Uncovered Silent Killers: The Prevalence of Non-Communicable Diseases and Health Insurance Coverage in Uganda

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Abstract

In this paper, we investigate the extent of utilization and willingness to pay for health insurance in Uganda. Specifically, we examine the effect of Non-Communicable Diseases (NCDs) on both utilization and willingness to pay for health insurance. We apply a binary logistic model on the 2016/17 Uganda National Household Survey (UNHS) data, and the results indicate that, individuals living with NCDs like diabetes, high blood pressure, and heart diseases, are less likely to utilize health insurance compared to those without such diseases. We also find that, although Ugandans suffering from NCDs are willing to pay for health insurance, very few are holders of health insurance policies. More precisely, their willingness to pay does not translate into actual uptake. The results further reveal that awareness about health insurance and wealth, are very crucial factors in an individual's willingness to pay, as well as utilization of health insurance. Therefore, policies geared towards enhancing health insurance uptake will go a long way in ensuring protection against NCDs. Such policies have to mitigate both demand and supply hindrances to health insurance uptake. For instance, massive awareness programmes, poverty reduction and income enhancing programmes, as well as implementation of a national health insurance scheme.

Key words: Non-Communicable Diseases, Health Insurance, Logistic, Uganda

JEL Classification codes: I11, I12, I19

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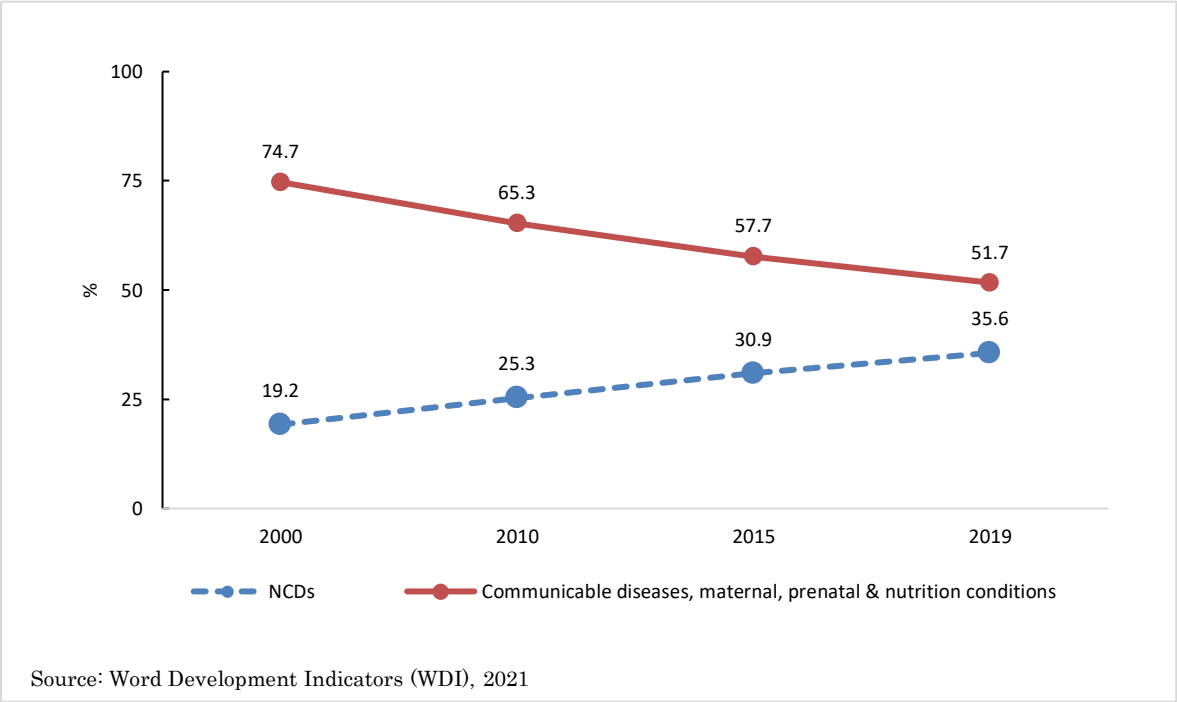
1 Introduction

Non-communicable diseases (NCDs)[1] are by far the leading cause of death in the world, representing 71 percent of all annual deaths. NCDs kill more than 41 million people each year and over 85 percent of all these deaths occur in low and middle-income countries. The four major NCDs (cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes) account for 80 percent of all premature deaths. People of all age groups, regions, and countries are affected by NCDs, with children, adults, and the elderly all vulnerable to the risk factors contributing to NCDs (WHO, 2018).

In Uganda, there is an upsurge in NCDs, as seen from total deaths caused by such diseases rising from 19.2 percent in 2000 to 35.6 percent in 2019. On the contrary, the number of deaths from communicable diseases, maternal, prenatal, and nutrition conditions to total deaths has been steadily reducing, that is from 74.7 percent in 2000 to 51.7 percent in 2019 (see Figure 1). This increase in NCDs does not only threaten poverty eradication initiatives in Uganda, but also the broader 2030 agenda of attaining the Sustainable Development Goals (Mpuuga *et al*., 2019).



Source: Word Development Indicators (WDI), 2021

Figure 1: Cause of disease related deaths in Uganda (2000-2019) [% of total]

Health insurance can consolidate the poverty gains since it reduces individuals' out of pocket expenditures on health (Ataguba and Goudge, 2012; Ibok, 2012; Kimani et al., 2012), which in turn increases their savings and thus promotes investment in an economy. The uninsured receive fewer preventive and diagnostic services, tend to be more severely ill when diagnosed, and receive less therapeutic care. Moreover, improving health status from fair or poor to very good or excellent

[1] A non-communicable disease is a noninfectious chronic health condition that cannot be spread from person to person. It always lasts for a long period of time. For example, cardiovascular disease, diabetes and cancer.

increases both work effort and annual earnings by approximately 15 percent to 20 percent (Hadley, 2003).

Despite the existence of a remarkably clear consensus about the importance of health insurance, only 5 percent of the Ugandans utilize health insurance as a mode of paying for medical care. Further still, only 11 percent of Ugandans are aware of health insurance as a mode of paying for medical care, and of these only 42 percent would consider joining any health insurance scheme (UBOS, 2018). A question is then posed, why is there low utilization and willingness to pay for health insurance and what does this imply for people living with NCDs?

It is in this regard that we examine the extent of actual utilization of health insurance as well as the willingness to pay for health insurance in Uganda. Specifically, we examine the effect of NCDs on utilization and willingness to pay for health insurance in Uganda. The paper proceeds as follows: Section 2 presents a synthesis of views about demand for health insurance from different scholars, while section 3 presents the methods and data sources adopted for this study and section 4 presents results, their explanation and discussion. We provide the conclusion and policy recommendations in section 5.

2 Related Literature

2.1 Theories of Demand for Health Insurance

Different theories have been put forward to explain why people opt or are always willing to opt for health insurance as a mode of paying for health insurance, although much emphasis was earlier put into understanding the demand for health. Studies such as Grossman (1972) mainly concentrate on explaining the demand for health as derived demand but do not delve into health insurance demand. Further still, Besley (1989) reviewed the economic theory of demand for health, health care, and health insurance with an aim of only investigating links between the three. It is worth to note that, many recent theories build on the conventional theory of health insurance as put forward by Newhouse (1978), which postulates that becoming insured acts like a reduction in the price of health care, just as if the price reduction had occurred exogenously in the market. According to this theory the mechanism by which insurance is financed can be ignored because the effect of premiums on the demand for medical care, and income effect is empirically negligible (Nyman, 2001).

The conventional theory further suggests that all of the additional health care that consumers purchase when insured is welfare decreasing because it is attributable to a price distortion. However, Nyman (2005) disagrees and postulates that a large portion of this additional consumption is attributable instead to an income effect that is transferred from those who purchase insurance and become ill. He believes that this income transfer effect is rather welfare increasing. Consequently, Nyman (2005) suggests that health insurance is purchased to obtain an income transfer when ill and with this additional income, consumers purchase more of medical care and other goods and services. He further argues that, the consumer purchases insurance when the expected utility gain generated by the income transfer when ill is greater than the expected utility lost from paying the premium when not ill.

Besides Nyman and the conventional health insurance theory, Zweifel (2007) presents a two-goods model of health insurance demand, with wealth in the no-loss state and wealth in the loss state

constituting the two goods. He applies a simpler alternative of the Von Neumann-Morgenstern (VNM) function and concludes that risk-averse individuals derive benefit at least on expectation from health insurance, provided the premium does not contain an excessive loading for administrative expense and profit, in other words so long as the premium is actuarially fair. To the extent that wealth is particularly important when ill, optimal coverage may even contain compensation for suffering, however, this result may not hold under the influence of moral hazard. Zweifel further argues that the marginal utility of wealth is higher in the healthy state than in the sick state for all values of wealth, implying that optimally wealth should be higher in the healthy state than in the sick state.

2.2 Empirical Literature

For a long time, non-communicable diseases (NCDs) were discussed as a burden of the developed world, however, recent statistics show a reverse trend and a dramatic increase of NCDs in the developing world. This is true for the main mortality triggering diseases such as cardiovascular diseases, cancer, and diabetes considering that almost 4 out of 5 NCD based death happens in low and middle-income countries (Wagner and Brath, 2012).

Like in many low and middle-income countries, the growing burden of NCDs in Uganda is part of an epidemiologic shift catalyzed by demographic and nutritional transitions. The growing urban population is tightly linked with the nutritional transitions as prepackaged food consumption is higher among urban dwellers than rural (Schwartz et al., 2014). Unfortunately, the majority of Ugandans exposed to the risk factors of NCDs are not aware. Guwatudde et al (2015) carried out an NCD risk factor survey and found out that only 7.7 percent of the participants with hypertension were aware of their high blood pressure, indicating a high burden of undiagnosed and uncontrolled high blood pressure. Hypertension is an important contributor to the global burden of disease and mortality, and is a growing public health problem in sub-Saharan Africa; however, most sub-Saharan African countries lack detailed countrywide data on hypertension and other non-communicable diseases risk factors that would provide benchmark information for the design of appropriate interventions.

Health insurance is widely seen as a solution to the ever-increasing out-of-pocket health expenditures incurred by households in Uganda and reliance on out-of-pocket payment for healthcare may lead poor households to undertake catastrophic health expenditure. Risk pooling mechanisms have been recommended to mitigate such burdens for households in Bangladesh (Ahmed et al., 2016). Ataguba and Goudge (2012) also recommend health insurance as an alternative to direct out of pocket (OOP) financing which aims at improving access to care and reduce OOP payments. They call for a need to design health insurance in the form that ensures not only adequate utilization of health services but also provision of financial protection to the insured. Furthermore, Orem and Zikusooka (2010) assessed the proposed National Health Insurance Scheme (NHIS) for Uganda, from an equity perspective, exploring the extent to which this NHIS would improve the existing disparities in the health sector; they argue that the NHIS is proposed mainly to obtain additional funding for the health sector and promoting financial risk protection. They further, highlight that gradual implementation of the NHIS will result in low coverage initially, which might pose a challenge for effective management of the scheme and they argue that it is not clear how the NHIS would fit into, and integrate within the existing financing mechanisms.

It is worth to note that, besides a handful of studies that have been conducted mainly on determinants of demand for health insurance such as Mpuuga et al. (2020) and Ssempala (2018), the general literature on health insurance and non-communicable diseases in Uganda is still scanty. There are also different methodological approaches applied by different studies, however, the probit and logit models are the most widely used, especially when the outcome variable is dichotomous (Cameron and Trivedi, 2005). The logit model is more preferred in health-related studies simply because of its comparative mathematical simplicity and the fact that it provides odds ratios which clearly show the magnitude. Other studies like Ataguba and Goudge (2012) use propensity score matching to investigate the impact of private insurance via membership of a medical scheme, whereas Cardon and Hendel (2001) apply a structural model of health insurance and health care choices on individual data from the National Medical Expenditure Survey (NMES). Ramesh and Nishant (2006) applied the Heckman two-stage estimation procedure, using both probit and ordinary least squares to analyze, first the factors which affect the insurance purchase decision. At the second level, they studied factors which affect the amount of insurance purchase in a micro health insurance scheme.

3 Methodology

3.1 Theoretical framework

To investigate actual utilization in contrast to willingness to pay for health insurance in Uganda, we adopted the expected utility theory as put forward by Zweifel (2007) in his two-goods model, with wealth in the no-loss state and wealth in the loss state constituting the two goods. In this model, a simpler alternative, based on the Von Neumann-Morgenstern (VNM) function was also adopted. There are two levels of wealth, W_L in the loss state and W_N in the no-loss state. The associated utilities are $U[W_L]$ and $U[W_N]$, where $U[W_L] < U[W_N]$.
The expected utility is given by;

$$EU = \pi\, U[W_L] + (1-\pi)\, U[W_N] \qquad (3.1)$$

Where,

$W_L = W_0 - L - P(I) + I$,

$W_N = W_0 - P(I)$, With π denoting the probability of loss $(0 < \pi < 1)$, P the premium, and I the amount paid by insurance in the event of a loss L, whereas W_0 is the initial wealth. The expected utility EU is associated with the expected value of wealth EW and there is a linear combination of utilities $U[W_L]$ and $U[W_N]$.

Considering a scenario where a high value and a low value of wealth may be realized with a certain probability. Given that the alternative providing certainty would be financially equivalent$(W = EW)$, a risk-averse decision-maker would opt for health insurance. This means that, $U[EW] > EU[W]$.

Introducing health status H in the risk-utility function. If the premium is actuarially fair,

$$P(I) = \pi I \quad (3.2)$$

Therefore, substituting equation (3.2) into (3.1) modified to comprise $U_h(W)$ for the healthy state and $U_s(W)$ for the sick state leads to equation (3.3).

Since $W_L = W_0 - L - \pi I + I$, and $W_N = W_0 - \pi I$, substituting both W_L and W_N into it EU results into;

$$EU = \pi U[W_0 - L + I(-\pi + 1)] + (1 - \pi) U[W_0 - \pi I].$$

Taking the first-order derivative of EU with respect to insurance coverage I, while following the chain rule results into;

$$\frac{dEU}{dI} = \pi U_s'[W_l](-\pi + 1) + (1 - \pi)U_h'[W_n](-\pi) = 0 \quad (3.3)$$

Dividing throughout by $\pi(1 - \pi)$ implies that,

$$U_s'[W_l] = U_h'[W_n] \quad (3.4)$$

Therefore, given an actuarially fair premium, the optimum for the potential buyer of health insurance is equality of the two marginal utilities of wealth. The theory of insurance demand predicts that risk-averse individuals derive benefit at least on expectation from health insurance, provided the premium does not contain an excessive loading for administrative expense and profit (Zweifel, 2007). Noteworthy, the two variables of wealth and health status (NCD[2]) as suggested in the theory by Zweifel (2007) were adopted for this study whereas age, gender, awareness about health insurance, residence, household size, education level, as well as marital status of the individual were adopted based on the empirical literature.

3.2 Estimation Procedure

The econometric model is specified as follows;

$$y_i = \beta' x_i + \varepsilon_i \quad (3.5)$$

Where, β is a vector of parameters to be estimated, y_i is the dependent variable which is 1 if the individual has health insurance and 0 otherwise. It is also 1 if the individual is willing to pay for health insurance and 0 otherwise.

With $\beta' = (\beta_0\ \beta_1 \dots\dots\dots\dots \beta_{12})$, and

$x_i' = (1\ NCD\ Age\ Age^2\ Gen\ Wea\ Res\ Hhs\ Mstatus\ Edn\ Awareness\ Region\ lnPrice)$[3]

[2] The NCD variable is a proxy for the health status of an individual.

[3] *Gen* stands for gender or sex of an individual, *Wea* stands for wealth of an individual, *Res* stands for residence, *Hhs* is the Household size, *Mstatus* is the Marital status, *Edn* is the education level, and *lnPrice* is the log of the health care expenditure by an individual.

Since the dependent variable is binary, the logit and probit models can be applied to run such a regression, however they give qualitatively similar results. It is therefore in this regard that the Hausman test was run first to choose whether to run the logit or the probit model. The Hausman test indicated that the logit model is consistent under both the null[4] and alternative hypotheses whereas the probit model is inconsistent under the alternative hypothesis but efficient under the null hypothesis. It is therefore in this regard that the logit model was adopted for this study. The linear probability model (LPM) could not be applied because it is always heteroskedastic, and its simplistic assumption of linearity, which cannot apply to a dichotomous variable. The fact that the predicted probabilities can lie outside the [0 1] interval makes the LPM inappropriate (Gujarati and Porter, 2009).

From the econometric model, $y_i = \beta' x_i + \varepsilon_i$

$$y = \begin{cases} 1 & if\ insured \\ 0 & if\ not\ insured \end{cases},$$

Let y_1 and y_0 be the net benefit or utility derived from being insured and not being insured respectively. Where,

$y_1 = \beta' x_1 + \varepsilon_1$ and $y_0 = \gamma' x_0 + \varepsilon_0$

We do not observe y_1 and y_0, but we do observe y where,

$y = 1$ if $y_1 > y_0$ and $y = 0$ if $y_1 \leq y_0$

In other words, if the utility gained from being insured is greater than the utility gained from not being insured, that is, $y_1 > y_0$ then $y = 1$. Likewise, $y = 0$ if utility gained from being insured is less or equal to that gained from not being insured, that is $y_1 \leq y_0$.

The probability of observing being insured is, therefore; $(y = 1) = F(\beta' x)$, because the expected value of y given x is just the probability. Where, $F(\beta' x) = \Lambda(\beta' x) = \frac{e^{\beta' x}}{1+e^{\beta' x}}$

3.2.1 Odds ratios

The odds ratio represents the constant effect of a predictor x; on the likelihood that one outcome will occur. The odds ratio is given by, $\frac{P(y=1)}{P(y=0)} = e^{\beta' x_i}$, and it gives the number of times an individual is likely to demand health insurance compared to not demanding (Cameron and Trivedi, 2005; Green, 2012; Johnston and Dinardo, 1996; Jones, 2005; Maddala, 1992; Wooldridge, 2016).

[4] The null hypothesis H_0 of the hausman test is that, the difference in coefficients is not systematic.

3.3 Data

We used secondary data from the Uganda National Household Survey (UNHS) 2016/17 which is the 6th in a series of consumption surveys conducted by the Uganda Bureau of Statistics (UBOS). The survey covered all the 112 districts of Uganda for a period of 12 months, which is from the end of June 2016 to June 2017 and a total of 17,450 households were scientifically selected countrywide. The survey collected information on a number of socioeconomic variables and the health insurance question was answered by persons aged 15 years and above. Health insurance information of dependants (especially children) is always provided by the household head or the main respondent in the household.

Table 1: Definition of variables

Variable	Definition	Coding	Variable type	Expected sign
Utilization (y_i)	Is the respondent covered by any health insurance?	1-Yes 0-No	Binary	Outcome variable
Willingness (y_i)	Would the respondent consider joining a health insurance scheme to pay for health care?	1-Yes 0-No	Binary	Outcome variable
NCD	Is the respondent suffering from any of the non-communicable diseases i.e. Diabetes, High blood pressure, and heart diseases?	0-No NCD **(Ref)** 1-Has NCD	Binary	+
Age	Age of the respondent in completed years	Continuous	Continuous	+
Age Squared	Age x Age of the respondent in completed years	Continuous	Continuous	-
Awareness	Whether the individual is aware of health insurance	0-Not aware **(Ref)** 1-Aware	Binary	+
Gender	Sex of the individual i.e. Male or Female	1-Male **(Ref)** 2-Female	Binary	+
Marital status	The marital status of the respondent	1-Married Monogamous **(Ref)** 2-Married polygamous 3-Divorced/separated 4-Widow/widower 5-Never married	Nominal	 - - - -
Education	Whether the respondent could read and write	1-Unable to read and write **(Ref)** 2-Able to read-only 3-Able to read and write	Nominal	 + +
Residence	Whether the respondent stays in a rural or urban area	0-Rural **(Ref)** 1-Urban	Binary	+
Household size	The number of members in a household	Continuous	Continuous	-
Wealth	The wealth status of the household	1-Poor **(Ref)** 2-Neither poor nor rich 3-Rich	Nominal	 + +
Region	The region where the respondent resides	1-Central **(Ref)** 2-Eastern 3-Northern 4-Western	Nominal	 - - -
Price (lnPrice)	Expenditure on medical care (opportunity cost of health insurance)	Continuous	Continuous	-

4 Results

Diagnostic tests were performed not only to correct for any possible anomalies in the data, but also to make sure that the right model and variables were adopted for the study. The variance inflation factor (VIF) as well as the pair wise correlation were used to detect the problem of multicollinearity (Gujarati and Porter, 2009). All the variables passed the test, except for Age and Age squared whose VIFs shot high above the threshold of 10, however this was expected since Age squared was generated from Age in order to investigate the possibility of a non-linear relationship between Age and the outcome variables. The average VIF is 5.394 and 5.378 for models 1 and 2 respectively (see TableB3, Appendix B). Age squared was normalized by dividing it by 100. The Price (total expenditure on health and medical care) which is the opportunity cost of health insurance was normalized by taking its logarithm (lnPrice).

Table 2: Summary of descriptive statistics

Variable	**Mean**	Sd	Min	Max	N
Utilisation	0.058	0.234	0	1	10360
Willingness	0.403	0.490	0	1	9759
NCD	0.050	0.219	0	1	10360
Awareness	0.403	0.490	0	1	10360
Age	31.09	14.19	6	102	10360
Agesq	1168	1161	36	10404	10360
Gender	1.446	0.497	1	2	10360
Marital status	2.906	1.870	1	5	10360
Education	2.812	0.573	1	3	10360
Residence	0.441	0.497	0	1	10338
Household size	5.395	2.721	1	20	10338
Wealth	0.580	0.589	0	2	10356
Region	2.517	1.264	1	4	10338
lnPrice	9.346	0.831	5.298	15.02	10309

The mean value of 0.058 for utilisation of health insurance compared to 0.403 for willingness to pay for health insurance confirms the fact that Ugandans are more willing to pay for health insurance than they actually utilize it. This can partly be attributed to the low awareness levels combined with the affordability constraints prevailing in the country (see table 2).

We carried out a hausman test in order to choose whether to regress a logit or a probit model. The results indicate that the logit model is consistent under both the null H_0 and alternative H_a hypotheses. The null hypothesis states that, the difference in coefficients of the logit and probit models is not systematic. On the other side, the probit model is inconsistent under the alternative hypothesis but efficient under the null hypothesis (see TableB1, Appendix B). Therefore, the hausman test favours the logit model over the probit model. It is in this regard that the regression results presented in table 3 and 4 as marginal effects and odds ratios respectively, are all logistic regressions. We further ran a link test to ascertain whether the models are properly specified and the results indicate that ***_hat***, is statistically significant in all the models, whereas and ***_hatsq***, is statistically insignificant in the respective models of utilisation and willingness to pay for health insurance (see TableB2, Appendix B). This is an indication that the models are well specified.

Two logit regressions were performed to generate marginal effects then two other regressions were run to generate odds ratios. All regressions were run on the estimation sample, not only to report consistent estimates but to also derive policy implications at a national level (Skinner and Mason, 2012). The weighted regressions resulted into a population size of 31,327,409 and 29,932,709 for models 1 and 2 respectively.

Table 3: Health Insurance and NCDs in Uganda (dy/dx)

VARIABLES	(1) Utilisation	(2) Willingness
NCD: No NCD **(Ref[5]=0)**		
Has NCD	-0.00319	0.0679**
	(0.00826)	(0.0293)
Awareness: Not Aware **(Ref=0)**		
Aware	0.0341***	0.276***
	(0.00402)	(0.0367)
Age:	0.00346***	-0.00119
	(0.000918)	(0.00283)
Agesq2:	-0.00400***	0.000824
	(0.00113)	(0.00314)
Gender: Male **(Ref=1)**		
Female	0.00238	0.0333
	(0.00403)	(0.0211)
Marital status: Married Monogamous **(Ref=1)**		
Married polygamous	-0.0106*	-0.0159
	(0.00558)	(0.0292)
Divorced/Separated	-0.0167	-0.0731*
	(0.0103)	(0.0434)
Widow/Widower	0.0119	0.00101
	(0.00921)	(0.0684)
Never Married	-0.00452	-0.0348
	(0.00607)	(0.0280)
Education: Unable to Read & Write (**Ref=1**)		
Able to read only	0.0248	0.276***
	(0.0160)	(0.0760)
Able to read & write	0.000701	0.121***
	(0.0108)	(0.0275)
Residence: Rural (**Ref=0)**		
Urban	0.0159***	-0.0694***
	(0.00419)	(0.0207)
Household size:	-0.00103*	-0.00786*
	(0.000601)	(0.00412)
Wealth: Poor **(Ref=0)**		
Neither poor nor rich	0.0120***	0.0969***
	(0.00368)	(0.0225)
Rich	0.0283***	0.0514
	(0.00591)	(0.0395)
Region: Central **(Ref=1)**		
Eastern	-0.00539	0.0365
	(0.00490)	(0.0404)
Northern	0.00506	-0.211***
	(0.00680)	(0.0351)
Western	0.000462	-0.0923***
	(0.00466)	(0.0245)
lnPrice:	-0.00373	-0.00806
	(0.00293)	(0.0107)
Observations	10,262	9,668

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: *Authors (2020) using STATA 15.0, ***, **, * indicate significance levels at 1%, 5% and 10% respectively.*

[5] **Ref** stands for the reference category or the base category of a categorical variable.

The results in table 3 indicate that having a non-communicable disease is negatively associated with an individual's utilization of health insurance but positively related to an individual's willingness to pay for health insurance. This implies that individuals with such diseases are more willing to pay for health insurance. The NCD variable is not statistically significant under the utilization model. The probability of willingness to pay for health insurance increases by 0.0679 for an individual with a non-communicable disease compared to one who does not have a non-communicable disease.

Furthermore, awareness has a significant impact on both an individual's utilization and willingness to pay for health insurance. From table 3, individuals who are aware of health insurance are more likely to utilize health insurance and are at the same time more willing to pay for health insurance if compared to those who are not aware. Their probability to utilize health insurance increases by 0.0341 in contrast to those that are not aware. This is because awareness through different sources of information like advertisements, seminars, and various advocacies about health insurance, increases individuals' demand for health insurance. Similarly, awareness has a very significant and positive impact on an individual's willingness to pay for health insurance with the probability increasing by 0.276.

Table 4: Health Insurance and NCDs in Uganda (Odds Ratios)

VARIABLES	(1) Utilisation	(2) Willingness
NCD: No NCD **(Ref=0)**		
Has NCD	0.886	1.335**[6]
	(0.278)	(0.165)
Awareness: Not Aware **(Ref=0)**		
Aware	3.640***	3.243***
	(0.503)	(0.506)
Age:	1.140***	0.995
	(0.0431)	(0.0120)
Agesq2:	0.859***	1.004
	(0.0405)	(0.0134)
Gender: Male **(Ref=1)**		
Female	1.094	1.152
	(0.166)	(0.103)
Marital status: Married Monogamous **(Ref=1)**		
Married polygamous	0.670*	0.935
	(0.139)	(0.116)
Divorced/Separated	0.532*	0.733*
	(0.196)	(0.135)
Widow/Widower	1.571	1.004
	(0.533)	(0.292)
Never Married	0.843	0.862
	(0.193)	(0.103)
Education: Unable to Read & Write (**Ref=1**)		
Able to read-only	2.558	3.233***
	(1.480)	(1.048)
Able to read & write	1.027	1.676***
	(0.421)	(0.196)
Residence: Rural (**Ref=0)**		
Urban	1.826***	0.744***
	(0.290)	(0.0645)
Household size:	0.962	0.967*
	(0.0229)	(0.0171)
Wealth: Poor **(Ref=0)**		
Neither poor nor rich	1.573***	1.511***
	(0.222)	(0.143)
Rich	2.922***	1.244
	(0.710)	(0.209)
Region: Central **(Ref=1)**		
Eastern	0.815	1.168
	(0.145)	(0.201)
Northern	1.211	0.407***
	(0.312)	(0.0600)
Western	1.018	0.675***
	(0.179)	(0.0696)
lnPrice:	0.868	0.966
	(0.0938)	(0.0439)
Constant	0.00584***	0.602
	(0.00731)	(0.310)
Observations	10,262	9,668

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: *Authors (2020) using STATA 15.0, ***, **, * indicate significance levels at 1%, 5% and 10% respectively*.

[6] Since the odds ratio of 1.335 is greater than 1, it signifies a positive relationship and thus it can as well be interpreted in terms of percentage; if 1.335-1=0.335, then 0.335x100=33.5% more willingness to pay for health insurance for an individual with an NCD in contrast to one without an NCD.

Just like marginal effects, the odds ratios presented in table 4 are in tandem with the fact that having a non-communicable disease is negatively associated with an individual's utilization of health insurance but positively related to an individual's willingness to pay for health insurance. The odds ratio of 1.335 in model (2) implies that individuals with non-communicable diseases are 33.5 percent more willing to pay for health insurance compared to those without non-communicable diseases. It should be noted that having a non-communicable disease has no significant impact on the utilization of health insurance. This is mainly due to the fact that, most insurance companies rarely cover for such diseases even when individuals may be willing to pay for their coverage and the fact that such diseases require very huge premiums for an individual to be covered. This is so, because of the high costs of treatment due to long treatment spells with the possibility of treatment till death – most of such diseases have no cure yet.

In addition, awareness has a significant impact on both the individual's utilization and willingness to pay for health insurance. From table 4, individuals who are aware of health insurance as a mode of paying for medical care are 264 percent more likely to utilize health insurance if compared to those who are not aware of health insurance. Moreover, individuals who are aware of health insurance as a mode of paying for medical care are 224.3 percent more willing to pay for health insurance if compared to those who are not aware.

The results of age and age squared further reveal that, as individuals grow, they tend to utilize more health insurance, however, as they approach their death which is in most cases after retirement, they tend to utilize less health insurance. This can partly be attributed to the fact that while still under employment, many job benefits may come with health insurance and the income from employment enables individuals to purchase health insurance, but such benefits and income dwindle after retirement and as the individual becomes much older the income flow drastically reduces. This is exacerbated by the fact that many insurance companies tend to shy away from insuring very old people due to the high risk associated. Furthermore, Individuals from urban areas tend to utilize more of health insurance compared to their rural counterparts. The results in table 4 confirm that rich individuals and those who are neither rich nor poor (middle class) tend to utilize health insurance more if compared to poor individuals.

The findings further indicate that individuals who are in polygamous marriages are less likely to utilize health insurance compared to individuals who are married monogamously. The divorced or separated individuals are also less likely to utilize health insurance if compared to those in monogamous marriages, whereas the divorced are less willing to pay for health insurance if compared to those who are married monogamously. In addition, being able to at least read implies more willingness to pay for health insurance compared to any person who cannot read. The results also indicate that; urban dwellers are more likely to utilize health insurance. Regional differences are evident because persons from the northern and western regions of Uganda are less willing to pay for health insurance compared to those from the central region of Uganda. Finally, individuals from large households are less willing to pay for health insurance.

4.1 Discussion of Results

The study findings indicate that individuals suffering from non-communicable diseases are more willing to pay for health insurance compared to those who are not suffering from any non-communicable disease, however, very few of the same individuals utilize health insurance,

implying that their willingness to pay does not translate into actual utilization[7]. This is partly because, in the absence of a national health insurance scheme, most private insurance companies shy away from insuring people with non-communicable diseases and instead find it easy to insure individuals against easily manageable diseases. The fact that such diseases are costly to treat and tend to be associated with high insurance premiums exacerbates the affordability constraints which also explains the low utilization compared to willingness to pay. This result confirms that utilization of health insurance is beyond being risk-averse which Zweifel (2007) postulates. It is rather very crucial to also consider the affordability of health insurance by individuals.

We further confirm that most Ugandans are not aware of health insurance as a mode of paying for medical care yet it is a very crucial factor in explaining utilization and willingness to pay for health insurance. Ssempala (2018), Mathauer et al. (2008) argue that access to information positively influences individuals' demand for health insurance. Furthermore, an individual's gender/sex does not in any way influence their utilization and willingness to pay for health insurance in Uganda[8], whereas their age has a significant but non-linear relationship with utilization of health insurance. Salari et al. (2019) conclude that an individual's age is positively associated with their enrollment into health insurance, whereas Ramesh and Nishant (2006) confirm the existence of a significant but non-linear relationship between age and health insurance purchase. The finding on the marital status of an individual implies that individuals from monogamous marriages generally find it easier to utilize health insurance in contrast to those in polygamous marriages and this is partly explained by the economic hardships that are characteristic of polygamous marriages due to huge family sizes. Dror et al. (2016), Owusu-Sekyere and Chiaraah (2014) and Salari et al. (2019) all agree that one's marital status is a very crucial factor in determining their enrollment into any health insurance scheme. Further still, being able to at least read, leads to more willingness to pay for health insurance on the side of an individual compared to any person who cannot read. In this regard, Ahmed et al. (2016), and Aregbeshola, and Khan (2018) present similar results about the education level of an individual.

Urban dwellers are more likely to utilize health insurance compared to their rural counterparts and this is mainly attributed to factors like exposure to information, and the fact that urban dwellers are more likely to be more educated and hence earn more income compared to rural dwellers. Generally, access to information about health insurance is easier in urban areas in contrast to rural areas. This is also translated in regional differences whereby persons from the northern and western regions of Uganda are less willing to pay for health insurance compared to those from the central region which is more urbanized. Even though both the northern and western regions exhibit less willingness to pay for health insurance, further differences amongst the two regions are witnessed with individuals staying in the northern region more unwilling to pay for health insurance compared to those from the western region, if these two regions are compared to their counterparts from the central region. This is commensurate with the poverty levels which are relatively low in both the central and west but high in the north and east. In addition, individuals who are neither poor nor rich (middle class) and the rich are more likely to utilize health insurance compared to poor individuals. Jutting (2003) argues that an individual's income or wealth is a major influencer of an individual's utilization of health insurance and a study by Adebayo et al. (2015) concludes that low levels of income and lack of financial resources are major factors affecting enrollment

[7] The *NCD* variable is not significant under the utilisation model but highly significant in the willingness model.

[8] The variable *Gender* was not significant in all the regressions.

into health insurance schemes. Finally, the results indicate that individuals from bigger households are less willing to pay for health insurance and this is partly attributed to increased expenditures on other basic needs like food, which is associated with a big household size hence reducing the amount available to cater for health and health insurance in this regard.

5 Conclusion

This study contributes to the body of knowledge that argues for increased uptake of health insurance in Uganda and sub-Saharan Africa in general, with special emphasis on NCDs which have since surged. According to the study findings, policies geared towards enhancing health insurance uptake should take into consideration both demand and supply hindrances. Noteworthy, Uganda has no national health insurance scheme, which is likely to undermine all the efforts geared towards the attainment of the third Sustainable Development Goal (SDG 3), that aims at ensuring healthy lives and promoting the well-being for all at all ages. It is in this regard that we recommend for implementation of a national health insurance scheme, while fully incorporating NCDs in the framework of the scheme, so as to fully realize the benefits of insuring the most vulnerable groups. In addition, massive awareness programmes need to be undertaken to promote enrollment into health insurance schemes. We also recommend more emphasis to be put towards poverty reduction and income enhancing programmes in a bid to boost the affordability of health insurance among individuals. Furthermore, preventive measures need to be emphasized as well, and these can include regular body exercises and monitored nutrition among others, so as to supplement the aforementioned recommendations. Noteworthy, NCD management interventions are very essential in Uganda's context, for example, detecting, screening, and treating these diseases early enough, can go a long way in reducing the need for the more expensive treatment at later stages of such diseases.

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Appendices

Appendix A

Probit Estimates: Table A; Health Insurance and NCDs in Uganda

VARIABLES	(1) Utilisation	(2) Willingness
NCD: No NCD **(Ref=0)**		
Has NCD	-0.00198	0.0671**
	(0.00980)	(0.0289)
Awareness: Not Aware **(Ref=0)**		
Aware	0.0396***	0.276***
	(0.00417)	(0.0358)
Age:	0.00372***	-0.00103
	(0.000978)	(0.00276)
Agesq2:	-0.00431***	0.000687
	(0.00117)	(0.00307)
Gender: Male **(Ref=1)**		
Female	0.00309	0.0332
	(0.00472)	(0.0204)
Marital status: Married Monogamous **(Ref=1)**		
Married polygamous	-0.0144**	-0.0147
	(0.00636)	(0.0286)
Divorced/Separated	-0.0213*	-0.0719*
	(0.0113)	(0.0427)
Widow/Widower	0.0161	2.11e-05
	(0.0109)	(0.0659)
Never Married	-0.00440	-0.0329
	(0.00689)	(0.0274)
Education: Unable to Read & Write (**Ref=1**)		
Able to read only	0.0285	0.269***
	(0.0185)	(0.0745)
Able to read & write	0.000378	0.118***
	(0.0116)	(0.0264)
Residence: Rural (**Ref=0)**		
Urban	0.0185***	-0.0680***
	(0.00482)	(0.0199)
Household size:	-0.00129*	-0.00783*
	(0.000695)	(0.00401)
Wealth: Poor **(Ref=0)**		
Neither poor nor rich	0.0139***	0.0959***
	(0.00405)	(0.0216)
Rich	0.0337***	0.0517
	(0.00752)	(0.0390)
Region: Central **(Ref=1)**		
Eastern	-0.00716	0.0378
	(0.00598)	(0.0404)
Northern	0.00697	-0.211***
	(0.00781)	(0.0332)
Western	0.00160	-0.0924***
	(0.00553)	(0.0238)
lnPrice:	-0.00515	-0.00786
	(0.00332)	(0.0105)
Observations	10,262	9,668

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: *Authors (2020) using STATA 15.0, ***, **, * indicate significance levels at 1%, 5% and 10% respectively*.

Appendix B

Table B1: The Hausman Test

Outcome Variable	Logit	Probit	Chi2(12)	Prob>Chi2
Utilisation (1)	Consistent under H_0 and H_a	Inconsistent under H_a but efficient under H_0	140.66	0.0000
Willingness (2)	Consistent under H_0 and H_a	Inconsistent under H_a but efficient under H_0	325.20	0.0000

Table B2: The Link Test

Utilisation (1)

(Running logit on estimation sample)
Survey: Logistic regression

Number of strata = 15 Number of obs = 10,262
Number of PSUs = 188 Population size = 31,327,409
Design df = 173
F(2, 172) = 138.53
Prob > F = 0.0000

Utilisation	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
			Linearized			
_hat	0.643	0.230	2.796	**0.028**	-0.187	1.473
_hatsq	-0.063	0.068	-0.940	**0.350**	-0.197	0.070
_cons	-0.441	0.575	-0.770	0.444	-1.575	0.693

Willingness (2)

(Running logit on estimation sample)
Survey: Logistic regression

Number of strata = 15 Number of obs = 9,668
Number of PSUs = 188 Population size = 29,932,709
Design df = 173
F(2, 172) = 138.70
Prob > F = 0.0000

Willingness	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
			Linearized			
_hat	0.825	0.091	9.080	**0.000**	0.646	1.004
_hatsq	-0.314	0.304	-1.032	**0.159**	-0.438	-0.189
_cons	0.152	0.062	2.440	0.016	0.029	0.274

Table B3: Variance Inflation Factor (VIF)

	Utilisation (1)	
Variable	**VIF**	**1/VIF**
Age	28.388	.035
Agesq2	24.512	.041
Mstatus	1.900	.526
Awareness	1.208	.827
Residence	1.155	.866
Education	1.131	.884
NCD	1.117	.895
Region	1.095	.913
Wealth	1.072	.933
Hhsize	1.072	.933
lnPrice	1.038	.963
Gender	1.037	.965
Mean VIF	5.394	

	Willingness (2)	
Variable	**VIF**	**1/VIF**
Age	28.324	.035
Agesq2	24.399	.041
Mstatus	1.921	.521
Awareness	1.192	.839
Residence	1.144	.874
Education	1.131	.884
NCD	1.118	.895
Region	1.094	.914
Hhsize	1.067	.937
Wealth	1.066	.938
lnPrice	1.041	.961
Gender	1.037	.965
Mean VIF	5.378	