BOD_{it}), population factors are controlled for the estimation through the country's population density levels (POP_{it}), an index of environmental policy (EP_{it}) and the education for the individual, measured as years of education obtained (E_{it}).

The main health status indicators used are life expectancy that is a popular indicator of health. Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Life expectancy was collected from the World Health Organization's Global Health Observatory Data Repository.

μ_t are the time specific intercepts, φ_i represents country-specific effects that summarize the influence of unobserved variables - such as infrastructure, period average climate, history and culture - which are assumed to be distributed independently across countries, with variance σ_μ^2 and ε_{it} is the stochastic error term for each country i and year t . The time specific intercepts are

included to account for time varying omitted variables and stochastic shocks that are common to all countries. Within this framework, we examine HE and corruption impacts on the health outcomes for the Persian Gulf countries' population.

The second independent variable chosen was per capita GDP. For individuals, income is one of the strongest and most consistent predictors of health and disease in public health research literature (8). National income is probably the best single indicator of living standards in a country since it comprises the value of all final products (goods and services) produced in a certain period. A wide range of these products can be expected to influence life expectancy, and expenditures on all of them are represented, with varying weights, in national income. It is the indicator most comprehensive of these multiple factors. Research finds that people with higher incomes generally enjoy better health and live longer than people with lower incomes. The relationship between income and health consistently (although not invariably) appears as a gradient, with the poor experiencing the worst health, but also where the health of those with modest incomes is worse than the health of those with the highest incomes (9-15). In other words, on average, the more money you make, the better your overall health (16).

We expect that countries with a higher GDP would have a longer life expectancy. Again, the per capita metric was used to account for variance in population. We also expect that per capita GDP would be positively correlated because beyond the basic necessities. Thus, countries with a higher income level can afford to spend

more on health. Furthermore, countries with a higher per capita GDP would probably have a better standard of living, which would affect life expectancy.

The foundation of economics lies in the allocation of scarce resources. Thus, we expect that if a state is spending money on a good or service, it is allocating itself a necessary resource. Because of this, we would assume that, logically, HE would result in some kind of health benefit. Thus, we expect an increase in HE to indicate a higher quality of health, quantified in our model through the use of life expectancy. Examining this relationship is important because it will allow for a greater understanding of the effectiveness of private and government spending on health.

One of the most basic services provided by the environment is support to life. Changes in environmental quality, such as pollution of water or air, are likely to increase the frequency of diseases, lead to impairment of activities and reduced life expectancy. While air pollution is an important case, used for illustration throughout this policy brief, other types of ambient pollution, such as groundwater pollution, also significantly affect human health, generating potentially important economic losses. The improvement of environmental quality, with the expectation of large potential benefits in terms of health and life expectancy, is a growing concern in many developing countries. While countries try to contain the growth of public HEs, policies designed to improve environmental quality are attractive complements for standard public health policies (17).

Environmental soundness measured in the forms of clean drinking water and

proper sanitation is a reflection on the salutary conditions of the country. The amount of CO₂ emissions and level of BOD reflected air and water quality.

Efficient energy use, sometimes simply called energy efficiency, is the goal to reduce the amount of energy required to provide products and services. It usually refers to devices or engineered systems that provide the same level of output or benefit with less energy consumption. Energy efficiency is a way of managing and restraining the growth in energy consumption and an index for EP. EP_{it} is energy efficiency (unit of energy used/GDP) as an index of EP. The interest of using such a quantitative variable is that it gives a real measure of the impact of the preceding variables. This allows distinguishing countries that apply concrete environmental measures from the ones that adopt a “theoretical” EP not really restrictive to firms.

Energy efficiency can enhance human health by reducing greenhouse gas (GHG) emissions, improving outdoor air quality and decreasing acid rain. The health-care sector is in need of cost-effective solutions to address the rising cost of energy and the health implications of energy use. Improving the efficiency of energy end uses reduces both energy cost and GHG emissions – and is often called “demand-side management.” A robust energy efficiency program is the foundation for a hospital to take its next step toward a cleaner energy portfolio – and is often called “supply-side management.” Displacing the use of conventional energy with clean, renewable energy reduces GHG emissions and contributes to softening price volatility

associated with oil, natural gas, coal, and electricity generated from these fuels.

The fourth independent variable used is literacy rate. Literacy rate is used as an indicator of the level of education in a country. We expect literacy rate to be positively correlated with life expectancy. A higher literacy rate indicates the population is better educated. A better-educated population is likely to be better informed about their health, and should contribute to a higher life expectancy. Literacy rate is measured as the percent of people aged 15 and above that can read and write.

3. Results

We estimate the model using 1980-2014 panel analysis of the health outcomes for the Persian Gulf selected countries' population, Bahrain, Iran, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Jordan, and Yemen. The source of data used for these variables were the World Health Organization's Global Health Observatory Data Repository and the World Bank's World Development Indicators, which has the most extensive data set for developing countries over the period of analysis.

We test the stationarity of variables in the model. Therefore, I make the unit root test

of Levin, Lin and Chu and Im, Pesaran and Shin W-statistics to test for it. The results show that all variables are stationary at a level in the five Persian Gulf countries (Table 1).

Since data are panel data, first, the type of model estimation must be indicated by Leamer F-test and Hausmen test. Since p value from Leamer test is 0.000, null hypothesis indicates model of pool data is rejected. The opposite hypothesis that indicates using panel data ($P < 0.0100$) is accepted.

We employ different panel data procedures to avoid estimation problems, namely, autocorrelation and heteroskedasticity. Heteroskedasticity and autocorrelation arise from different countries characteristics. Therefore, I employ feasible general least square for panel data to avert autocorrelation and heteroskedasticity. The different tests show that we have autocorrelation and heteroskedasticity in the nine Persian Gulf countries.

Table 2 indicates the results. Both fixed and random effects model were tested for the sample of all countries. Fixed effects regression is the model to use when we want to control for omitted variables that differ between cases but are constant over time.

Table 1. Variables stationarity tests in the nine Persian Gulf countries

Variables	Levin, Lin and Chu test		Im, Pesaran and Shin W-statistics test	
	Statistic	P	Statistic	P
GDPP _{it}	-4.76166	< 0.0001	-5.38136	< 0.0001
CO _{it}	-5.70375	0.0042	-5.23834	0.0001
E _{it}	-3.76847	0.0001	-3.94342	< 0.0001
POP _{it}	2.66335	< 0.0001	4.02245	< 0.0001
C _{it}	4.2302	< 0.0001	2.4741	0.0001
BOD _{it}	3.5621	0.0001	4.84604	< 0.0001
EP _{it}	-5.33756	< 0.0001	-5.22526	< 0.0001
HE _{it}	5.20648	< 0.0001	3.58352	< 0.0001

GDP: Gross domestic product

Table 2. Panel analysis of health system, 1980-2014

Variables	Random effect	Fixed effect ⁽¹⁾
C	2.585** (1.88)	5.974* (11.49)
GDPP _{it}	-2.325* (-2.35)	-3.425* (-3.13)
CO _{it}	-7.672* (-2.20)	4.533** (3.41)
E _{it}	10.382 (1.47)	9.753* (2.99)
C _{it}	-3.281* (-5.95)	-2.117* (-8.51)
BOD _{it}	-3.870* (2.71)	-6.326* (5.66)
POP _{it}	-7.031 (3.06)	-4.021* (-5.98)
EP _{it}	2.243* (2.43)	6.285* (6.03)
HE _{it}	-2.481* (2.21)	-2.241* (3.43)
R ²	0.5881	0.7284
Groups	9	9
Number of observation	315	315
Time periods	35	35
Breusch and Pagan LM test	91.72	
P > chi-square	< 0.0001	
Modified Wald test for group-wise heteroskedasticity ⁽³⁾		6.0e+03
P > chi-square		< 0.0001
Pesaran's test of cross sectional independence		42.462
P		0.000
Hausman test ⁽²⁾	$\chi^2(4) = 26.38$	
P > chi-square	0.0010	
Wooldridge test for autocorrelation in panel data	21.929	
P > F	0.0018	

GDP: Gross domestic product

T-statistics are shown in parentheses. Significance at the 99%, 95% and 90% confidence levels are indicated by *, **and ***, respectively. (1) The acceptance of model by the Hausman test and (2) The Hausman test tests the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator. If they are (insignificant P value, P > chi-square larger than 0.05) then it is safe to use random effects. If you get a significant P value, however, you should use FE, (3) for FE regression model, the modified Wald test for groupwise heteroskedasticity is used while the Woolridge test for autocorrelation in panel data (H₀: No autocorrelation) is applied. FE: Fixed effect

It lets we use the changes in the variables over time to estimate the effects of the independent variables on your dependent variable and is the main technique used for analysis of panel data.

If we have reason to believe that some omitted variables may be constant over time but vary between cases, and others may be fixed between cases but vary over time, then you can include both types using random effects. The generally accepted way of choosing between fixed and random effects is running a Hausman test. A Hausman test can be used to test for inconsistency in the random effects estimate by comparing the fixed effects and random

effects slope parameters (18). A significant difference indicates that the fixed effects model is estimated inconsistently, due to the correlation between the explanatory variables and the error components. Since P value from Hausmen test is 0.000, null hypothesis that indicates using method of random effects is rejected. The opposite hypothesis that indicates using fixed effects (P < 0.0500) is accepted.

The Lagrange multiplier (LM) test has provided a standard means of testing parametric restrictions for a variety of models. Its primary advantage among the trinity of tests [LM, likelihood ratio (LR), Wald] generally used in likelihood-based

inference is that the LM statistic is computed using only the results of the null, restricted model, which is usually simpler than the alternative, unrestricted model. If, under the null hypothesis, the parameter being tested lies on the boundary of the parameter space, an additional advantage of the LM test is that it will still have standard distributional properties, whereas the LR and Wald tests will not.

The random effects linear regression is a prominent example; Breusch and Pagan's LM test for random effects in a linear model is based on pooled ordinary least square residuals, while estimation of the alternative model involves generalized least squares either based on a two steps procedure or maximum likelihood (19,20).

Baltagi et al. (21) extensively discuss testing for serial correlation in the presence of random and fixed effects. Many of these tests make specific assumptions about the nature of the individual effects or test for the individual-level effects jointly.

Some of these tests such as the Baltagi Wu test derived in Baltagi and Wu are optimal within a class of tests. In contrast, because the Wooldridge test is based on fewer assumptions, it should be less powerful than the more highly parameterized tests, but it should be more robust. While the robustness of the test makes it attractive, it is important to verify that it has good size and power properties under these weaker assumptions (22).

In opposition to what has been expected, there is a statistically significant negative relationship between life expectancy and per capita GDP of a country proving that a 1% increase in the GDP would lead to a 3.425% decrease in life expectancy. There

is no reason to expect a direct influence of national income per head on life expectancy and it measures simply the rate of entry of new goods and services into the household and business sectors. Its influence is indirect; a higher income implies and facilitates, though it does not necessarily entail, larger real consumption of items affecting health such as food, housing, medical and public health services, education, leisure, health-related research and, on the negative side, automobiles, cigarettes, animal fats and physical inertia.

Corruption is actually negatively correlated with life expectancy. It appears that an increase in corruption does not translate to an increase in the overall quality of health in the country. This can perhaps again be attributed to the inefficient of health care in those countries. Corruption affects health-care services in two ways: (1) corruption may increase the cost of this service and (2) corruption may lower the quality of health care services.

Corruption can lead to failure of governments in developing countries since this can have an adverse effect on growth and life expectancy (23). The weaknesses in the health structures of developing countries often give room to corrupt officials to run government health policies in a vague manner or to lead the populace in these developing countries in complete secrecy. Through the implementation of weak health policies an oligarch class often emerges that rules with impunity and become gradually insensitive to the plight of the populace.

The HE coefficient is 2.241 with a t-statistic of 3.43. This indicates that the negative relationship between HE and life expectancy is statistically significant at the

1% level, unlike what we expected.

We predicted a stronger correlation between the two variables, as any slight increase in HE would improve the overall quality of health care. Reasons for this difference may include the inefficiency in health care spending in region. The HE variable constitutes both private and public spending; however, the lack of correlation perhaps shows the misallocation of these resources. In this region, corruption is rampant and the importance given to health-care spending is fairly low. Thus, the incapability of the model to explain the relationship between health care spending and quality of health care given leads us to believe that the spending is not efficient or effective. Overall, the findings in the literature suggest that there will not be a positive relationship between HE and life expectancy.

The effect of an aging population on the services required in the prevention of disease and the treatment of the sick is a subject of major interest in connection with future population trends. The general effect of an aging population on medical and nursing services and hospital facilities may be predicted by comparing the distribution of patients of the several categories, and the corresponding services, according to the causes of illness for which the services were received. The patients attended for illness due to the communicable diseases, tonsillitis and appendicitis, and confinement cases occurred with high frequency in the periods of childhood, youth, or early adult life, and were relatively infrequent among older adult patients. Cancer, the degenerative diseases, diseases of the digestive system (exclusive of

appendicitis—in the classification used here, chiefly chronic in nature), rheumatism, and orthopedic impairments were among the major causes of illness of patients in middle and old age and were relatively infrequent diagnoses among younger patients. In this experience, the patients attended for the types of illness which were characteristically high in frequency at the younger age's outnumbered patients treated for the chronic diseases of middle and old age in each medical and nursing category.

Essential for achieving environmental health and sustainable economic development, reducing the consumption of non-renewable energy and other natural resources has profound implications for human health as well. While it is clear that a lack of access to energy and resources, or their uneven distribution, chokes economic development, excess energy consumption from fossil-fuel sources promotes extensive pollution and global warming, and is a sign of economic and public ill-health and inequality.

When we improve our efficiency, we reduce the cost of doing business or running a household. We also strengthen our economy by producing goods at a lower cost and creating jobs. New regulations limiting GHGs from power plants provide an opportunity for us to scale up energy efficiency programs since energy efficiency is generally the lowest cost compliance option. States should look to energy efficiency as a first and best option for reducing air pollution, and should include energy efficiency as a substantial part of their plans to comply with federal clean air regulations.

Energy efficiency reduces our need to burn coal and other fossil fuels. Those

reductions in pollution mean big gains for health, as pollutants from fossil fuel combustion contribute to four of the leading causes of death in general: cancer, chronic lower respiratory diseases, heart disease, and stroke. These pollutants damage all the major organ systems in the body and reduce life expectancy.

The coefficients for literacy rate indicating positive relations with life expectancy. There is a positive relationship between life expectancy and literacy rate of the population. Education impacts on health in two ways; first through teaching that enables children to learn specifically about health (often known as skills-based health education) and second through the educational process as a whole which provides skills such as critical thinking and making choices that enable children to opt for healthy lifestyles. Skills-based health education is widely applicable to a range of conditions where knowledge, behaviors, attitudes, and skills play a critical role in combating disease including vector-borne infections such as malaria; water and sanitation related diseases such as diarrheal diseases, trachoma and schistosomiasis; nutrition-related conditions such as micronutrient deficiencies and other forms of malnutrition.

4. Discussion

Health is one of the most critical development issues facing the world today. Health system indicators for workforce, hospital beds, access to medicines, and vaccinations clearly corresponded with life expectancy of each cluster. Corruption in the health sector is a concern in all

countries, but it is an especially critical problem in developing economies where public resources are already scarce. Thus, our research sought to determine whether there is an effect of corruption and HE on life expectancy in Persian Gulf selected countries over 1980-2014.

Corruption reduces the resources effectively available for health, lowers the quality, equity and effectiveness of health-care services, decreases the volume and increases the cost of provided services. It discourages people to use and pay for health services and ultimately has a corrosive impact on the population's level of health. However, we found that an increase in corruption is negatively significant on life expectancy in Persian Gulf selected countries over the period of analysis.

We hypothesized that there would be a negative correlation between HE and life expectancy indicating that an increase in spending would decrease life expectancy. However, we found that an increase in spending is negatively significant in Persian Gulf selected countries' health system. The effect of healthcare spending on life expectancy in the region indicates that money is not allocated effectively toward health spending. Merely increasing spending does not guarantee that there is any kind of improvement in healthcare.

In combination with the reality that criminal activities can easily impact and move across geopolitical borders affecting multiple states/organizations, health corruption presents significant challenges for detection and enforcement. The broad infiltration of corruption, diversity of illicit acts, and multitude of stakeholders involved (often with limited or indirect

accountability) adds to health system complexity, existing information asymmetry, and uncertainty in health markets with developing countries particularly vulnerable.

Conflict of Interests

The Authors have no conflict of interest.

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References

1. Haroon MZ. Corruption in healthcare system: an obstacle in achieving optimal outcome. *J Ayub Med Coll Abbottabad* 2014; 26(2): 109-10.
2. Gilson L. Health policy and systems research - a methodology reader. Geneva, Switzerland: World Health Organization; 2012.
3. Schonhofer PS. Controlling corruption in order to improve global health. *Int J Risk Saf Med* 2004; 16(3): 195-205.
4. Toebes B. Human rights, health sector abuse and corruption. Human rights and human welfare (working paper no. 64) [Online]. [cited 2011 Apr]; Available from: <http://www.du.edu/korbel/hrhw/workingpapers/2011/64-toebes-2011.pdf>
5. World Bank. World Development Report 2004: Making services work for poor people. Washington, DC: World Bank; 2004.
6. Vian, T. Corruption and the Health Sector. Washington, DC: US Agency for International Development (USAID) and Management Systems International (MSI); 2002.
7. Vian T. Review of corruption in the health sector: theory, methods and interventions. *Health Policy Plan* 2008; 23(2): 83-94.
8. Yen I, Bhatia R. How increasing the minimum wage might affect the health status of San Fransisco Residents: A discussion of the links between income and health. Working Paper 2002 Feb 27.
9. Kitagawa EM, Hauser PM. Differential mortality in the United States: A study in socio-economic epidemiology. 1st ed. Cambridge, MA: Harvard University Press; 1973.
10. Pappas G, Queen S, Hadden W, Fisher G. The increasing disparity in mortality between socioeconomic groups in the United States, 1960 and 1986. *N Engl J Med* 1993; 329(2): 103-9.
11. Minkler M, Fuller-Thomson E, Guralnik JM. Gradient of disability across the socioeconomic spectrum in the United States. *N Engl J Med* 2006; 355(7): 695-703.
12. Kanjilal S, Gregg EW, Cheng YJ, Zhang P, Nelson DE, Mensah G, et al. Socioeconomic status and trends in disparities in 4 major risk factors for cardiovascular disease among US adults, 1971-2002. *Arch Intern Med* 2006; 166(21): 2348-55.
13. House JS, Lepkowski JM, Kinney AM, Mero RP, Kessler RC, Herzog AR. The social stratification of aging and health. *J Health Soc Behav* 1994; 35(3): 213-34.
14. Braveman PA, Cubbin C, Egerter S, Williams DR, Pamuk E. Socioeconomic disparities in health in the United States: what the patterns tell us. *Am J Public Health* 2010; 100(Suppl 1): S186-S196.
15. Finch BK. Early origins of the gradient: the relationship between socioeconomic status and infant mortality in the United States. *Demography* 2003; 40(4): 675-99.

16. National Bureau of Economic Research. Health, income, and inequality. NBER Reporter: Research Summary Spring 2003 [Online]. [cited 2014 Feb 5]; Available from: URL: <http://www.nber.org/reporter/spring03/health.html>
17. Willinger M. Environmental quality, health and the value of life [Online]. [cited 2001]; Available from: URL: <http://www.clivespash.org/eve/prb7-edu.pdf>
18. Ait-Sahalia Y, Xiu D. A hausman test for the presence of market microstructure noise in high frequency data. Chicago Booth Research Paper (No. 16-06) [Online]. [cited 2016 Apr 9]; Available from: URL: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2741911
19. Greene WH. Econometric analysis. 7th ed. Upper Saddle River, NJ: Pearson-Prentice Hall; 2011.
20. Catani P, Terasvirta T, Yin M. A Lagrange Multiplier test for testing the adequacy of the constant conditional correlation GARCH model. CREATES Research Paper 2014-3. Aarhus, Denmark: Department of Economics and Business Economics, Aarhus University; 2014.
21. Baltagi BH, Feng Q, Kao C. A Lagrange Multiplier test for cross-sectional dependence in a fixed effects panel data model. *J Econom* 2012; 170(1): 164-77.
22. Bera AK, Sosa-Escudero W, Yoon M. Tests for the error component model in the presence of local misspecification. *J Econom* 2001; 101(1): 1-23.
23. Ross M. Natural Resources and Civil War: An Overview with Some Policy Options. Proceedings of the Conference on "The Governance of Natural Resources Revenues; 2002 Dec 9-10; Paris, France.