Effect of Health Insurance on Inpatient Health Service Utilization among Households Affected by Non-communicable diseases in Busia County, Kenya

ABSTRACT

Background: Non-Communicable Diseases (NCDs) are increasingly becoming important agents of illness and premature deaths globally, killing up to 41 million people annually, most of which occur in LMICs. In Kenya, major NCDs are cardio-vascular diseases, chronic respiratory diseases, cancers and diabetes. They account for 50% of all inpatient morbidities and 39% of all hospital mortalities. Patients afflicted with NCDs go through expensive treatment regiments, restraining them from utilizing available care. NCDs deepen inequality and are major drivers of unending poverty. World leaders resolved to deal with the devastating consequences of NCDs as a developmental challenge under SDGs. Kenya successively reformed its National Health Insurer to include a package that address the blight of NCDs and transform it into a primary enabler for achieving UHC. There is however, evidence suggesting that enrolment in health insurance (HI) does not necessarily guarantee inpatient utilization of NCDs care. This study examined the effect of HI on inpatient health service utilization among households with NCDs.

Methods. A quasi experimental design was conducted among eligible households with HI cover and those without, involving a representative sample of 350 households. Interviewersconducted interviews at baseline and after one year among household heads.

Results. Utilization of Inpatient NCDs care improved 1.256 (95% CI= 0.965-1.634), times more among insured households, (*P*=0.04).

Conclusion. HI improvesinpatient utilization of NCDs care. To accelerate progress towards UHC, national government should expand HI program to all counties, improve awareness of cover package entitlementsand remove payment preconditions for inpatient procedures. County government to ensure health systems at primary level are well equipped to tackle inpatient NCDs care needs.

Key words: Health Insurance, Inpatient Health service utilization, NCDs care.

1. Introduction

NCDs are increasingly becoming important agents of illness and premature deaths globally, killing up to 41 million people annually, majority of which occur in LMICs [1]. In Kenya, the major NCDs are cardio-vascular 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, NCDs related hospital mortalities will have increased to 55% [2]. Patients with NCDs go through lengthy treatment regiments with most of their drug combinations being expensive, as a result of often erratic supply of essential medicine [3,32,33].NCDs deepen inequality and are the major drivers of poverty that is passed from generation to generation. There is also evidence suggesting that most patients with NCDs have unequal access to care including screening and treatment due to low capacity in primary health care institutions [4]. World leaders in 2015 agreed to deal with the devastating consequences of NCDs as a developmental challenge under the 2030 Sustainable Development Goals (SDGs). Kenya integrated SDG 3 on health and wellbeing into her health sector strategy goals and committed to achieve the SDG goal 3.8 on UHC by the year 2022 [5]. The National government successively reformed the National Health Insurer- National Health Insurance Fund (NHIF) to include a package of services that address the blight of NCDs and build its capacity to deliver UHC[6]. All Kenyans are eligible to enroll into the scheme with a fixed monthly household premium for the informal sector and a monthly premium graduated based on monthly earnings deducted from salary for the formally employed. NHIF contracts public and private health care facilities to provide care to its members and reimburse them using capitation and case based systems [7]. In 2018, Kenyan Government through NHIF rolled out a Pilot HI program in the counties of Kisumu, Machakos, Nyeri and Isiolo, targeting 3.2 million residents, with an aim of using 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 for lost revenues [8]. This initiative was replicated by County Governments in collaboration with their development partners. In Busia County for instance, a HI 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 lead by Indiana University) together with the County Government and NHIF. The program aimed at scaling up NCDs management in the region by strengthening primary care services; linking patients to different levels of care and linking patients with NHIF [9].

Effect of HI on NCDs care utilizationin LMICsgenerally, has been demonstrated by other published studies. Some have shown evidence that HI enhances the use of health interventions by people living with NCDs [10,11&12] while other studies found evidence that HI has a negative or an insignificant effect on utilization of NCDs care [13 &14].

In Kenya, given that more often, NCDs are diagnosed late when the disease has advanced to stages that require inpatient care and given that most patients with NCDs have unequal utilization of available care as a result of financial barriers that limit access [4], there is urgent need for evidence whether HI programs already in place improve inpatient health service utilization among the growing population of households with NCDs. To our knowledge, there's no evidence that the NHIF reforms addressed the needs of people with NCDs in relation to utilization of inpatient NCDs care. This study aims to fill this gap and inform scale up of UHC program in Kenya.

2. METHODS

2.1 Study Setting

Kenya is among the LMICs in the sub-Sahara Africa region. The hierarchy of Health delivery structure in Kenya is organized into three sub-systems: 1). Private for-profit institutions, 2). Government institutions which include facilities operated by County and those manned by the National Government, 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 [17].Upon the promulgation of the new constitution in 2013, delivery of health services was devolved to the County governments with an exception of level 6 facilities. The national government also retained health policy, standards, regulation and training functions [18].

2.2.Study site.

The study was implemented in Busia County, situated in the western part of Kenya.Fishing is the most dominant economic activity since part of Lake Victoria extends to the County. Other complementing economic activities include rice farming under irrigation and subsistence farming [19].Population parameters of Busia County are comparatively indicated in table 1.

Table 1. Population Parameters of study area.

Administrative unit	Population			Area (km2)	No. of Households	Household size	Pop density
	Male	Female	Inter sex				
Kenya	23,548,056	24,014,716	1,524	580,876	12,143,913	3.9	82
Busia	426,252	467,401	28	1,696.3	198,152	4.5	527

Source: *(Kenya National Bureau of statistics 2019)*

2.3. Study Objective

Our work is part of a study that evaluates the effects of HI on Health service utilization and Economic burden of NCDs in Busia County using 4 objectives. This publication is however limited to only 1 specific objective. To assess the effect of HI on inpatient Health Service Utilization among households with NCDs.

2.4. Study Design

We conductedaquasi-experimental (Pretest- posttest non-equivalent control group) design.The HI program was rolled out by stakeholders hence randomization was not possible.When participants in a study are not randomized, the resulting groups are non-equivalent [20 &21]. Using household registers created during registration of beneficiaries, the study recruited households into an intervention group

(with cover) and a comparison group (without cover). Both groups were interviewed for pretest before roll out of HI cover and posttest 1 year later when intervention group had enjoyed their HI cover.

2.5. Study population

Study population comprised households that had at least one member living with at least 1 among the 4 common NCDs in Kenya. Participants needed to have met the following inclusion criteria: - (1). Be a household head of an enrolled (with cover) or an enlisted household (to get cover later) having at least one household member living with one of the 4 common NCDs in Kenya. (2). Household needed to have sought at least one inpatient visit in a hospital 4 weeks preceding the survey. (3). Household head should be willing to voluntarily consent to participate in the study. (4). Household head should be 18 years or older and (5) Household reside within the study area and will be available for posttest 1 year later.

2.6. Creation of comparison group

We used propensity score matching (PSM) to match each intervention household to a comparison household of similar baseline characteristics based on calculated propensity scores. The propensity score for each household is the probability of that household being enrolled in the HI program, given the set of baseline household characteristics included in the model [22]. Control variables which included observed characteristics of households before introduction of the HI program such as (age, gender, marital status, education level, occupation of household head, household size, household income, geographical location, number of household members with NCDs and number of household members with NCDs comorbidity) were used to calculate propensity score for each household. Covariates were selected following extensive literature review of similar studies [22]. Logistic regression was used to compute the scores whereas Nearest Neighbor Method with caliper adjustment was used to create matches from propensity scores. Households were only matched when their propensity scores felt within the designated caliper or otherwise discarded.

In order to ensure that insured households had a distribution of propensity scores similar to those of uninsured, quality of matches was checked by numerically comparing their balances using absolute Standardized Mean Differences (SMD) and the Variance Ratios (VR) [22-25]. Similar to other studies [25 & 26], we considered covariate balance as an absolute SMD value less than 0.1 and a VR near 1. The formula in equation (1)was used to calculate SMD for continuous covariates likeage of household head, household size household income and household propensity score. For dichotomous variables likegender of household head, marital status of household head, level of education for household head, geographical location of household, household NCD morbidity and household NCD comorbidity, the formula in equation (2), was used to calculate SMD.

Equation (1).

$$\boldsymbol{SMD\ of\ X} = \frac{\left|\bar{\boldsymbol{X}}_{\boldsymbol{intervention}} - \bar{\boldsymbol{X}}_{\boldsymbol{comparison}}\right|}{\sqrt{\frac{\boldsymbol{Var}_{\boldsymbol{intervention}} + \boldsymbol{Var}_{\boldsymbol{comparison}}}{\boldsymbol{2}}}}$$

Where, $\bar{\boldsymbol{X}}_{\boldsymbol{intervention}}$ and $\bar{\boldsymbol{X}}_{\boldsymbol{comparison}}$ are the sample means for the insured and uninsured groups respectively while $\boldsymbol{Var}_{\boldsymbol{intervention}}$ and $\boldsymbol{Var}_{\boldsymbol{comparison}}$ are the sample variances for the insured and uninsured groups respectively.

Equation (2).

$$SMD\ of\ x = \frac{|\hat{p}_1 - \hat{p}_2|}{\sqrt{[\hat{p}_1(1-\hat{p}_1) + \hat{p}_2(1-\hat{p}_2)]/_2}}$$

Where, $\hat{p}_1$ and $\hat{p}_2$ were the prevalence of dichotomous variables in the insured and uninsured groups respectively.

2.7. Sample size and sampling

Using a formula suggested by Sullivan [27], we estimated that a minimum sample size of 175 households per group would have 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 [28]. To ensure that all the 350 households will be available for analysis after 1 year, an additional 15% was added to each group to cater for those that would be lost during follow up.

2.8. Data collection and analysis

Interviewersconducted interviews at baseline and at posttest among household heads. Descriptive analysis was done to summarize data using percentages, means and median where applicable. Under inferential analysis, dependent variable was counts expressed as discrete positive values, commonly analyzed using Poisson regression models. Since data was over dispersed (variance greater than mean), due to high number of zeros, Negative binomial regression was run to predict the number of household posttest inpatient visits from household HI status, while controlling for the number of baselinevisits.

3. Results.

3.1. Socio-demographic Characteristics of Households

Table 2 illustrates the households' socio-demographic and economic characteristics and Table 3 outlinesthe NCDs types affecting households in the study area.

Table 2. Socio-demographic and economic characteristics of respondents.

COVARIATE	LEVEL	INTERVENTION		COMPARISON	
Dichotomous		**Freq.**	**%**	**Freq.**	**%**
Gender	Male	109	29.9	111	30.5
Marital status	Married	107	29.4	103	28.3
Education level	Not attained secondary	100	27.5	94	25.8
Residence location	Rural	140	38.5	138	37.9
NCD Morbidity	More than 1 in HH	14	4	13	3.7
NCD Comorbidity	Present in HH	33	9.4	34	9.7
Wealth quintiles (Monthly income in Kenya shillings).	1,000 to 5,000	80	22.7	79	22.6
	Over 5,000 to 9,000	62	17.7	67	19.1
	Over 9,000 to 14,500	33	9.4	29	8.3
Continuous	LEVEL	**Mean**	**SD**	**Mean**	**SD**
Age	Household head	55.40	12.61	56.0	12.25
No of people	Household	4.82	1.33	5.0	1.23
Monthly income	Household	6198.9	3033.87	6105.71	2643.36

Table 3:NCDs 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

3.2. Association between household HI status and utilization of inpatient NCDs care

Our primary outcome of interest was the number of household hospital admissions occasioned by NCDs. Overall; households recorded a (25%) increase in hospital admissions during the study period. Insured households reported more admissions by (20.6%) as compared to uninsured (4.4%). Utilization among households without NCDs comorbidity soared by (18.9%) across both groups compared to households with comorbidity (6.1%). Hospitalization aimed at seeking CVDs care was most frequently utilized irrespective of HI status as a result of a high prevalence of CVDs in the study area. All households with cases of cancer witnessed increased hospitalizations during the study as a

result of delayed diagnosis at advanced disease stages, prompting specialized care that demands hospitalization.

For inferential analysis, Table 4 illustrates the Negative binomial regression model output.

The study found evidence that utilization among insured households improved by 1.256 (95% CI = 0.965 - 1.634), times compared to uninsured households (P = 0.04). The study however did not find evidence that utilization among households with NCDs comorbidity was different for insured and uninsured households 1.230 (95% CI = 0.884 -1.712), P = 0.22.

The study did not find evidence that households with more than one member afflicted by NCDs had more hospital admissions 0.263 (95% CI 0.162 - 0.749) compared to households with only one member, P = 0.14). This finding was as a result of households with more than one member afflicted by NCDs being relatively small for the study to detect the effect of HI cover among insured.

The study did not find evidence that utilization among insured and uninsured households in the lowest income brackets was different, 0.776 (95% CI 0.637 - 0.946), P = 0.07. NCDs severity that demands inpatient care is often critical, forcing households to seek care regardless of HI status including borrowing funds or selling assets.

Table 4. Negative Binomial Regression Model Output for Inpatient Utilization.

Parameter Estimates

Parameter	B	Std. Error	95% Wald CI Lower	95% Wald CI Upper	Hypothesis Test Wald Chi-Square	df	Sig.	Exp(B)	95% Wald Confidence Interval for Exp(B) Lower	95% Wald Confidence Interval for Exp(B) Upper
(Intercept)	-0.530	0.216	-0.953	-0.108	6.048	1	0.01	0.588	0.385	.898
HH HI STATUS 1	0.228	0.134	-0.035	0.491	2.884	1	0.04	1.256	0.965	1.634
HH Comorbidity 1	0.207	0.169	-0.123	0.537	1.509	1	0.22	1.230	0.884	1.712
No. with NCDs 1	0.622	0.199	0.233	1.011	9.816	1	0.14	0.263	0.162	0.749
Low quintiles 1	-0.254	0.101	-0.451	-0.056	6.317	1	0.07	0.776	0.637	0.946
Baseline visits 1	0.419	0.101	0.220	0.617	17.135	1	0.09	1.520	1.247	1.853
Negative binomial)	4.98E 8[b]	.	.	.						

4. Discussion.

The study found evidence that households with HI cover utilized in-patient NCDs care more than those without cover. This finding is consistent with those reported by Liu and Zhao using fixed-effects model with instrumental variables [29] in China. Similarly, Erlangga and team in Indonesia [30] as well as Nguyen and colleagues in Vietnam [10] reported similar findings.

Households reported an increase in utilization of in-patient NCDs care across both groups during the study period. This could be linked to a general rise in demand for NCDs care across the country due to the changing epidemiologic trend [31].

The study however did not find evidence for the difference in inpatient utilization among comorbid households and those without comorbidity. Whereas utilization among insured households with comorbidity was expected to have gone higher due to a reduction in cost because NCDs comorbidity is expensive to manage, in this study, most households sought care at primary level facilities where specialized service for comorbid cases was inadequate. This finding could also be due to lack of awareness of the HI cover package entitlements by patients and hospital staff. Other studies have reported that inadequate awareness on the HI package entitlements among care givers and patients can lead to denial of available services hence reducing utilization among the insured [4& 16]. Studies have also reported that patients skip scheduled appointments due to a requirement by NHIF that

monthly premiums have to be paid one to two years upfront before authorization of some inpatient procedures. This precondition limits inpatient utilization of NCDs care [4].

5. Conclusion

National government should prioritize scaling up the NHIF HI program targeted at NCDs so as to enable the growing number of households with NCDs access and utilize available inpatient care. The scale up should focus on improving awareness of cover package entitlements by patients and hospital staff as well as removing payment preconditions for inpatient procedures. County government toensure health systems at primary level are well equipped to tackle inpatient NCDs care needs.

Consent

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

Ethical Approval:

Ethical approval was obtained from Moi University-Institutional Research and Ethics Committee (IREC) no 0003628. Approval to conduct research was obtained from JKUAT.

Abbreviations

AMPATH. Academic Model Providing Access to Healthcare.
HI. Health Insurance.
JKUAT. Jomo Kenyatta University of Agriculture and Technology.
LMICs. Low and Middle Income Countries.
NHIF. National Health Insurance Fund.
SDGs. Sustainable Development Goals.
UHC. Universal Health Coverage.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

REFFERENCES

1. WHO (2022). Non-communicable diseases key fact sheet. Geneva. WHO.
2. Ministry of Health (2021). National strategic Plan for the prevention and control of Non-Communicable diseases 2021/2022-2025/2026. Nairobi. *Afya House,Ministry of Health.*
3. Barasa E, Nguhiu P, McIntyre D (2018). Measuring progress towards sustainable development goal 3.8 on UHC in Kenya. *BMJ Global Health; 3(30.*
4. Oyando R, Were V, Willis R, Koros H, Kamano J, Naanyu V et al., (2023). Examining the responsiveness of the National Hospital Insurance Fund to people living with Hypertension and Diabetes in Kenya. A qualitative study.
5. Ministry of Health (2018). Kenya National Health Financing Domestic Resource Mobilization for Health: National Health Financing Dialogue for Implementation of the Health Sector Domestic Financing Sustainability Plan UHC Delivery for Kenya – Issue Paper. Nairobi.
6. Barasa E. Rogo K. Mwaura N. et al., Kenya national hospital insurance fund reforms: implications and lessons for universal health coverage. Health systems and reform;vol. 4:346-361.
7. KNBS and ICF. Kenya demographic and health survey 2022. Key indicators report: Nairobi, Kenya, and Rockville, Maryland, USA: KNBS and ICF. 2023.
8. Njuguna J. (2023). The effect of pilot universal health coverage program on hospital workload: A comparative study of 2 counties in Kenya. Dialoques in health 2 (2023).
9. Nolte E, Kamano J, Naanyu V, *et al*. (2022). Scaling up the primary health integrated care project for chronic conditions in Kenya: study protocol for an implementation research project. *BMJ. Doi: 10.1136/ bmjopen-2021-056261.*
10. Nguyen H, Tran Q, Khuong, T, Phan, V & Rohan J, (2020): Is Health Insurance Associated with Health Service Utilization and Economic Burden of Non-Communicable Diseases on Households in Vietnam? *Health Systems & Reform, 6:1.*
11. Ibanez-Gonzalez DL, Mendenhall E and Norris SA (2015). A mixed methods exploration of patterns of healthcare utilization of urban women with non-communicable disease in South Africa. *BMC Health Services Research.*
12. El-Sayed AM, Palma A, Freedman LP and Kruk ME (2015). Does health insurance mitigate inequities in non-communicable disease treatment? Evidence from 48 low and middle income countries. *Health Policy. 119(9):1164-1175.*
13. Ngwira A, (2021). The Wedge Between Need and Access to Healthcare: Does Health Insurance Improve Utilization for People With Non- Communicable Diseases? *Research Square. DOI: https://doi.org/10.21203/rs.3.rs-523487/v1*.
14. Kien V, Minh H, Ngoc N, Phuong T, Ngan T, & Quam M (2017). Inequalities in household catastrophic health expenditure and impoverishment associated with non-communicable diseases in Chi Linh, Hai Duong, Vietnam. Asia Pacific Journal of Public Health. Volume 29 (5):35–44.
15. Jehu-Applah C, Aryeetey G, Agyepong I, et al. household perceptions and their implications for enrolment in the national health insurance scheme in Ghana. Health Policy Plan 2012, (27)
16. Barasa EW, Mwaura N, Rogo K, et al., (2017). Extending voluntary health insurance to the informal sector: experiences and expectations of the informal sector in Kenya. Wellcome Open Res 2017; 2:94.
17. Ministry of Health (2014). Kenya Health Policy 2014–2030. Towards attaining the highest standard of health. Nairobi. *Ministry of Health.*
18. Mugo P, Onsomu E, Munga B, Nafula N, Mbithi J & Owino E (2018). An assessment of Healthcare Delivery in Kenya under the Devolved System. Kenya Institute for Public Policy Research and Analysis Special Paper No. 19. Nairobi.*Ministry of Health.*
19. County Government of Busia. County Integrated Development Plan 2018 – 2022 https://www.devolution. go.ke
20. White, H., & S. Sabarwal (2014). Quasi-experimental Design and Methods, methodological Briefs: impact Evaluation 8, UNICEF Office of Research, Florence.
21. Barnighausen T, Tugwell P, Rottingen J-A, Shemilt I, Rockers P, Geldsetzer P, Lavis J, et al. Qusi-experimental study designs series – Paper4: uses and value, Journal of Clinical Epidemiology (2017).
22. Ali, M.S., Groenwold R. H., Belister S. SV., Pestman W. R., Hoes A. W., Roes K. C., de Boer A., & Klungel O. H., 2015. Reporting of Covariate Selection Balance Assessment in Propensity Score Analysis Is Suboptimal: A Systematic review. Journal of Clinical Epidemiology 68 (2): 112-21.

23. Ho DE, Imai K, King G, et al. MatchIt: nonparametric preprocessing for parametric causal inference. Journal of statistical software 2011, 42:1-28.
24. Staffa, S & Zurakowski, D, (2018). Five Steps to Successfully Implement and Evaluate Propensity Score Matching in Clinical Research Studies. Anesthesiology-Analgesia 127(4):1066–73. Doi: 10.1213.
25. Zhang Z, Kim HJ, Lonjon G, et al. balance diagnostics after propensity score matching. Annals of Translational Medicine 2019; 7:16.
26. Zhao QY, Luo JC, Su Y, Zhang YJ, Tu GW, Luo Z. Propensity score matching with R: conventional methods and new features. Annals of Translational Medicine 2021; 9(9):812
27. Sullivan, L (2018). Essentials of Biostatistics in Public Health. 3rd edition, Jones & Bartlett Learning. Boston.
28. Sharma, K., Mudgal, K., Thakur, K, & Gaur, R (2020). How to calculate sample size for observational and experimental nursing research studies. National Journal of Physiology, Pharmacy & Pharmacology. *Vol. 10(01), 1-8.*
29. Liu, H. & Zhao, Z. (2014). Does health insurance matter? Evidence from China's urban resident basic medical insurance. Journal of Comparative Economics, vol. 42, no. 4, pp. 1007–1020.
30. Erlangga D, Suhrcke M, Ali S, Bloor K (2019). The impact of public health insurance on health care utilization, financial protection and health status in low- and middle-income countries: A systematic review. PLOS ONE 14(11):
31. Mwenda N, Nduati R, Kosgei M & Kerich G. (2021). What drives outpatient care costs in Kenya? An Analysis with Generalized Estimating Equations.

32 Giang NH, Oanh TT, Anh Tuan K, Hong Van P, Jayasuriya R. Is health insurance associated with health service utilization and economic burden of non-communicable diseases on households in Vietnam?. Health Systems & Reform. 2020 Dec 1;6(1):e1619065.

33 Engelgau MM, Karan A, Mahal A. The economic impact of non-communicable diseases on households in India. Globalization and health. 2012 Dec;8:1-0.