Effect of Health Insurance on Catastrophic Health Expenditure among Households of People with Non-Communicable Diseases in Busia County, Kenya

Wilson Kemei[1*], Jackline Nyaberi[1] and Simon Ruttoh[2]

[1]*School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya and* [2]*School of Public Health, Moi University, Eldoret, Kenya*

***Correspondence author**: Wilson Kemei. Email address: wskkemei@gmail.com

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Abstract

INTRODUCTION

Non-communicable diseases (NCDs) are increasingly becoming important causes of illness and premature deaths globally, causing up to 41 million deaths annually, mostly occurring in Low and Middle-Income Countries. However, NCD treatment is lengthy and expensive forcing households to incur catastrophic expenditure. Thus, NCDs deepen inequality and are major drivers of unending poverty due to their lengthy treatment. Kenya successively reformed the National Health Insurance Fund to include a package that covers the plight of NCDs and transform it into a primary enabler for achieving Universal Health Coverage. This study examined whether health insurance affects catastrophic health expenditure among households of people with NCDs.

METHODOLOGY

A quasi-experimental design was conducted among eligible households with health insurance and those without, involving a representative sample of 350 households. Trained interviewers conducted interviews at baseline and after one year with household heads.

RESULTS

Households without cover spent a higher proportion of their total income (23%) on NCD care compared to households with insurance (11.7%). The mean total expenditure on NCD care for insured households was Ksh. 8,657.37 (95% CI 7,061.6 - 10,253.1) while that for non-insured was Ksh. 16,851.20 (95% CI 15,255.4 - 18,445.0), p = 0.000. Although the proportion of un-insured households that incurred catastrophic health expenditure (CHE) was higher than that of insured households, the study failed to establish that the incidence of CHE was different for non-insured and insured households (χ^2 = 33.89, df =1, p = 0.062).

CONCLUSION

NHIF cover was unable to protect Households of People with NCDs from CHE. The study recommends that NHIF's benefits package be further reformed to adequately cover all NCD's care needs. County government to strengthen the health system and boost capacity at lower levels of care to enhance NHIF coverage.

Keywords*: Busia County, Health Insurance, Financial Risk Protection, NCDs Care*

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Introduction

NCDs are increasingly becoming important causes of illness and premature deaths globally, killing up to 41 million people annually, the majority of which occur in LMICs. The rising burden of NCDs is a major threat to the performance of the health system especially on the protection of households from the high cost of treatment that limits access to available care [1]. In Kenya, the major NCDs are cardiovascular diseases, diabetes, chronic respiratory diseases

and cancers. These 4 major NCDs account for more than 50% of all hospital admissions and 39% of hospital deaths. It is projected that by the year 2030, NCD-related hospital mortalities will have increased to 55%. Patients with NCDs go through lengthy treatment regimens with most of their drug combinations being expensive [2]. Out-of-pocket (OOP) expenditure levied at service points in health institutions remains a major barrier to accessing NCD care early before complications set in [3]. There is also evidence suggesting that a household with a member having NCD is twice more likely to incur catastrophic health expenditure (CHE) while seeking NCD care compared to a household without NCDs [4]. NCDs thus deepen inequality and are the major drivers of poverty that are passed from generation to generation [2].

In 2015, world leaders resolved to deal with the devastating financial burden of NCDs as a developmental challenge under the 2030 Sustainable Development Goals (SDGs) [5]. Kenya integrated SDGs into her health sector strategy goals and committed to achieving SDG goal 3.8 on Universal Health Coverage (UHC) by the year 2022 [6]. The government successively reformed the National Health Insurer (NHIF) to include a package of services that address the plight of NCDs and build its capacity to protect households from financial risks of illness [7]. All Kenyans are eligible to enrol into the scheme with a fixed monthly household premium of Kenya shillings 500 for the informal sector and a monthly premium graduated based on monthly earnings deducted from the salary for the formally employed. NHIF contracts public and private healthcare facilities to provide care to its members and reimburse them using capitation and case-based systems [8].

In 2018, the National Government through NHIF rolled out a Pilot health insurance program in the counties of Kisumu, Machakos, Nyeri and Isiolo, targeting 3.2 million residents, to use the lessons learned to further scale up the program to all counties in Kenya. Under this program, County Governments abolished user fees levied at level 4 and 5 government-owned facilities while the National Government refunded them lost revenues [9]. This initiative was replicated by other County Governments in collaboration with their development partners. In Busia County for instance, a health insurance program was initiated by AMPATH (a partnership between Moi University College of Health Sciences Moi Teaching and Referral Hospital and a consortium of North American Universities led by Indiana University) together with the County Government. The program aims to scale up NCD management in the region by strengthening primary care services, linking patients to different levels of care and linking patients with NHIF coverage [10]. In Kenya, despite the shifting epidemiological disease burden, there's no evidence that NHIF reforms addressed the needs of households with NCDs concerning financial risk protection. Given that most households cannot afford diagnostic and treatment costs for NCDs as a result of their low income levels [11], there is an urgent need for evidence of whether health insurance is capable of protecting households from the financial risks of NCDs as the country embarks on the highly ambitious plan to attain UHC. Our study objective was to assess whether health insurance has an effect on CHE among households of people with NCDs

Methodology

Study design and setting

We conducted a quasi-experimental (Pre-test- post-test non-equivalent control group) design. Health insurance program was rolled out by national stakeholders hence randomization of participants was not possible, hence, the resulting groups were non-equivalent [16 &17]. Using household registers created during the registration of beneficiaries, the study recruited households into an intervention group (with cover) and a comparison group (without cover).

Both groups were interviewed for a pre-test before roll out of the health insurance cover and a post-test 1 year later when the intervention group had enjoyed their health insurance cover.

Kenya is among the LMICs in the sub-Saharan Africa region. The hierarchy of health delivery structure in Kenya is organized into 1). Private for-profit institutions 2). Government institutions and 3). Private not-for-profit institutions. Government-owned facilities are structured from level 1 community units with no physical structure to highly specialized level 6 referral facilities [12]. Upon the promulgation of the new constitution in 2013, delivery of health services was devolved to County governments except for the level 6 facilities, training, health policies, standards, and regulation [13].

Study site

The study was implemented in Busia County situated in the western part of Kenya. Here fishing is the most dominant economic activity [14]. According to the Kenya National Bureau of Statistics [15], Busia County with an area of 1,696 km2, has a population of 893,653 of which 426,252 are male and 467,401 are female.

Study population

The study population comprised 1,826 households that had at least one member living with NCD and had either been enrolled (910 cover paid) or enlisted (916 waiting list) for the health insurance program. To participate, the household needed to have sought at least one outpatient hospital visit 4 weeks preceding the survey or to have had at least one case of hospitalization 12 months preceding the survey.

Comparison groups

Non-randomization can introduce selection bias where intervention subjects can be systematically differ in baseline characteristics from comparison subjects [17]. We used PSM to create a comparison group by matching each intervention household to a comparison household of similar baseline characteristics based on calculated propensity scores. Using logistic regression, control variables which included observed characteristics of households before the introduction of the health insurance program such as (age, gender, marital status, education level, occupation of household head, household size, income, geographical location, number of household members with NCDs and number of household members with NCDs comorbidity) were used to calculate the propensity score of each household. These variables were selected following a review of related studies [18]. The study used the Nearest Neighbour Method with calliper adjustment to create matches from propensity scores where households were only matched if their propensity scores felt within the designated calliper distance or otherwise discarded. To ensure that insured households had a distribution of propensity scores similar to those of uninsured; we checked the quality of matches by numerically comparing their balances using absolute Standardized Mean Differences (SMD) and the Variance Ratios (VR) [18-21]. Similar to other studies [21 & 22], we considered covariate balance as an absolute SMD value less than 0.1 and a VR near 1.

Sample size and sampling

Using a formula suggested by Sullivan [23], we estimated that a minimum sample size of 175 households per group would have a power of 80% using a 2-sided alpha of 0.05 and a medium effect of 0.3. Power of 80% or greater is appropriate to establish a statistically significant difference [24]. To ensure the total sample size of 350 was available for analysis at 12 months, an additional 15% was added to each group to cater for those that would be lost during follow-up. Systematic sampling was used to select participating households in the intervention group. The study aimed and achieved a response rate of 100%.

Study variables

Financial risk protection is in many instances measured by analyzing if or not a household's OOP health expenditure is

catastrophic- meaning it exceeds a fixed threshold of either total income or total expenditure after food expenses are removed [25]. The institution created by the UN to develop and implement a global indicator monitoring framework for SDGs- known as the Inter-Agency Expert Group on SDGs indicators (IAEG SDG), recommends the use of CHE indicator, specifically defined as 10% (CHE10%) or 25% (CHE25%) of total household income as the official SDG indicator to monitor financial protection sub-target on UHC. The CHE10% metric, however, is more widely used [25]. In this study, households whose OOP expenditure for NCD care exceeded 10% of their total annual income were considered as experiencing CHE.

Data collection

Data was collected using structured questionnaires at baseline and post intervention. The questionnaire was pre-tested using 20 randomly sampled respondents, 10 in the intervention and 10 in the comparison group. The 20 households that participated in the pre-test were not included in the final analysis. Cronbach's Alpha was then computed and a reliability mean value of 0.67 was obtained. Validity was assured by adopting and modifying the questions used in related studies and through appraisal by persons who were deemed as experts on the subject.

Data analysis

Descriptive analysis was computed to summarize data using percentages, means and standard deviation. Under inferential analysis, we ran ANCOVA to test whether the means of OOP health expenditure for NCD care was different. Pearson's chi-square test was used to test the incidence of incurring CHE. SPSS Version 25 was used during the analysis.

Ethical approval

Ethical approval was obtained from the Moi University-Institutional Research and Ethics Committee (IREC Approval No. 0003628). Approval to conduct research was obtained from Jomo Kenyatta University of Agriculture and Technology, as well as NACOSTI.

Results

Socio-demographic and economic characteristics of households

The mean age for the intervention group was 55.4 years while that of the comparison group was 56 years. The average household monthly income was generally low with (45.5%) of the households earning Ksh. 5000 or less. A higher proportion (62.8%) of households were headed by males with more than half (53.4%) of the household heads having not attained secondary level of education. Table 1.

Table 1:
Households' Socio-Demographic Characteristics

COVARIATE	LEVEL	INTERVENTION		COMPARISON	
		Freq.	%	Freq.	%
Gender	Male	109	31.1	111	31.7
Marital status	Married	107	29.4	103	28.3
Education level	Not attained secondary	97	27.7	90	25.7
Residence location	Rural	140	40	138	39.4
NCD Morbidity	More than 1 member	14	4	13	3.7
NCD Comorbidity	Present in Household	33	9.4	34	9.7
Wealth quintiles (Ksh.)	Up to 5,000 (Poor)	80	22.9	79	22.6
	> 5,000 - 9,000 (Middle)	62	17.7	67	19.1
	> 9,000 (Rich)	33	9.4	29	8.3
		Mean	SD	Mean	SD
Age (Years)	Household head	55.40	12.61	56.0	12.25
Household size	Household	4.4	1.33	4.5	1.23

The majority (79.4%) of the households resided in the rural areas and only 7.7% had more than one member treated for NCDs. The average age of household heads was 55.7 years.

Types of non-communicable diseases affecting households

Cardiovascular diseases (CVDs) were the most prevalent NCDs (31.4%). Among households with reported NCDs comorbidity, CVDs with diabetes were most common (16%). Table 2.

Household out-of-pocket NCD care expenditure

Table 3 illustrates the adjusted mean OOP expenditure. Intervention group households spent a lower proportion (11.7%) of their total household income on NCD care compared to comparison group households that spent (23%) of their total income.

The adjusted mean OOP health expenditure for the intervention group was Ksh. 8,657.37 (95% CI 7,061.6 - 10,253.1) while that for the comparison group was Ksh. 16,851.20 (95% CI 15,255.4 - 18,445.0), p value = 0.000. The poorest households spent a higher proportion (31.7%) of their total annual income on NCD care compared to the richest households which spent only (10.2%) of their total annual income.

Households that reported having more than one member being treated for NCDs spent a higher (22.1%) proportion of their annual income on NCD care compared with households that had only one member (17%).

Table 2:
NCD Types Affecting Households in the Study Area

S/N	NCD Type	Intervention	Comparison	Total	(%)
		Frequency	Frequency	Total	%
1.	Cancer	11	10	21	6
2.	Diabetes	29	30	59	16.9
3.	CVDs	55	55	110	31.4
4.	CRDs	33	33	66	18.9
5.	Diabetes with CVDs	28	28	56	16
6.	CVDs with CRDs	11	11	22	6.3
7.	Diabetes with CRDs	5	5	10	2.8
8.	Cancer with CVDs	3	3	6	1.7
	Total	175	175	350	100

Table 3:
ANCOVA Output for Mean Income and Adjusted Mean OOP Expenditure in Ksh.

COVARIATE	n	Household INCOME		Household OOP HEALTH EXPENDITURE		P value
		Mean	95%CI	Adjusted Mean	95% CI	
HH HI Status						
Intervention	175	74,386.29	69,309.9 - 79,462.7	8,657.37	7,061.6 - 10,253.1	0.000
Comparison	175	73,286.57	68,192.2 - 78,345.0	16,851.20	15,255.4 - 18,445.0	
HH Wealth Quintiles						
Poor	159	43,743.40	41,829.7 - 45,657.7	13,862.14	12,038.9 - 15,685.4	0.000
Fair	129	83,838.56	81,707.9 - 85,957.2	11,152.48	9,146.4 - 13,158.6	
Rich	62	130,161.3	127,096.6-133,226.0	13,245.97	10,370.6 - 16,121.4	
HH NCDs Comorbidity						
Present	67	59,641.79	51,606.8 - 67,676.8	17,727.51	13,469.8 - 19,993.0	0.142
Not present	283	77,185.87	73,276.3 - 81,095.4	14,180.20	12,795.7 - 15,564.7	
HH NCDs Morbidity						
1 member	323	75,094.74	71,388.8 - 78,800.7	12,737.76	11,414.5 - 14,061.0	0.934
More than 1	27	58,666.67	45,848.6 - 71,484.7	12,951.95	8,092.2 - 17,811.7	

However, this finding was not statistically significant (p =0.93, 95% CI 8,092.2-17,811.7).

Reason for OOP Health Expenditure

Table 4 illustrates the different areas for OOP Health Expenditure. Insured households spent a higher proportion (7.9%) of their income on radiology and Ultrasound services compared to the comparison group (3.7%). The study did not find evidence that OOP health expenditure on medical drugs and medical procedures was different for the two groups. The study however established that insured households spent a lower proportion (12.9%) of their income on diagnostic/follow-up tests compared to the comparison group (26.6%).

Association between household HI status and incidence of CHE

Table 5 illustrates the incidence of CHE. Generally, about four in every ten households (42.9%) that participated in the study incurred CHE. The proportion of comparison group households that incurred CHE was 32.0% while that of intervention households was 11%. This difference was however not statistically significant (χ^2 = 33.89, df =1, p = 0.062).

Table 4.
ANCOVA Output on Reason for OOP Health Expenditure

	HI Status	Household OOP health Expenditure		P value
		Adjusted Mean	95% CI	
Diagnostic and follow-up tests	Intervention	9,627.23	8,420.80 - 10,624.53	0.001
	Comparison	19,500.44	18,051.35 - 20,665.70	
Medical drugs	Intervention	9,111.66	8,572.60 – 10,212.42	0.210
	Comparison	10,410.34	8,995.82 – 11,511.26	
Radiology/Ultra Sound	Intervention	5,854.87	4,712.50 – 6,219.48	0.001
	Comparison	2,712.78	1,801.32 – 3,642.55	
Medical Procedures	Intervention	6,844.47	5,670.45 – 7,539.04	0.185
	Comparison	6,578.93	5,369.19 – 7,228.12	
Others	Intervention	3,118.72	2,015.74 – 3,985.40	0.363
	Comparison	3,185.38	2,003.01 – 3, 955.75	

Table 5:
Incidence of CHE using Pearson Chi-square test

Covariate	Level	n	Intervention			Comparison			P value
			n	CHE	%	n	CHE	%	
Wealth	Poor	159	80	38	10.9	79	62	17.7	0.000
Quintiles	Rich	62	33	0	0	29	17	4.9	0.000
	Nil	283	142	28	8	141	81	23.1	0.000
Comorbidity	Comorbid	67	33	10	2.9	34	31	8.9	0.000
Morbidity	1 Member	323	161	31	8.9	162	100	28.6	0.000
	>1 Member	27	14	7	2.0	13	12	3.4	0.016
HI Status	Intervention	175	175	38	10.9	-	-	-	0.062
	Comparison	175	-	-	-	175	112	32.0	
NCDs	Cancer	21	11	11	3.1	10	9	2.6	0.283
Types	Diabetes	59	29	3	0.9	30	24	6.9	0.000
	CVDs	110	55	4	1.1	55	27	7.7	0.000
	CRDs	66	33	3	0.9	33	9	2.6	0.056
	DM/CRDs	10	5	1	0.3	5	5	1.4	0.052
	Cancer/CVDs	6	3	3	0.9	3	3	0.9	0.310

Up to 28.6% of the households in the lowest wealth quintiles incurred CHE compared to only 4.9% of households in the highest wealth quintiles across both groups (χ^2 = 63.88, df =1, p = 0.000). The study also observed that almost similar proportions of households with cancer-related illnesses incurred CHE regardless of their health insurance status (χ^2 = 1.16, df =1, p = 0.283). All the households afflicted by comorbidity of cancer with CVDs incurred CHE (χ^2 = 0.11, df=1, *P*=0.310).

Discussion

The study established that although the households in the intervention group spent a lower proportion of their income when seeking care compared to comparison group households, the incidence of CHE was not different between the groups. This finding was consistent with those of other studies in other LMICs [26-27] and in Kenya [28-29]. For instance, in Vietnam, Nguyen *et al*., established that there was no significant association between household health insurance status and incidence of CHE among households of people with NCDs [27]. In this study, insured households spent a higher proportion of their income on radiology and ultrasound than the comparison group. Increased utilization among the insured households due to insurance coverage coupled with inconsistent supply of commodities and lack of radiology services at lower level facilities subjected households to spending more out of pocket at private and higher level facilities. Another study associated NHIFs' inability to protect households from the financial risks of NCDs with its provider payment mechanism that fails to cater for crucial care needs such as NCDs medicine [30]. Although households with cover spent a lower proportion of their income compared to uninsured on medical drugs, this difference was not statistically significant.

Purchaser and provider factors compromised physical access to NHIF-accredited facilities. First, capitation-based payments by NHIF limited access to only one NHIF-accredited facility. As such, households had to pay OOP to access care from other providers if the services they sought were not available from the facilities where they were capitated. Secondly, health system gaps hindered access and compromised the quality of NCD care services as medical drugs and other medical supplies were sometimes lacking in most public facilities accredited by NHIF. Thirdly, insured patients from the informal sector were required by NHIF to pay their monthly premiums at least 1 year in advance before authorization for them to undergo expensive medical procedures. This could have countered the role of health insurance as a mechanism for preventing CHE from OOP health expenditure.

Poor households spent a higher proportion of their income on NCD care compared to the richer households irrespective of their health insurance status. Other studies have reported similar findings [27, 29, 31-33]. Apart from low income which is not adequate to sustain poor households during illness, a high concentration of them live in rural areas where screening is unavailable early before complications set in. Poor households also lack health literacy in terms of NCDs early screening and preventive measures compared with the rich. With complications and a lack of quality NCD care in rural areas, the majority of poor people could be forced to incur CHE at tertiary facilities. In Kenya, significant gaps in the implementation of social support programs exist where extremely poor households are left out in preference for rich households [33].

The study did not find evidence that health insurance protects households with different NCD types equally, from incurring CHE. For instance, cancer-related illness was highly associated with a household incurring CHE irrespective of household health insurance status. Similar to the findings of a study in Kenya [34], incidences of CHE were found to be highest among households with cases of cancer. Patients

with cancer undergo radiology and other medical procedures than patients afflicted by other NCDs. In this study, households with cover spent more than those without cover in relation to radiology and medical procedures due to cover limits further worsening the plight of those with cancer.

We found the incidence of CHE to be higher than those reported by other related studies in Kenya [29, 34]. For instance, Nyakangi *et al*, [33] using a household's capacity to pay threshold of 40%, found an overall CHE incidence of 10.1%. Their respondents included formally employed household heads whose income was high. Oyando *et al* [29] using a household's capacity to pay threshold of 40% found an overall CHE incidence of 23.1%. Whereas our study included households with cases of cancer which studies [34 & 35] have associated with a high incidence of CHE, theirs did not.

Strengths and Limitations

The study utilized a pretest-posttest control group design, capable of capturing the effect of health insurance on financial risk protection over time. Selection bias was eliminated using propensity score matching. Self-reporting by respondents could have caused minimal measurement errors due to recall bias. Effort was however made to minimize bias by using different recall periods for different questions and also by requesting respondents to keep a diary of care-seeking events during the study period. One year could have been short to evaluate the effect of health insurance.

Conclusion

Based on our findings, the study concluded that NHIF's coverage was unable to protect Households of People with NCDs from CHE. The study recommends that NHIF's benefits package be further reformed to adequately cover all NCD's care needs including follow-up tests, radiology and medical procedures. County government to strengthen the health system and boost capacity at lower-level facilities to screen and manage NCDs. This will enhance NHIF's financial risk protection.

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