Journal of Economics and Development Studies
June 2017, Vol. 5, No. 2, pp. 78-85
ISSN: 2334-2382 (Print), 2334-2390 (Online)

Published by American Research Institute for Policy Development
DOI: 10.15640/jeds.v5n1a8
URL: https://doi.org/10.15640/jeds.v5n1a8

Determinants and Distribution of Catastrophic Health Expenditures and Impoverishment in Kenya

Njuguna Njuguna[1], Diana N. Kimani[2] PhD & Bethuel Kinyanjui[2] PhD

Abstract

The Constitution of Kenya, 2010 guarantees citizen the right to health. The Kenya health policy commits the government to offer easy, accessible, reasonable and valuable health care services to the population countrywide (Republic of Kenya, 2015a). However, the government is faced with budgetary constraints; hence the health services are provided under a serious resource constrained setting. An analysis of patterns of health care expenditure is essential for assessing levels of inequalities in health care needs and access. Furthermore, analyses of differentials on health care expenditure by socioeconomic and demographic characteristics of population could be used to develop appropriate policies and models to new interventions. The research utilized the secondary data from the Kenya Household Health Utilization and Expenditure Survey (KHHEUS) 2013 to examine the association between households' health care expenditures with socioeconomic variables. The goal of the research was to provide critical analyses on household out-of-pocket expenditures in Kenya and how these health expenditures become catastrophic pushing the households into poverty. The findings will contribute towards a better understanding of existing variations in catastrophic health expenditures and impoverishment in Kenya. These results can be used by the government of Kenya, health planners and managers and other stakeholders to facilitate design of appropriate policies which will impact positively to households and particularly the vulnerable ones. The information could contribute to improving financial protection and equitable income redistribution and eventually towards poverty reduction and better health for all Kenyans.

Keywords: Out of Pocket, Impoverishment, Catastrophic

1. Introduction

Health is a basic need that each person is entitled to enjoy. Good health, protection from diseases and quality medical care are necessary for human personal development and survival. Improved quality of life in any country depends highly on the availability and accessibility to healthcare facilities at affordable costs. In line with Vision 2030 and the Constitution of Kenya 2010 (Republic of Kenya, 2010a), the government is committed to implementing strategic interventions aimed at accelerating the attainment of Universal Health Coverage (UHC) for all Kenyans. The health sector plays a major role for the achievement of vision 2030, since maintaining a health nation is important for a working population which later translates to increased labor productivity. A household's expenditure on health services is always directly dependent on income, social networks and wealth position of the households (Wild et al., 2004). A lot of Poor households in developing countries forego expenditure on health services in order to use their earnings on basic needs like food and as such positioning them in higher risks of mortalities when diseases become fatal (Russel, 2004). According to WHO (2005), a household faces "catastrophic" health costs if health expenditure is greater than or equal to 40 percent of a household's non-subsistence income, i.e. income available after basic needs have been met ("capacity to pay").

[1] Senior Economist, Ministry of Health, P.O Box 30016-00100, Nairobi, Kenya
[2] School o Economics, The University of Nairobi, Kenya

Households that incur huge OOP are at risk of getting poorer due to healthcare costs and will experience a phenomenon called catastrophic which varies across households. The main challenge of healthcare access in Kenya lies primarily in the acute scarcity of resources, and inefficient resource allocation. In the past few decades, the out-of-pocket (OOP) expenditure has been increasing since the introduction of user fees in the health sector. Moreover, to limit the rising publicly-financed health expenditures, OOP expenditures have continued to be implemented in the country. However, higher health-related OOP expenditure may burden social subgroups unequally. The literature reviewed gives an analysis of the theoretical underpinning on health care access and utilization and how it influences the productivity of individual and households. Empirical literature reviewed shows that increased out of pocket expenditure or occurrence of catastrophic health expenditure has been linked to negative effect on individuals and household health outcomes across the world as more households are pushed further into poverty (Berki, 1986; Wagstaff and Van Doorslaer, 2003; Chollet and Betley, 1987; and Stiglith, 1988).The reviewed literature relates to effects on household income and vulnerability to poverty. The survey shows that economic effects of ill health contrast widely depending on the account of illness and household characteristics (Mahal et al, 2005; Wagstaff and Van Doorslaer, 2003). The approaches used to assess catastrophic expenditure in a household in the reviewed literature point to two distinct approaches related to the measurement of catastrophic health expenditure in the literature.

Assessments of catastrophic health expenditures show the impact of these costs on poor households. While some studies consider the share of OOP expenditure in a household, others measure the incidence and extent of OOP health expenditures across countries of different economic status (Wagstaff and van Doorslaer, 2003; Xu et al. 2006; Saksena et al. 2006; O'Donnel et al. 2005; Van Doorslaer et al. 2007). Others evaluate both actual and potential incidence of catastrophic expenditure (Saksena et al. 2006). Saksena et al. (2006) brings out the difference between households that seek healthcare and those that do not. These studies conclude that catastrophic health expenditures increase the likelihood of a household to slide into poverty but has not looked at the determinants of catastrophic health expenditures and impoverishment and the distribution at sub national levels. Studies on catastrophic health expenditures and impoverishment done in Kenya have not estimated the incidence of catastrophic health expenditure and impoverishment at county level. Some are case studies (Perkins, 2009), while the others are provide national and regional (province based) estimates (Kimani and Maina, 2015). This study proposes to fill the identified information gap and do a comparison to the national estimates of catastrophic health expenditures and impoverishment.

2. Study Objective

The study seeks to assess health expenditure taking into account health being a devolved function the country and existence of county variation in socio-economic characteristics. Because of future prospects of growth and development, it is important to provide information to policy makers in programming –health expenditures that are catastrophic leading to poverty.

3. Methodology and Data

This study used the Xu's Approach (Xu, 2005) to estimate catastrophic health expenditures and impoverishment.
To examine the determinants of catastrophic health expenditure, the study uses logit model. Cameron and Trivedi (2005) indicated that either logit or probit can be used because often there is little difference between the predicted probabilities from probit and logit models. Further, the fitted log-likelihoods often are very similar for the two models.

The study specifies a logistic regression model of the form:

$$che = \alpha + \beta X + \varepsilon \qquad \text{……12}$$

Where che is the catastrophic health expenditures, and will take a value of 1 for a household with catastrophic expenditures and 0 without catastrophic expenditure as specified by (Xu 2005). X is a vector of the independent variables, (equivalized household size; illness; level of education of the household head; gender of the household head; out of pocket expenditure; employment status of the household head; marital status; age of the household head, distance to health facility; residence; county and household expenditure)

To analyze impoverishment, equation 13 will be used:

$hipoor=\alpha+\alpha 1hi+\varepsilon$.....13

Where hipoor is a dummy variable indicative of whether a household has experienced impoverishment or not, hi is a vector of independent variable. α, α 1 are parameters while ε is an error term.

Table 1: Variables, Definition, Categories and Expected Sign

This section provides a definition of variables used in the various models. The dependent variables are: dummies for household catastrophic expenditure, and household impoverishment on account of illness.

Table 1: Summary of variables in the model

Variables	Variable description and measurement	Expected sign	
		Catastrophic exp. equation	Impoverishment equation
Catastrophic health expenditure	Household having catastrophic health expenditure on account illness. Equal to 1 if a household experienced catastrophic expenditures; 0 otherwise		
Impoverishment	Household impoverished on account illness. Equal to 1 if a household experienced impoverishment; 0 otherwise		
Illness	Household report having had any illness 4 weeks prior to the survey (Dummy, presence of any disease =1, 0 otherwise)	Positive	Positive
Location	Dummy, urban =1, 0 otherwise.	Indeterminate	Indeterminate
Household size	Total number of members of a household	Indeterminate	Indeterminate
Household head working status	Dummy variable equal to 1if household head is working ; 0 otherwise	Negative	Negative
Level of education	Dummy variable equal to 1 if the level of education is Primary and below; 0 otherwise	Negative	Negative
Sex	Dummy variable equal to 1 if the household head is a male; 0 otherwise	Uncertain	Uncertain
Distance to facility	Distance in kilometres to the nearest health facility	Uncertain	Uncertain
Age	Age in years of the household head	Uncertain	Uncertain
Out of pocket expenditure	Total health cost incurred by a household seeking health service	Positive	Positive

Data Source

The study used the 2013 Kenya Household Expenditure and Utilization Survey (KHHEUS) data. KHHEUS 2013 was conducted as part of the National Health Accounts. The sampling strategy for the KHHUES 2013 was the National Sample Survey Evaluation Programme five (NASSEP V) to the extent possible which was designed to generate national and county representative estimates of all survey items and indicators and representative estimates for the rural and urban population for both national and county level. The study had targeted 33,675 households (20,350 from Rural and 13,325 from urban). The study covered 1,347 clusters distributed as 814 (60 percent) rural and 533 (40 percent) urban throughout Kenya.

Results and discussion

This section presents the descriptive statistics for the dependent and independent variables used in estimating the Catastrophic Health Expenditure equation (equation 9, and 12) and the ones used in estimating the impoverishment equation (equation 10 and 13). The survey respondents had a mean age of was 45.29 years. Their average schooling was 7.78 years and the average household size was 4.3 persons. About 80 per cent of the respondents were married; 14.9 percent had insurance cover; and 88.2 percent of household heads were working. 24.3 percent of the households reported illness.

Table2: Summary of Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Catastrophic	152,566	0.063	0.243	0	1
Impoverishment	23,470	0.046	0.210	0	1
illness	148,537	0.243	0.429	0	1
Insurance	148,537	0.149	0.356	0	1
Location	152,566	0.344	0.475	0	1
Household Size	148,452	4.253	0.828	1	14
Working	148,358	0.882	0.322	0	1
Education	130,746	0.778	0.415	0	1
Gender	148,529	0.738	0.440	0	1
Distance	43,004	6.497	24.395	0	11.2
Marital status	148,529	0.798	0.402	0	1
Age	148,529	45.286	14.495	15	99

Source: Author's computation

Table 2 further shows that the majority (66 percent) of the households were residing in rural areas. On average household members travelled a distance of 6.497 kilometres to access health services from the nearest health facility. There was a large variation in the number of male and female in the survey with 73.8 percent of the respondent's being male and 26.2 percent were female.

Paired Correlation Test for Variables used in Estimating che

As shown in table 3, the coefficients of the variables are related at 95 percent confidence level apart from gender and distance; marital status and distance.

Table 3: Correlation matrix for variables used in estimating che

	Catastrophic	Insurance *	illness	Location	Household Size	Employment	Education	Gender	Distance	Marital status	Age
Catastrophic	1										
Insurance *	0.0676*	1									
illness	0.1995*	0.0311*	1								
Location	0.0637*	0.1512*	0.0105*	1							
Household Size	-0.0555*	-0.1055*	-0.1032*	-0.1507*	1						
Employment	-0.0006	0.0909*	0.0141*	0.0400*	-0.0074*	1					
Education*	-0.0319*	-0.2100*	0.0339*	-0.1554*	0.1047*	-0.0522*	1				
Gender	-0.0066*	0.0593*	-0.0294*	0.0074*	0.1548*	0.1630*	-0.0157*	1			
Distance	0.1146*	0.0390*	0.0352*	-0.0482*	-0.0051	-0.0111*	-0.0306*	0.0075	1		
Marital status	-0.0104*	0.0920*	-0.0232*	-0.0295*	0.1972*	0.1268*	0.0038	0.5959*	0.0019	1	
Age	0.0098*	-0.0800*	-0.0026	-0.1207*	0.1699*	-0.1242*	0.0113*	-0.0557*	0.0767*	-0.1226*	1

Source: Author's computation.

Table 4 shows the coefficients of the independent variables in the probit model and its confidence level at 95%. Insurance, illness, location, household size, employment status of household head, education level of household head, distances to health facility, marital status and age have an association with catastrophic expenditure at 95percent confidence. Gender is the only variable in the model that doesn't have any association with catastrophic expenditure.

Table 4: Relationship between Catastrophic health expenditures and independent variables

Cata	Coef.	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Insurance	0.21	0.02	8.46	0.00	0.16	0.26
illness	0.44	0.04	12.33	0.00	0.37	0.51
Location	0.28	0.02	13.95	0.00	0.24	0.31
Household Size	-0.05	0.01	-3.96	0.00	-0.07	-0.02
Working	-0.10	0.03	-3.19	0.00	-0.16	-0.04
Education	-0.19	0.02	-8.28	0.00	-0.23	-0.15
Gender	0.04	0.03	1.56	0.12	-0.01	0.10
Distance	0.00	0.00	10.81	0.00	0.00	0.01
Marital status	-0.07	0.03	-2.39	0.02	-0.13	-0.01
Age	0.00	0.00	7.46	0.00	0.00	0.01

Source: Author's computation.

R square was 0.0454 showing that the variables had 4.5 percent variation in the estimation of catastrophic health expenditures. Wald chi2 was 794.68; Prob > chi2 was 0.0000.

Marginal Effects explaining catastrophic expenditure Table 5 presents estimates results from the probit model which used robust standard errors to address possible heteroskedascity and checked for multicollinearity. From the table 6, one can make inference that presence of illness, availability of insurance cover, residence, gender of household head, distance travelled in seeking health care services and age increases the probability of incurring catastrophic health expenditures. On the other hand, household size, level of education of the household head, employment status of the household head and marital status of the household head, decreases the probability.

Table 5: Marginal effects of factors explaining che from households reporting illness

variable	dy/dx	Std. Err.	z	P>z	[95%	C.I.]	X
Insurance *	0.037	0.005	7.710	0.000	0.028	0.047	0.167
illness*	0.058	0.004	15.940	0.000	0.051	0.065	0.875
Location*	0.048	0.004	13.130	0.000	0.041	0.055	0.349
Household Size	-0.003	0.001	-4.750	0.000	-0.005	-0.002	5.305
Working *	-0.017	0.006	-3.040	0.002	-0.028	-0.006	0.889
Education*	-0.034	0.004	-7.650	0.000	-0.042	-0.025	0.798
Gender*	0.007	0.004	1.580	0.113	-0.002	0.016	0.715
Distance	0.001	0.000	10.730	0.000	0.001	0.001	6.881
Marital status*	-0.011	0.005	-2.070	0.038	-0.021	-0.001	0.778
Age	0.001	0.000	7.570	0.000	0.001	0.001	46.130

(*) dy/dx is for discrete change of dummy variable from 0 to 1
Source: Author's computation

4. Conclusions

The goal of the research was to provide critical analyses on household out-of-pocket expenditures in Kenya and how these health expenditures become catastrophic hence pushing the households into poverty. Further, analyses of differentials on health care expenditure by socioeconomic and demographic characteristics of population can contribute towards a better understanding of existing variations in catastrophic health expenditures and impoverishment that could be used to develop appropriate policies and models to new interventions. Insurances, illness, location, household size, employment status of household head, education level of household head, distances to health facility, marital status and age have an association with catastrophic expenditure while illness, location, employment status of household head, education level of household head, distances to health facility, have an association with impoverishment. The results suggest that catastrophic health expenditures continue to be experienced in Kenya and as a result, many families are pushed into poverty. The study used the Xu (2005) method in the estimation of catastrophic health expenditures and impoverishment. The results shows that 6.3 percent of households that used healthcare in 2013, incurred catastrophic health expenditures and 4.6 percent were impoverished. Moreover, the rates of catastrophic expenditures varied considerably between counties. From the results, 23 counties reported a rate of catastrophic health expenditure exceeding 40 percent of total non-food expenditure on health while 22 counties

reported impoverishment. These rates were higher than the national average, suggesting that about 2.6 million and 1.7 million Kenyans experienced catastrophic health expenditures and were pushed into poverty line due to OOP expenditures. The result illustrates the extent to which health care payments can push a household into poverty but this is never captured in poverty estimation in the country i.e. many people are not classified as poor despite being below the poverty line after incurring health expenditures. Therefore, there is need to relook at the poverty estimation so as to capture the people (who were initially not poor) falling below poverty line due to health expenditures.

Urban areas had the highest number of households incurring catastrophic expenditure at a count of 8.4 against the rural at 5.17 percent. Further, Catastrophic health expenditures were experienced highest in the account of illness at 10.4 percent while impoverishment was experienced highest by people with secondary education and above at 7.07 percent this study has some limitations. The income and expenditures data is self-reported and thus not verifiable from other sources. The recall period of 12 months for expenditures on healthcare can be a limitation since it is difficult to ascertain possible inaccuracies in recall can occur for income or expenditures. Despite the limitations, this study provides critical and useful insights which can evoke important discussion that can inform health financing programming at both national and county levels. The study made several contributions. It examined the determinants of catastrophic health spending and impoverishment as well as the distribution at county level.

References

Abegunde, D. O., Mathers, C. D., Adam, T., Ortegon, M., & Strong, K. (2007). The Burden and Costs of Chronic Diseases in Low-Income and Middle-Income Countries. The Lancet, 370(9603), 1929-1938.

Becker, G. S & Murphy, M. (1988). A Theory of Rational Addiction. The journal of political economy, 96:675-700

Becker, G. S. (1962). Investment in Human Capital: A Theoretical Analysis. The journal of political economy, 70:9-49

Berki, E. (1986). A Look at Catastrophic Medical Expenses and the Poor. Health Affairs 5: 139-45

Bolin, K., Jacobson, L., & Lindgren, B. (2002). The Family as the Health Producer – When Spouses Act Strategically. Journal of health economics, 21:475-495

Cameron, A. C. & Trivedi, P. (2005). Microeconometrics: Methods & Applications, Cambridge University Press

Chollet, D. & Betley, C. (1987). Catastrophic Health Care Cost: Who is at Risk? In: Where Coverage Ends: Catastrophic Illness and Long- Term Health Care Costs, 1987. Employee Benefit Research Institute.

Chuma, J., & Maina, T. (2012). Catastrophic Health Care Spending and Impoverishment in Kenya. BMC Health Services Research, 12(1), 1.

Feenberg, D. & Skinner, J. (1994). The Risk and Duration of Catastrophic Health Care Expenditures. The Review of Economics and Statistics, 76(4), 633- 647

Flores, G., Krishnakumar, J., O'Donnell, O. & VanDoorslaer, E. (2008). Coping with Health Care Costs: Implications for the Measurement of Catastrophic Expenditures and Poverty. Health Economics, 17(12):1393-412

Fun, J. & Zick, D. (2005). The Economic Burden of Health Care, Funeral, and Burial Expenditures at the End of Life. Journal of Consumer Affairs, 38(1): 35-55

Gakidou, E., Lozano, R., González-Pier, E., Abbott-Klafter, J., Barofsky, J. T., Bryson-Cahn, C., ... & Murray, C. J. (2006). Assessing the effect of the 2001–06 Mexican health reform: an interim report card. The Lancet, 368(9550), 1920-1935.

Gakidou, E., Lozano, R., Gonzalez-pier, E…, (2006). Health Systems in Mexico 5- Assessing the Effect of the 2001 to 2006 Mexican Health Reform; an Interim Report Card. Lancet, 368(9550): 1920 – 1935

Garg, C. (1998). Equity of Health Sector Financing and Delivery in India. Viewed at; http://www.hsph.harvard.edu/research/takemi/files/rp144

Ghaffar, A., Reddy, S. &Singhi, M. (2004). Burden of Non-Communicable Diseases in South Asia. British Medical Journal, 328:807-10.

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. The Journal of political economy, 80:223-636

Janz, N. & Becker, H. (1984). The Health Belief Model: A Decade Later. Health education quarterly, 11:1047

Kimani, D. & Maina, T. (2015). Catastrophic Health Expenditures and Impoverishment in Kenya. Washington, DC: Futures Group, Health Policy Project.

Kimani, D. (2014). "Out-of-Pocket Health Expenditures and Household Poverty: Evidence from Kenya. University of Nairobi

Kimani, D. N., Mugo, M. G., & Kioko, U. M. (2016). Catastrophic Health Expenditures And Impoverishment in Kenya. European Scientific Journal, 12(15).

Knaul, F. M., Arreola-Ornelas, H., Méndez-Carniado, O., Bryson-Cahn, C., Barofsky, J., Maguire, R., ... & Sesma, S. (2006). Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico. The Lancet, 368(9549), 1828-1841.

Knaul, M. Arreola-Ornelas H, Mendez-Carniado, O…, et al. (2006). Health System Reform in Mexico four- Evidence is Good for Your Health System; Policy Reform to Remedy Catastrophic and Impoverishing Health Expenditure in Mexico. Lancet, 368(9549): 1828 – 1841

KNBS and ICF Macro (2015). Kenya Demographic and Household Survey 2014. Calverton, Maryland: KNBS and ICF Macro

Kyobutungi, C., Ziraba, A. K., Ezeh, A., & Yé, Y. (2008). The burden of disease profile of residents of Nairobi's slums: Results from a Demographic Surveillance System. Population health metrics, 6(1)

Lamiraud, K, Booyen, F & Scheil-Adlung X. (2005). The Impact of Social Health on Access to Health Care, Health Expenditure and Impoverishment: A Case Study of South Africa. International labour office, Geneva

Limwattananon, S, Tangacharoensathien, V & Prakongsai (2007). Catastrophic and Poverty Impacts of the Health Payments: Results from National Household Survey in Thailand. Bulletin of WHO, 85(8); 600- 606

Mahal, A., Karan, A. & Engelgau, M. (2010). The Economic Implication of Non-Communicable Disease for India. HNP discussion paper: World Bank. Washington, DC

Mahal, A., Sakthivel, S. & Nagpal, S. (2005). National Health Accounts for India In Health Systems in India: Delivery and Financing of Services, National Commission on Macroeconomics and Health, Ministry of Health and Family Welfare, Government of India, New Delhi, pp. 222-228.

Nugent, R. (2008). Chronic Diseases in Developing Countries; Health and Economic Burdens. Center for Global Development, Washington, DC, USA

O'Donnell, O., Van Doorslaer, E., Rannan-Eliya, R. P., Somanathan, A., Adhikari, S. R., Akkazieva, B., ... & Huq, M. N. (2008). Who pays for Health Care in Asia? Journal of health economics, 27(2), 460-475.

O'Donnell, O., E. Van Doorslaer, et al, (2005). Explaining the Incidence of Catastrophic Expenditures on Health Care: Comparative Evidence from Asia. EQUITAP Working Paper NO 5. Eramsus University, Rotterdam and IPS, Colombo.

Perkins, M., Brazier, E., Themmen, E., Bassane, B., Diallo, D., Mutunga, A., & Ngobola, O. (2009). Out-of-Pocket Costs for Facility-Based Maternity Care in Three African Countries. Health Policy and Planning, 24(4), 289-300.

Pradhan, M. & Prescott, N. (2002). Social Risk Management Options for Medical Care in Indonesia. Health Economics,11:431-46

Republic of Kenya, (2016). Economic Survey. Kenya National Bureau of statistics, Nairobi.

Republic of Kenya (2015a). Kenya Health Policy 2014 - 2030. Ministry of Health. Mimeograph. Nairobi.

Republic of Kenya, (2015b). Kenya National Health Accounts 2012/13. Ministry of Health.

Republic of Kenya, (2015c). Kenya Household Expenditure and Utilization Survey Report 2013. Ministry of Health.

Republic of Kenya, (2015d). Accelerating attainment of Universal Health Coverage: The Kenya Health Sector Strategic and Investment Plan 2014 to 2018. Ministry of Health.

Republic of Kenya, (2010a). The Constitution of Kenya, Government Printers. Nairobi.

Republic of Kenya, (2010b). Analysis of Performance, Analytical Review of Health Progress and Systems Performance. Kenya Health Policy Framework 1994 to 2010: Ministries of health.

Republic of Kenya, (2005). Reversing the Trend: The Second Health Sector Strategic Plan of Kenya. Ministry of Health Sector Secretariat.

Republic of Kenya, (1999). National Health Sector Strategic Plan I, Ministry of Health Sector Secretariat.

Russell, S. (2004). The Economic Burden of Illness for Households in Developing Countries: A Review of Studies Focusing on Malaria, Tuberculosis and HIV/AIDS. American Journal of Tropical Medicine and Hygiene, 71(Supplement 2):147-55.

Rosenzweig, R, and Schultz P (1983), Estimating a Household Production Function: Heterogeneity, the Demand for Health Inputs, and Their Effects on Birth Weight. Journal of Political Economy, 91(5): 723-746

Saksena, P., Ke Xu, and Guy Carrin. "The Impact of Universal Insurance Program on Catastrophic Health Expenditure: Simulation Analysis for Kenya." Geneva: World Health Organization. Global Public Health 15 (2006).

Stiglith, E. (1988). The Economics of the Public Sector. 2nd edition, Norton & Co, New York.

Tiku, M. L. (1980). Robustness of MML estimators based on censored samples and robust test statistics. Journal of Statistical Planning and Inference, 4(2), 123-143.

Van Doorslaer, E., O'Donnell, O., Rannan-Eliya, R. P., Somanathan, A., Adhikari, S. R., Garg, C. C., ... & Karan, A. (2006). Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data. The lancet, 368(9544).

Van Doorslaer, E., O'Donnell, O., Rannan-Eliya, R. P., Somanathan, A., Adhikari, S. R., Garg, C. C., ... & Karan, A. (2007). Catastrophic payments for health care in Asia. Health economics, 16(11), 1159-1184.

Wagstaff, A. & Van Doorslaer, E. (2003). Catastrophe and Impoverishment in Paying for Health Care: With Applications to Vietnam 1993-98. Health Economics, 12: 921-34.

Wagstaff, A. (2008). Measuring Financial Protection in Health. World Bank, Washington, DC; Development Research Group. Policy Research Working Paper # WPS 4554

Waters, H., Anderson, G., Mays, J. (2004). Measuring Financial Protection in Health in the United States. Health Policy, 69 (3): 339-349.

Wild, S., Roglic, G., Green, A., Sicree, R., & King, H. (2004). Global prevalence of diabetes estimates for the year 2000 and projections for 2030. Diabetes care, 27(5), 1047-1053.

World Health Organization, (2010). Path to Universal Health Coverage. Geneva Switzerland.

World Health Organization. (2006). Health service utilization and the financial burden on households in Vietnam: the impact of social health insurance.

World Health Organization, (2005). Designing Health Financing System to Reduce Catastrophic Health Expenditures. Geneva Switzerland.

World Health Organization, (2000). The World Health Report: Health Systems, Improving Performance. Geneva Switzerland.

Xu, K. (2005). Distribution of Health Payments and Catastrophic Expenditures Methodology.

Xu, K., Carrin, G., Phuong, N…,et al , (2006). Health Service Utilization and Financial Burden on Households in Vietnam: the Impact of Social Health Insurance. WHO, Geneva

Xu, K., Evans, D. B., Kawabata, K., Zeramdini, R., Klavus, J., & Murray, C. J. (2003). Household catastrophic health expenditure: a multicountry analysis. The lancet, 362(9378), 111-117.