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Send correspondence to:
Mohammed Elhaj Mustafa Ali
University of Kassala
mohdaj1976@gmail.com

[1] The views expressed here are those of the authors and do not necessarily represent those of the NHIF.

[2]Assistant Professor of Economics, University of Kassala, Sudan, Email: mohdaj1976@gmail.com
[3]Assistant Professor of Economics, University of Khartoum, Sudan,Email: ebaidallamahjoub@yahoo.com

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Abstract

This study investigates the factors that influence the participation of the informal workers in health insurance program in two Sudanese states, namely, Kassala and Khartoum. To this end, the study relies on primary data collected from 742 informal workers in these two states. Both qualitative and quantitative techniques have been adopted to carry out the intended investigation. The analysis indicates that factors such as respondent' age, wealth status, chronic disease status, morbidity, health insurance awareness, health-seeking behavior and proximity to health care facilities are the most significant factors affecting informal workers' engagement in health insurance system. The result also reveals that being residing in urban areas lowers the probability of joining health insurance membership in the full, Kassala and Khartoum samples. Both monetary income and average years of schooling are found to contribute positively in raising the likelihood of voluntary enrollment in health insurance. These findings still hold under different robustness checks, confirming the existence of barriers that prevent a huge portion of the informal workers from voluntary enrollment in health insurance. Finally, the paper ends with some recommendations aimed at enhancing the role of NHIF in accommodating the informal workers and achieving universal health coverage.

Keywords: Kassala, health, informal workers, insurance, enrollment

JEL Classifications: E21, H51, I13

1. Background

It has been widely acknowledged that informal jobs capture the lion share from total employment in most of the developing countries. Over the globe, informal workers represent around two-third of the total labor force (World Bank, 2009). In some regions, however, this proportion exceeds the global average. In Sub-Saharan Africa, for instance, informal workers occupy between 50 to 70% of total employment (Haan, 2006). This heavy reliance on informal sector as a key source for employment opportunities leads to several negative consequences on workers particularly with respect to health matters. In the contexts of developing labor markets, informal workers perform works under uncomfortable conditions. They expose to harmful injuries, disabilities, high morbidity rates and have less access to health care facilities. What make things worse is fact that a huge segment of the informal workers remains out of health insurance coverage and, consequently, incur back-breaking catastrophic out of pocket (OOP) health expenditures (Vogel, 1990 and Markowitz et al., 1991; Kimani et al., 2012). Such unbudgeted health expenditures cut workers' expenses on other day-to-day necessities such as food, clothes, education and hygienic inputs (Gertler and Gruber, 2002, Van Doorslaer et al., 2006 and Ebaidalla and Mustafa, 2017). Diverting a large portion of the budget to cover health spending would certainly deteriorate worker' livelihood and worsen his/ her poverty status. From health perspectives, the crowding-out between necessities and health spending in the household's budget is likely to lower healthcare utilization and reduce the quality of health care services.

Currently, and due to the emergence of worldwide attention about the issue of informality, there is a growing concern towards the actions that can be instigated to accommodate informal workers in health insurance programs. The available stylized facts indicate that the rate of enrollment in health insurance among those workers is extremely low compared to those who employed formally (Cutler and Zeckhauser, 2000 and Hatt et al., 2009). The literature consistently cites that the failure to integrate informal workers into health insurance coverage can be attributed to many reasons. First, the dominance of low and non-regular income makes the collection of compulsory insurance premium from informally employed workers very challenging (Abel-Smith, 1992; Wagstaff et al., 2009; Collins et al., 2009; Wagstaff et al., 2014 and Holtz and Phily, 2014). Second, it has been argued that the insurers may tend to avoid insuring this category of workers since their insurance cost is anticipated to be very high compared to organized labor. Third, the high premium payments may also obstruct the enrollment of informal workers in health insurance schemes (Abel-Smith, 1992; Barnighausen et al., 2007; Mathauer et al., 2008 and Thornton et al., 2010). Fourth, joining health insurance might be influenced by workers' knowledge, health literacy, and prior perception towards health matters (Blumberg and Nichols, 2004). Fifth, the informal workers are more likely to be reluctant in paying health insurance premium for services that they might not use in the nearer future (Brown and Churchill, 2000 and Kimani et al., 2012). Sixth, informal workers are unorganized, underrepresented and don't possess the bargaining power to demand social protection (Ahmad, 1991). These obstacles work collectively to lower informal workers'

enrollment in health insurance giving birth to countless harmful consequences on the wellbeing of societies. Therefore, achieving health insurance coverage for this group of workers represents one of the challenging tasks that need to be addressed by both researchers and policymakers.

In 1995 Sudan has introduced its health insurance scheme as a response to the failure of user fees system which had been adopted in the early 1990s. In 2003, the country took its first step towards realizing universal health insurance coverage when National Corporation for Health Insurance had transformed into National Health Insurance Fund (NHIF) and the enrollment become open for all population. In subsequent years, this scheme has witnessed considerable attention from the government which aims to improve utilization and accessibility to health care as well as achieving universal health coverage by 2020. Although this newly-introduced system realized some outstanding degrees of penetration among population, however, the ranges of coverage remain relatively low. The recent statistics show that only 55.8% of the total population in Sudan is covered by health insurance (NHIF, 2017). Unfortunately, of those insured, only 22.5% were from informal sector (Herberholz and Fakihammed, 2017). This sluggish progress in expanding health insurance coverage generates many negative consequences on population including the exposure to high health spending, low accessibility to health care services and living with illnesses for a long period of time. This prevalence of situation is likely to lead to bad performance in health outcomes and widens gaps between poor and well-off population. The problem, however, becomes more shocking if informally employed workers are considered. Keeping those workers uninsured would deepen the problem of poverty in the country and disturb the nation's steps towards achieving the desired levels of economic development. At the current stage, many charitable and official institutions such as the Chamber of Zakat, Federal Ministry of Finance and others pay health insurance premiums on behalf of a considerable proportion of informal workers. However, the limited resources make these institutions unable to expand/ or at least continue to offer health insurance premiums for this vulnerable group.

After this background, the rest of this study is structured as follows. Sections 2, 3, 4, 5 and 6 are, respectively, problem statement, study justifications, study contribution, study questions and study objectives. Section 7 assesses and reviews the relevant literature. Drawing on that literature, Section 8 develops the methods to be used in the intended analysis and introduces issues pertains to data used. Section 9 declares the ethical considerations that govern the execution of the study. Sections 10 and 11, respectively, present the empirical results of the quantitative and qualitative analysis. Section 12 concludes the study and offers some policy implications.

2. Research Problem

Like the case of other developing countries, a large portion of Sudanese workers is employed in the informal sector. The statistics reveal that informal labor market occupies around 60% of the total employment in Sudan (African Economic Outlook, 2012). Narrowing down, in some states

such as Kassala and Khartoum the informal workers capture the lion share in the labor market. This dominance of informality necessitates the expansion of health insurance coverage to cover this vulnerable category. It is worth mentioning that the admission to health insurance services in Sudan became open to all population based on a unified subscription ratio of 4% for employees and workers with regular salaries and flat rate premium according to actuarial estimates for those with irregular incomes. However, despite the expansion in health insurance, maintaining universal coverage for all population, particularly informal workers remain an unattainable target. The recent statistics show that only 55.8% of the total population in Sudan was included in health insurance schemes in (NHIF, 2017). Unfortunately, of those who get insured, only 22.50% were from informal sector. Accordingly, the question may arise here is that what are the factors that affect the enrollment of informal workers in health insurance coverage.

Against this backdrop, this study aims at understanding the factors that influence the voluntary participation of the informal workers into health insurance system.

3. Study Justifications

Many reasons have motivated us to choose the population of this study from Khartoum and Kassala States. First, the chosen states accommodate a large share of the population in Sudan. The reported statistics indicate that the population of Khartoum and Kassala States represents, respectively, about 20 and 7 percentages of the country's total population. Thus, the sample undertaken reflects the realities of labor market in Sudan, particularly the part related to health insurance status of informally employed workers. In the end, the sample with such characteristics would lead to accurate results and, hence, help policymakers coin appropriate policy actions to enroll this category of workers in health insurance programs. Second, Khartoum and Kassala States host a considerable portion of labor force in the informal sectors (CBS, 2009). Thus, these two states represent a good choice to explore the reasons obstructing the diffusion of health insurance enrollment among informally employed workers. Specifically, Khartoum represents the hub of economic activities in Sudan and hosts a large portion of labor force of which informal labor occupies a considerable share. By the same token, Kassala State, although not economically developed like Khartoum, but it has a big informal sector. This has been the case because the economy of the state is dominated by farming and trading with neighboring countries. The dominance of these activities triggers the growth of informal employment among labor and, therefore, affects healthiness and livelihood of the population.

Accordingly, having chosen these two states as a case study may come out with suggestions to accommodate this category of workers in health insurance networks. Third, the scholars have frequently claimed that the economic development is always biased towards the region hosting the presidential city and against the regions locating in the peripheries (Todaro, 2010). Studying the reasons behind the failure to accommodate informal workers in health insurance in these two states, which differ in the level of development and geographical location, allows us to bring the two edges of economic development spectrum in Sudan together. This would definitely help to

anatomize the phenomena of having a large number of uninsured informal workers effectively and, at the same time, raises the generalizability of the findings obtained to the whole country.

4. Study Contribution

This study has many advantages. First, this study is the first of its type in Sudan. According to the authors' knowledge, no study has been conducted to explore the factors affecting health insurance enrollment among informal workers. The evidence to be brought by this study, would sketch the roadmap for policymakers to make informative interventions to bring informal workers under health insurance shelter.

Second, the study possesses significant policy relevance with respect to Sudanese case. It informs policymakers about the appropriate policy measures that can be enacted to achieve universal health insurance coverage in the few coming years. As mentioned previously, enrollment in health insurance program became open to all population since 2003. However, passing legislative and regulative frameworks to expand health insurance coverage for all population is not enough to accelerate the process of enrollment. Along with these legislations, a package of practical actions needs to be initiated. However, these actions will be functionless unless they based on informative results the matter that cannot be achieved without conducting a concrete empirical analysis.

Third, according to 2009's Sudanese Baseline Households Survey, 46.5% of the total population in Sudan lives in poverty status. Definitely, informal workers represent a large portion of those who had been classified as poor. Thus, expanding health insurance umbrella to include this disadvantaged group would cut back the poverty rates and reduces the social costs associated with lacking health insurance. As acknowledged by Ebaidalla and Mustafa (2017), health spending contributes significantly in pushing a large portion of the Sudanese population under poverty line. Accordingly, by investigating the determining factors of health insurance enrollment among informally employed workers, this study would possibly contribute to lighten the burdens of OOP health expenditures being shouldered by poor workers.

Fourth, the study helps explain the factors that inhibit the voluntary enrollment of informal workers' in health insurance in Khartoum and Kassala States in which informality is widely spread. Correspondingly, the evidence will be brought by this study offers important lessons from which the rest of the states may learn a lot.

5. Study Questions

This study seeks to address the following questions:

1. What are the factors that determine informal workers enrollment in the health insurance scheme in Khartoum and Kassala States?
2. Do the determinants of informal workers' enrollment in health insurance diverge in each of the two states under examination?

3. Do the determinants of informal workers' enrollment in health insurance vary across regions?

6. Study Objectives

The main objective of this study is to understand the factors that influence the participation of informal workers in health insurance. The specific objectives of the study can be outlined as follows:

1. Understanding health insurance status of informally employed workers.
2. Identifying the factors that push informal workers to participate/not participate in health insurance.
3. Examining to what extent participation in health insurance varies across the two states under study.

7. Literature Review

There has been a growing body of studies on the determinants of health insurance participation among workers. In these studies, a large number of variables have been set forth to explain the propensity of workers to enroll or not to enroll in health insurance system. In general, most of these studies have reported that the participation in health insurance coverage can be mostly decided by different combinations of factors including levels of education, age, type of employment, health status, income and gender (Taylor and Wilensky, 1983; Swartz et al., 1993 Marquis and Long, 1995; Asenso-Okyere et al., 1997; Liu and Christianson, 1998; Banighausen et al., 2007; Banighausen et al., 2007 and Acharya et. al, 2012). However, one may argue that the sensitivity of taking up health insurance to these factors may differ according to whether the workers are formally or informally employed. Having formal jobs, for instance, enables workers to pay insurance subscription fees raising the probability to be insured. Thus, compared to informally employed workers, the enrollment of formally employed workers is expected to be less sensitive to factors such as income and premium contribution. On the contrary, the socio-economic, demographic and health characteristics are expected to play a critical role in deciding health insurance status for this type of labor. This conclusion has been supported by a considerable number of studies (Asenso-Okyere et al., 1997; Banighausen et al., 2007 and Onwujekwe et al., 2010). For example, Banighausen et al. (2007) examined the determinants of willingness to pay for social health insurance among informal workers in Wuhan city in China.

Using the contingent valuation method to assess the maximum willingness to pay for basic health insurance among informal workers in the city, those scholars found that the willingness to pay for insurance premium has increased significantly with increases in income and higher past health care expenditures. In contrast, the premium contribution, being male, a migrant and not holding permanent job decreases the willingness to pay for health insurance. Surprisingly, this study indicated that the level of education did not correlate with health insurance membership.

Asenso-Okyere et al. (1997) used an ordered probit model framework to explore the willingness of informal households to join and pay premiums for a proposed national health insurance scheme in Ghana. Their findings demonstrated that the level of premiums that households were willing to pay was significantly influenced by the dependency ratio, income, sex, health care expenditures and education. Closely related to this strand of studies, some evidence reveals that the probability of health insurance subscription increases as the willingness and ability to pay rises. For instance, Onwujekwe et al. (2010) examined the influence of geographic differences on respondents' willingness to join health insurance programs in two Nigerian states, namely, Anambra and Enugu States. Their findings confirmed that the willingness and ability to pay for health insurance was higher among urbanites compared with peri-urban and rural dwellers.

Some researchers incorporate the familiarity with health insurance and institutional factors like subscribers' knowledge and the quality of bureaucratic procedures in deciding workers' health insurance status. A study by Mathauer et al. (2008), for instance, found that lacking knowledge and inability to pay represented one of the critical factors to obstruct Kenyan informal workers' engagement in health insurance. Using experimental evaluation of a voluntary health insurance program, Thornton et al. (2010) showed that health insurance signing up among Nicaraguan informal workers was negatively correlated with the premium costs and streamlined bureaucratic procedures. The same conclusion has been obtained by Mnally (2013) who indicated that factors such as enhancing affordability, accessibility and quality of health services make health insurance more acceptable the among informal workers in Tanzania. However, the author concluded that sex, income and number of dependents were not good predictors for workers' willingness to join health insurance.

Other studies have considered the role that could be played by employment status in explaining the likelihood of being insured among informally employed workers. For example, Kimani et al. (2012) attempted to investigate the determinants of engagement in public health insurance program in Kenya by employing a sample of 23,000 households surveyed by Urban Health and Demographic Surveillance System in two slums in Nairobi city. The researchers found that respondents working informally were more unlikely to be enrolled in the national health insurance scheme compared to those who work formally.

Summing up, although aforementioned studies have provided valuable insights about the factors determining the demand for health insurance among informal workers, the presented evidence, however, is inadequate for the Sudanese case for a number of reasons. For instance, due to its distinctive labor market, which is dominated by a huge number of informal workers, Sudan represents a unique case for investigating the interactions between informality and enrollment in health insurance. In other words, the features of Sudanese society differ from the socio-economic contexts in which these studies have been conducted. No doubt, this fact makes the evidence brought by these studies on the factors motivating informal workers to uptake health insurance is

not applicable to Sudanese case. For instance, the presence of extended families in Sudanese society is expected to serve in constituting unwritten insurance contract and health protection mechanism for those who are unable to be insured officially. This societal built-in insurance mechanism has been manifested in the collective support provided by families for member(s) who may experience a sudden or permanent health shock. Therefore, due to the unique characteristics of Sudanese society, the results on the determinants of health insurance enrollment derived from data on other societies become questionable and inapplicable to the case of informal workers in Sudan.

8. Research Methodology

This study adopts both quantitative and qualitative techniques to run intended analysis. First, with respect to quantitative analysis, the study employs probit regression modeling approach to investigate the factors challenging the involvement of informal workers in health insurance system. The probit technique is more appropriate in the case under investigation in which the dependent variable is a binary variable (i.e., individuals' decision to purchase or not purchase health insurance services). It is well known that there are two options to estimate a model with a binary dependent variable, which are logit and probit models. The only difference between these two models is the underlying distributional assumption about the error term. The logit model assumes that the error terms follow a logistic distribution, while the probit model assumes that they follow the normal distribution. This study uses the probit model because it is easy to compute and is followed by most of the previous studies conducted on the demand for health insurance (e.g. Jutting, 2004).

8.1. Model Specification

To determine the probability that an informal worker would register in the health insurance system, the functional form for the probit model can be expressed as follows:

$$P = \Pr(Y = 1|X) = \varphi(X'\beta) \qquad (1)$$

Where Y is a binary, with the values of 0 and 1, Pr is the probability, φ is a cumulative distribution function (CDF) of the normal distribution, β is a vector of unknown parameters, X denotes the vector of explanatory variables.

The discussion in the literature section suggests that participation in health insurance could be determined by a wide range of determinants. Nevertheless, a careful selection needs to be taken in order to avoid omitting unobservable features of the sample being studied. In this study, the individual's enrollment in health insurance is set as a function of the worker's socioeconomic, demographic and health characteristics. Following Thornton et al., (2010), the model to estimate informal workers' demand for health insurance can be specified in a form of linear model as follows:

$$HI_i = \alpha_1 + \alpha_2 INC_i + \alpha_3 W_i + \alpha_4 HSIZ_i + \alpha_5 AGE_i + \alpha_6 SEX_i + \alpha_7 MAR_i + \alpha_8 DEP_i + \alpha_9 URB_i + \alpha_{10} SCH_i + \alpha_{11} WEMP_i + \alpha_{12} HE_i + \alpha_{13} \mathrm{CHRO}_i + \alpha_{14} \mathrm{MOR}_i + \alpha_{15} \mathrm{HOSP}_i + \alpha_{16} \mathrm{HAW}_i + \alpha_{17} \mathrm{PROX}_i + \alpha_{18} \mathrm{WAT}_i + \mu_i \quad (2)$$

Where the dependent variable (HI) is a binary variable representing the health insurance status of the informally employed worker. It takes value of 1 if a worker has health insurance coverage and 0 otherwise. In this model, we postulate that informal workers' health insurance participation is a linear function of worker's income (INC), wealth (W), household size ($HSIZ$), age (AGE), gender (SEX), marital status (MAR), number of dependents (DEP), place of residence, i.e. rural or urban (URB), years of schooling attended by household's head (SCH), type of employment ($WEMP$), health expenditures (HE), incidence of chronic illness (CHRO), morbidity (MOR), times of being hospitalized (HOSP), health insurance awareness (HAW), proximity of health care facilities (PROX) and household's accessibility to improved water sources (WAT).

Second, the qualitative method is adopted to inquire NHIF's officials about the current health insurance status of unorganized labor. This method also seeks to collect information about the obstacles delaying the accommodation of informal workers in health insurance. The focus is directed to examine initiatives have been adopted to host informal sector into health insurance coverage. In this regard, the study relies on secondary data collected from NHIF's officials and other relevant institutions.

8.2. Data Sources

Following the methods adopted by this study, both quantitative and qualitative data are collected. However, the study depends mainly on primary data collected from a sample of 742 workers drawn from the informal sector in Khartoum and Kassala States. The study employs a cluster sampling technique by dividing the population into three groups (i.e. sampling units). The primary sampling units are represented by localities within each state; the secondary sampling units are the administrative units within each locality, and finally the household represents the final unit of sampling. According to this procedure, five out of eleven localities in Kassala State have been selected namely, Khashm El-girba, Kassala, Rural Kassala, Rural west Kassala and Rural Aroma. Similarly, in Khartoum State, four out of seven localities have been surveyed namely, Khartoum, Umbada, Jabal Awlia and Sharq El-Nil. In each locality a certain number of villages and blocks have been selected. Then in each village or block, certain units of households have been interviewed. The questionnaire is administrated so as to inquire the respondents about their demographic, economic and health characteristics (see Appendix A). For qualitative data, interviews are administered with NHIF's officials in both Khartoum and Kassala States. The focus of these interviews is to collect information about the factors disturbing the inclusion of informal workers in the health insurance system. These interviews also target evaluating the

interventions being adopted by NHIF to increase informal workers' membership in the health insurance system.

8.3 Determining Sample Size

In order to determine the sample size, the study employs the cluster sampling technique by utilizing information available on labor participation rate and the contribution of the informal sector into the national economy. Based on the works of Krejcie and Morgan (1970) and Cohen (1992), the sample size for each state is calculated based on the following formula:

$$n = \frac{Z^2 pq}{d^2} \times deff$$

Where n represents the sample size; Z is the confidence level (Z = 95% confidence level which corresponds to 1.96 z-score); p is the proportion of the community (i.e. the ratio of informal workers to total population, which equals to labor force participation rate times the contribution of informal sector in the economy);$q = 1 - p$; d is the error term, assumed to be 5 percent and $deff$ is the effect of the sample design which is set at value of 2.

For the purpose of calculating the sample size for each state, we use the available information on a total number of the population residing in the states along with the labor participation rate and the estimated ratio of the informal sector. Based on the recent statistics, the total population in Khartoum and Kassala is, respectively, about, 8,000,000 and 2,200,000 inhabitants. Since there is a variation in labor force participation rate (LPR) across Sudan, we use 27% rate as LPR for Khartoum as indicated by ILO' statistics in 2014, and 20% LPR rate for Kassala assuming that labor force participation in the states dominated by rural communities is lower than urbanized areas. Given the fact that the contribution of the informal economy to Sudan's GDP is about 60%, hence, the valid population of informally employed workers for Khartoum State will be (8,000,000*0.27*0.60) =1,296,000, while for Kassala will be (2,200,000*0.20*0.60) = 264,000.

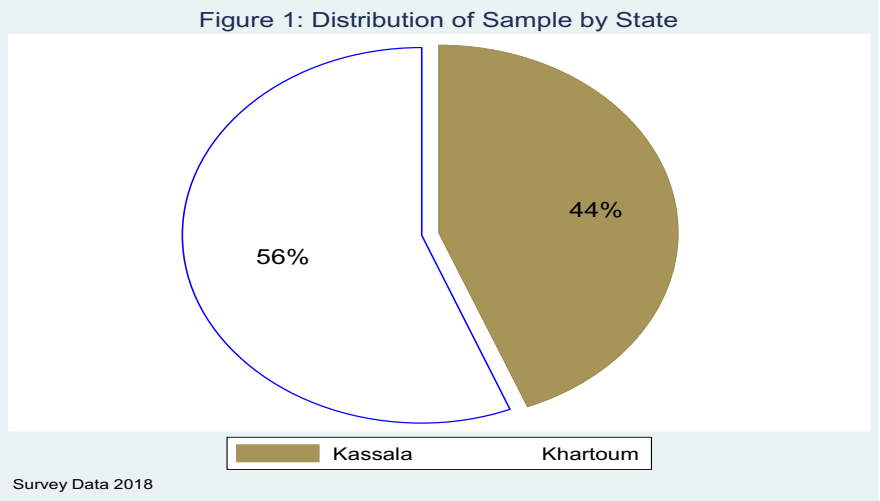
Based on the above formula, the exact samples size are 416, and 326 respondents for Khartoum and Kassala States, respectively, with a total of 742 informal workers.

9. Empirical Results and Discussions

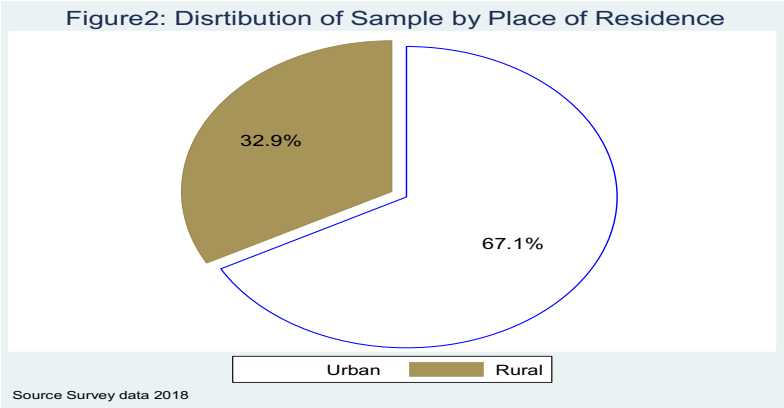
Based on the methodology outlined above, this section presents the empirical results and discussion. The section is divided into three sub-sections: the first reports some descriptive statistics on the key characteristics of the respondents under study, while the second sub-section presents econometric results. It reports the estimates of probit regressions concerning the factors influencing the engagement of the informal workers in the health insurance system. Finally, the third section presents the results of qualitative analysis.

9.1. Descriptive Statistics

As indicated in the methodology, the survey covered 742 informal workers, comprising 326 and 416 respondents from Kassala and Khartoum States, respectively. Figure 1 below presents the distribution of respondents by state.



Since not all respondents reside in one place, it is very important to give some details about their decomposition according to the degree of urbanization. Figure 2 below shows that 498 respondents (i.e., 67.1%) out of total sample reside in urban areas, while 244 respondents (i.e., 32.9%) live in rural areas. One may argue that the distribution of this sample contradicts the fact that the majority of the population in Sudan are residing in rural areas. However, the answer to this question is straightforward. That is, the sample has been dominated by Khartoum State in which the vast majority of respondents are residing in urban areas.



9.1.2. Demographic, household and socioeconomic characteristics of the respondents

Table 9.1 reports the demographic, household and socioeconomic characteristics of the surveyed respondents. The reported figures indicate that, compared to Khartoum State, the majority of respondents in Kassala State are younger. This implies that young age cohort dominates informal sector in Kassala. This may also explain the lower levels of educational attainment among Kassala's respondents, as a sizable portion of the population leaves school earlier and transfers to

labor market. The statistics also reveal that the majority of the respondents in the two states are males, reflecting lower labor participation among Sudanese females. In addition, the reported statistics prove that most of respondents are married, with the percentages of 85.6 and 84.4 in Kassala and Khartoum States, respectively. Regarding respondents' educational status, the table shows that the percentage of illiterates or respondents with low educational levels in Kassala State is higher than Khartoum. Likewise, the table indicates that the proportion of the respondents who have completed tertiary education is very small.

Table 9.1: Individual demographic characteristics of the respondents

Description	Category/Measure	Khartoum		Kassala	
		Freq.	Percent	Freq.	Percent
Age of Respondent	Less than or equal 30	58	13.94	42	12.88
	31-40	78	18.75	109	33.44
	41-50	137	32.93	83	25.46
	51-64	100	24.04	68	20.86
	More than 64	43	10.34	24	7.36
	Total	**416**	**100.00**	**326**	**100.00**
Sex of Respondent	Male	355	85.34	289	88.65
	Female	61	14.66	37	11.35
	Total	**416**	**100.00**	**326**	**100.00**
Marital Status of Respondent	Married	351	84.38	279	85.58
	Single	36	8.65	25	7.67
	Divorced	9	2.16	14	4.29
	Widowed	20	4.81	8	2.45
	Total	**416**	**100.00**	**326**	**100.00**
Highest educational level of respondent	illiterate	55	13.22	69	21.17
	Khalwa	31	7.45	57	17.48
	Primary	114	27.40	92	28.22
	Intermediate	35	8.41	24	7.36
	Secondary	112	26.92	69	21.17
	University and above	69	16.59	15	4.6
	Total	**416**	**100.00**	**326**	**100.00**

Source: Survey data, 2018

Table 9.2 reports the socio-demographic characteristics of surveyed respondents along with the type of residence. The table shows that about half of households in both Kassala and Khartoum States have a middle size ranging between one and seven members. These numbers are consistent with the average household's size in Sudan as reported by 2009 and 2014/2015 National Baseline Household Surveys (NBHS) conducted by the Central Bureau of Statistics (CBS). Moreover, households with more than seven persons are about 101 (i.e. 30.1%) and 152 (36.5%) in Kassala and Khartoum States, respectively. This implies that about one-third of respondents belonging to large household size. In the absence of official social security protection, the larger size of the households may represent one of the factors that push members to engage in the informal labor market.

Table 9.2: Socio-demographic Characteristics of Respondents' Household

Description	Category/Measure	Khartoum		Kassala	
		Freq.	Percent	Freq.	Percent
Size of household	1-3 members	54	12.98	51	15.64
	4-7 members	210	50.48	174	53.37
	More than 7 members	152	36.54	101	30.98
	Total	**416**	**100.00**	**326**	**100.00**
Residence' building materials	Wood and grass/net	4	1.16	98	30.06
	Mud	174	41.83	112	34.36
	Bricks	237	56.97	116	35.58
	Total	**100.0**	**0.24**	**326**	**100.00**
Sources of waters	Public piped water	380	91.35	161	49.39
	Tanker water	11	2.64	13	3.99
	donkey to supply water	25	6.01	147	45.09
	Pond water	-	-	2	0.61
	Others	-	-	3	0.92
	Total	**416**	**100.00**	**326**	**100.00**

Source: Survey data, 2018

According to the table, a considerable segment of respondents in Kassala State (i.e. about 30%) resides in houses made from woods and grass, confirming that the majority of the population in the state live in rural areas. On the contrary and quite better than the situation observed in Kassala State, more than half of the surveyed respondents in Khartoum State (i.e. about 57%) are found to be residing in houses made from bricks. The dominance of houses made from woods and grass in Kassala may stand as an indication that informal workers in this state lack access to sanitation and hygienic services and have a high probability to be vulnerable to poverty. What is more, living under such unhealthy conditions is likely to exaggerate the incidence of infections and acute diseases and, as a result, boosts OOP health spending undertaken by population. The table also illustrates that about half of the respondents in Kassala State don't have access to improved sources of waters, as 161 households (49.4%) out of them enjoy piped water compared to 91.4% in Khartoum State. These disparities in households' demographic and residence characteristics in the two states under consideration may entail great dissimilarities in the livelihoods as well as varieties in respondents' health status.

9.1.3 Employment and Economic status of Respondents

Table 9.3 below demonstrates employment and economic characteristics of the respondents. As can be read from the table, the freelancer employees represent the largest category of labor (i.e. 36% and 35% for Kassala and Khartoum, respectively) followed by sellers in shops (i.e. 25%). The large number of freelancer group among informally employed respondents indicates that Sudanese informal labor market is extremely dominated by non-skilled and unorganized workers. The statistics also reveal that the organized labor categories like handcrafters and

farmers report moderate numbers. This situation may signify the lower health insurance enrollment, as unorganized employees have a lesser tendency to enroll in health insurance. The reported figures also show that self and wage employment absorbs, respectively, 55.4% and 44.6% of total informally employed workers in Khartoum State. Similarly, these two informal jobs host around 67% and 33% from informally employed labor in Kassala State. This is consistent with reality as the majority of informal workers in Sudan has lower qualifications and, therefore, engages in self-work activities.

Regarding the distribution of income, the table demonstrates that the level of deprivation, measured by monthly monetary incomes, is higher among Kassala respondents. Specifically, different from Khartoum State, the table shows that as the category of income gets higher, the proportion of earners among Kassala's respondents drop down. Astonishingly, respondents with monthly income higher than SDG 5000 represent about 22% and 20% in Kassala and Khartoum States, respectively. This fact may indicate great disparities in the income distribution in Kassala State compared to Khartoum State. With respect to consumption, the reported statistics indicates significant conformity between the levels of monthly income and the patterns of households' consumption. From a welfare perspective, spending the whole income on consumption would lead to negative consequences on the population's affluence in the future. This is the case because consuming entire income makes household financially unprepared to face the occurrence of sudden health shocks.

Table 9.3: Labor and Income Situation of Respondents

		Khartoum		Kassala	
Description	**Category/Measure**	**Freq.**	**Percent**	**Freq.**	**Percent**
Type of Job	Street vendor	23	5.53	17	5.21
	Seller in Shop	117	28.13	69	21.17
	Handcrafters	111	26.68	53	16.26
	Farmer	5	1.20	73	22.39
	Free lancer	152	36.54	112	34.36
	Others	8	1.92	2	0.61
	Total	**416**	**100**	**326**	**100**
Nature of Job	Salaried/wage employed	224	53.85	107	32.82
	Self-employed	192	46.15	219	67.18
	Total	**416**	**100**	**326**	**100**
Monthly Income	Less than SDG 500	4	0.96	10	3.07
	SDG 500 - 1500	20	4.81	42	12.88
	SDG 1500 - 2500	64	15.38	70	21.47
	SDG 2500 - 3500	146	35.10	86	26.38
	SDG 3500 - 5000	96	23.08	46	14.11
	Greater than SDG 5000	86	20.67	72	22.09
	Total	**416**	**100**	**326**	**100**
Monthly Consumption	Less than SDG 500	3	0.72	5	1.53
	SDG 500 - 1500	15	3.61	52	15.95
	SDG 1500 - 2500	65	15.63	76	23.31

SDG 2500 - 3500	145	34.86	85	26.07
SDG 3500 - 5000	117	28.13	43	13.19
Greater than SDG 5000	71	17.07	65	19.94
Total	**416**	**100**	**326**	**100**

Source: Survey data, 2018

9.1.4 The Health Status of Respondents

Before inspecting the health insurance status of respondents, it is necessary to shed some lights on their health characteristics. The statistics displayed in Table 9.4 reveals that 535 of respondents (i.e. 72.1%) out of the total sample under consideration are healthy and at least do not suffer from any chronic diseases. Disaggregating figures to the state's level, the proportions of healthy population turn out to be about 64% and 82% in Kassala and Khartoum States, respectively. Alternatively stated, this fact makes the proportion of respondents suffering from chronic diseases close to 34% and 17% in Khartoum and Kassala States, respectively. These statistics confirm that the incidence of chronic diseases in Khartoum State is, approximately, doubled that of Kassala State.

Table 9.4: Health Status of Respondents

		Khartoum		Kassala	
Description	**Category/Measure**	**Freq.**	**Percent**	**Freq.**	**Percent**
Respondents Health Situation	Healthy	268	64.42	267	81.90
	Disabled	4	0.96	2	0.61
	Chronic diseases	144	34.62	57	17.48
	Total	**416**	**100**	**326**	**100**
Types of chronic Disease of Respondents	Diabetes	48	30.77	23	38.33
	Hypertension	23	14.74	12	20.00
	Asthma	4	2.56	2	3.33
	Heart disease	2	1.28	-	-
	Others	25	16.30	5	8.33
	Co-morbidity chronic	54	34.62	17	28.33
	Total	**156**	**100.00**	**60**	**100.00**
Dependents chronic diseases status	Yes	144	34.62	65	19.94
	No	272	65.38	261	80.06
	Total	**416**	**100**	**326**	**100**
Common Diseases Experienced by respondents/ family member	Malaria	36	8.65	32	9.82
	Typhoid	5	1.20	-	-
	Diarrhea	5	1.20	-	-
	Flu and inflammation	130	31.25	58	17.79
	Others	9	2.16	1	0.31
	No disease	219	52.64	-	-
	Have many disease infections	12	2.88	235	72.09
	Total	**416**	**100**	**326**	**100**
Place to seek Medication First	Official health care provider	382	91.83	317	97.24

	Pharmacy	15	3.61	5	1.53
	Traditional healer	17	4.09	3	0.92
	Quran healer	2	0.48	1	0.31
	Total	**416**	**100**	**326**	**100**
Methods to pay Medication Bill	Cash	219	52.64	201	61.66
	Health insurance	186	44.71	111	34.05
	Inability to pay	11	2.64	14	4.29
	Total	**416**	**100**	**326**	**100**

Source: Survey data, 2018

Diabetes and hypertension are among the most common chronic diseases. They represent about 31% and 15% of the total chronic diseases being hosted by respondents in Khartoum State. Also, diabetes and hypertension represent 38% and 20% of chronic diseases suffered by respondents in Kassala State. The table also shows that 35% and 20% of respondents in Kassala and Khartoum States report that their dependents suffer from at least one chronic disease. The prevalent of these illnesses among informal workers may signify the widespread of chronic diseases among Sudanese population. Seen from welfare perspective, the large proportion of chronically ill workers may reduce labor productivity and, consequently, threatens the well-being of the population.

Table 9.5: Coping with medical and health issues

		Khartoum		Kassala	
Description	**Category/measure**	**Freq.**	**Percent**	**Freq.**	**Percent**
Methods for coping with inability to pay	Barrowing	134	32.21	206	63.19
	Zakat	9	2.16	31	9.51
	Relatives	70	16.83	14	4.29
	Selling assets	19	4.57	6	1.84
	Others	50	12.02	5	1.53
	Many coping methods	18	4.33	64	19.63
	Total	**416**	**100**	**326**	**100**
Number of consultation/ visits to health center/hospital	None	19	4.57	1	0.31
	One time	47	11.30	18	5.52
	Two times	57	13.70	38	11.66
	Three times	72	17.31	57	17.48
	More than three times	221	53.13	212	65.03
	Total	**416**	**100**	**326**	**100**
Type of health care services center	Health unit	17	4.09	5	1.53
	Dressing point	1	0.24	-	-
	Health center	346	83.17	302	92.64
	Hospital	47	11.30	9	2.76
	Not available	1	0.24	10	3.07
	Centre and Hospital	4	0.96	-	-
	Total	**416**	**100**	**326**	**100**
Out of pocket health Expenditures	Nothing	22	5.29	1	0.31
	Less than SDG100	16	3.85	24	7.36

	SDG 100- 500	96	23.08	90	27.61
	SDG 500 - 1000	64	15.38	76	23.31
	SDG 1000 - 2000	78	18.75	58	17.79
	Greater than SDG 2000	140	33.65	77	23.62
	Total	**416**	**100**	**326**	**100**

Source: Survey data, 2018

The table also reveals that Flu and Inflammation and Malaria are among the most widespread diseases experienced by respondents/ family members during the last six months preceding the survey. Moreover, as the table indicates, the majority of respondents in the two states go to official health care centers as a first place for receiving treatment and medical consultancies, while a negligible percent tend to go to pharmacies and traditional healers. Interestingly, this may perhaps indicate fairly well-developed health seeking behavior among respondents.

Table 9.5 shows that respondents use different methods to cope with medical and health financial matters in case they lack the ability to pay. Concisely, the table indicates that the majority of the surveyed population in the two states resort to borrowing money as a suitable coping with the mechanism. However, and as the table indicates, the reliance on borrowing varies between the two states. As the figures indicate, compared to Khartoum State, Kassala's respondents rely greatly on borrowing to cope with lacking ability to pay. Getting assistance from relatives comes as a second alternative to cope with sudden health matters among Khartoum's respondents, while for respondents in Kassala's, Zakat emerges as a second coping with the mechanism. The heavy dependence on Zakat as a mechanism to cope with health financial matter among Kassala's respondents may signify the high incidence of poverty in the state.

The table also shows that the majority of respondents in the two states seek medication more than three times during the last six months preceded the survey. The table also indicates that health centers represent the main destinations for patients when seeking health care services. Respectively, 83% and 92% out of total respondents in Khartoum and Kassala States tend to admit to health centers. Furthermore, the table shows that about 34% and 24% of respondents in Khartoum and Kassala States used to pay, on average, more than SDG 2000 per month to cover medication bill. Compared to the average monetary income reported by respondents, this fact indicates that health expenditure consumes a significant portion of the household's income which entails great negative effects on livelihoods.

9.1.5. Health insurance status and awareness

With respect to the health insurance status of the respondents, Table 9.6 shows that 46% and 37% of the total respondents in Khartoum and Kassala States are, respectively, currently enrolled in health insurance. The table also reveals that about 10% and 5% of the respondents in Khartoum and Kassala States have, for some reasons, quit health insurance. Moreover, the statistics shows that 40% of the total enrollees pay the premium of health insurance directly by themselves. The Chamber of Zakat pays for about 49% of the enrollees in Khartoum State, while

it pays on behalf of 19% of respondents in Kassala State. The Federal Ministry of Finance pays on behalf of 31% of the enrollees in Kassala State and 2% of enrollees in Khartoum State. This indicates that Chamber of Zakat and the Federal Ministry of Finance play a significant role in providing a considerable proportion of the population with health insurance coverage. The higher contribution of these two institutions in paying health insurance premium for poor households implies that a considerable segment of respondents are poorer.

Table 9.6: Respondent health insurance status

		Khartoum		Kassala	
Description	**Category/measure**	**Freq.**	**Percent**	**Freq.**	**Percent**
Respondent's health insurance status	Currently enrolled	190	45.67	118	36.20
	Enrolled in the past/ever enrolled	41	9.86	14	4.29
	Never enrolled	185	44.47	194	59.51
	Total	**416**	**100**	**326**	**100**
Health insurance premium payer	Self pay	78	41.05	52	44.07
	Family member	1	0.53	3	2.54
	Pension Fund	5	2.63	2	1.69
	Zakat	94	49.47	22	18.64
	Ministry of Finance	4	2.11	37	31.36
	Others	8	4.21	2	1.69
	Total	**190**	**100**	**118**	**100**
Suitability of current health insurance premium	High	283	68.03	113	34.66
	Suitable	119	28.61	199	61.04
	Cheap	14	3.37	14	4.29
	Total	**190**	**100**	**118**	**100**

Source: Survey data, 2018

Concerning the impression of the respondents towards health insurance premium, Table 9.7 indicates that about 68% of respondents in Khartoum State and 38% in Kassala State believe that the cost of subscription is high. However, 61% of respondents in Kassala State and 29% of respondents in Khartoum see that premium paid against health insurance is suitable. The table reveals that about 23% and 30% of Khartoum and Kassala enrollees are, respectively, believe that the services presented via health insurance windows are excellent. About half of enrollees in Khartoum State (i.e. 48%) report that the services provided by health insurance system are good. Slightly different from Khartoum, 46% of Kassala's enrollees report the same impression on health care services presented via health insurance. On the whole, these percentages confirm that enrollees have a good impression about health care services being presented by the insurer. Finally, the table shows that the majority of participants in health insurance state that health insurance covers part of prescribed treatments suggesting some limitations in the coverage. In response to the question about the ways through which enrollees know about the benefits of health insurance, the statistics show that the bulk of the participants knew health insurance services via local people committees. Indeed, people committees conduct campaigns regarding the benefits of health insurance and facilitate population with necessary information about

enrollment procedures. Employers come in the second place with respect to connecting enrollees with health insurance providers. The role of Trade Union in availing information and familiarizing people about health insurance came in the third place indicating that informally employed are not organized under trade union. Unexpectedly, the contribution of media like TV and Radio is negligible, the issue that needs more attention from NHIF.

Table 9.7: The perspective of insurance enrollees regarding satisfaction

		Khartoum		Kassala	
Description	**Category/measure**	**Freq.**	**Percent**	**Freq.**	**Percent**
Satisfaction of customers	Excellent	44	23.16	36	30.51
	Good	92	48.42	55	46.61
	Acceptable	35	18.42	22	18.64
	Bad	19	10.00	5	4.24
	Total	**190**	**100**	**118**	**100**
HI's coverage for drugs	Covers all prescribed drugs	14	7.37	27	22.88
	Covers part of prescribed drugs	169	88.95	88	74.58
	Does not Cover the prescribed drugs	7	3.68	3	2.54
	Total	**190**	**100**	**118**	**100**
How do you know about HI?	People Committee	126	66.32	56	47.46
	Radio and TV	4	2.11	3	2.54
	Employer	45	23.68	46	38.98
	Relatives and Friends	5	2.63	1	0.85
	Trade Union/Association	1	0.53	10	8.47
	Others	9	4.74	2	1.69
	Total	**190**	**100**	**118**	**100**

Source: Survey data, 2018

Finally, with respect to respondents' health insurance awareness, Table 9.8 indicates that about 76% of respondents in Khartoum State and 84% in Kassala State are well aware of the benefits that could be generated from engaging in health insurance. In addition, about half of surveyed respondents in the two states stated that they are familiar with the premises and places of health insurance administration. Finally, the table reveals that the majority of the respondents does not belong to any association or organized body such as trade union. The implicit conclusion arises from this reality is that these associations have no significant say in deciding health insurance status of the respondents.

Table 9.8: Health insurance' awareness

		Khartoum		Kassala	
Description	**Category/measure**	**Freq.**	**Percent**	**Freq.**	**Percent**
Do you recognize the importance of HI	Yes	314	75.48	273	83.74
	No	102	24.52	53	16.26
	Total	**416**	**100**	**326**	**100**
Do you know the place of HI administration?	Yes	181	43.51	226	69.33
	No	235	56.49	100	30.67

	Total	**416**	**100**	**326**	**100**
Are you a member in any association or trade union	Yes	27	6.49	33	10.12
	No	389	93.51	293	89.88
	Total	**416**	**100**	**326**	**100**
Reasons that prevent non participants from enrollment into health insurance	Not having enough income	25	13.51	22	11.34
	Lack of sufficient information about HI	17	9.19	20	10.31
	I believe that HI services are not good	13	7.03	20	10.31
	Complicated enrolment's procedures	16	8.65	28	14.43
	I don't know that HI open to all people	19	10.27	14	7.22
	Others	95	51.35	8	4.12
	Combination of reasons	25	13.51	22	11.34
	Total	**185**	**100**	**194**	**100**

Source: Survey data, 2018

Regarding the reasons that prevent workers from enrollment into health insurance, the statistics show that, approximately, half of the uninsured respondents have more than one reason for not to participate. Not having enough income, lack of information about health care services presented and complications in enrollment process are the most reported. Complications of enrollment procedures come in the third rank among the reasons disturbing respondents' enrollment. Moreover, a considerable proportion of respondents report that they don't know that enrollment is open to all population including unorganized labor. Lacking sufficient information about health insurance system and accessibility to health care services represent low constraints for enrollment.

9.1.6 The Relationship between Health Insurance and Socioeconomic Variables

For the purpose of sensitivity analysis, we examined the relationship between health insurance status and respondents' socioeconomic characteristics, health insurance awareness and the levels of satisfaction gained from insurance package using cross tabulation analysis as presented in Appendix I. The Chi-square test has been implemented to verify the probable association between variables under consideration. The null hypothesis of Chi-square test is that there is no association between health insurance and the variable under the study. The Chi test results reveal that there is no significant statistical association between enrolment and average years of schooling, suggesting that education has no impact on respondents' health insurance status. This outcome can be explained by the fact that most of the informal workers have a low level of education. The analysis also indicates that there is no significant association between health insurance and household size as indicated by insignificant Chi square test. This implies that the number of the household members has no effect on the respondents' enrollment. According to the health insurance regime in Sudan, the enrollment of the household's head or the guardian allows dependents to enroll freely without incurring any incremental increases in initial premium.

In addition, the Chi test for the relationship between insurance and respondent's age is significant, suggesting that older respondents tend to engage in health insurance enrollment. This may also indicate that elder workers expose to more–illnesses and, hence, tend to enroll. Likewise, the analysis rejects the null hypothesis of no association between health insurance and the type of work confirming the existence of a significant relationship between health insurance enrollment and the type of work that workers perform. That is, being wage-employed improve workers participation in health insurance compared to those who are self-employed. Moreover, the analysis shows that there is a significant association between respondent's health insurance status and chronic diseases. This suggests that chronically ill workers have a higher tendency to be insured. Obviously, this result implies a symptom of moral hazard among enrollees. Likewise, the significance of Chi-square test emerging with the relationship between health insurance and morbidity suggests that there is a significant statistical connection between health insurance participation and respondent's health status. In the same way, the Chi-square test indicates that worker's awareness toward health insurance benefits has a positive relationship with health insurance membership. Indeed, people who are more aware about the importance of health insurance are more likely to be enrolled. Finally, the results show a significant association between health insurance participation and the suitability of health insurance premium. That is, most of health insured respondents believe that the cost of health insurance is high. This may also indicate that cost of the health insurance is one of the factors that may prevent people from participating in health insurance.

9.2 Econometrics Results

In this section, we report estimation results of the probit model on the factors that influence informal workers enrollment in the health insurance system. For the purpose of comparisons, equation1 has been estimated via four models specifications, namely Model I, II, III and IV. Model I is based on the full sample in which uninsured, contributory and non-contributory insured are all treated as one group (i.e. the full sample). Then, we report the estimates of model II and III which examine the determining factors of enrolment among informal workers in Kassala and Khartoum States separately. In these two models, both insured (self and non-contributory) and uninsured residing in the same state are dealt with as one group. As a final step, we report the estimates for model IV which is concerned with the factors that are likely to determine informal workers' enrollment in health insurance by paying premium from their own resources (i.e., voluntary enrollment).

A. Full Sample Estimation Results

Table 9.9 displays the results drown from model I which is based on the full sample of the population studied. Noticeably, the results indicate that the majority of predictors' coefficients are associated with anticipated signs and satisfy the significance at reasonable levels. Some estimators, however, oppose our prior expectations and, thus, need some justifications. For instance, the coefficient of income variable, although carries a positive sign, it is insignificant

even at all conventional levels. This demonstrates that income has no consequence on informal worker's health insurance status. Many justifications can be proposed in order to interpret this unexpected outcome. First, model I has been estimated using the full sample which contains a huge number of informal workers for whom health insurance premium has been paid by other bodies including the Federal Ministry of Finance, Zakat, Pension Fund and other volunteers. Thus, the ability to pay, as a key factor in deciding health insurance status, has been completely neutralized. Alternatively stated, non-contributory health insurance enrollment targets enrolling vulnerable sectors of the population. This reality makes monetary income plays no role in shaping people decisions on health insurance. Second, the high incidence of poverty rates among Sudanese population makes people look at health care as a luxurious good. This claim is drawn from health economics literature, according to which in some cases health is considered a luxury good that can be only demanded by rich people (Newhouse, 1987 and Gerdtham and Johnson, 2000). The prevalence of such stance towards health would definitely discourage poor people, who mostly spend large shares of their incomes on necessities, to enroll in health insurance programs.

Table 9.9: Determinants of informal workers' enrolment in health insurance (Model I)

Dependent variable: insured informal worker				
	Coefficient	Std. Err.	z	P-value
Income	0.012	0.048	0.25	0.802
Wealth	0.077**	0.039	1.98	0.048
Household size	-0.019	0.019	-0.97	0.331
Age	0.022***	0.005	4.14	0.000
Male	-0.241	0.176	-1.37	0.172
Married	0.072	0.172	0.42	0.676
Dependency	0.055	0.050	1.10	0.270
Urban	-0.389**	0.156	-2.49	0.013
Schooling	-0.002	0.013	-0.17	0.866
Wage employment	0.241**	0.111	2.15	0.031
Health expenditure	-0.265***	0.046	-5.65	0.000
chronic	0.589***	0.129	4.57	0.000
Morbidity	0.177***	0.055	3.22	0.001
Being hospitalized	0.381***	0.119	3.19	0.001
Health insurance awareness	1.186***	0.164	7.25	0.000
Health seeking behavior	0.437**	0.222	1.97	0.049
Proximity	-0.380*	0.221	-1.72	0.086
Water	0.654***	0.173	3.78	0.000
Constant	-2.652***	0.467	-5.67	0.000
Number of Obs	736			
Pesudu R^2	23			
LR $Chi^2(18)$	227.50			
Prob > Chi^2	0.000			

Note: ***p<0.001,**p<0.01,*p<0.05

Conversely, the coefficient appears in front of wealth variable, which measured by the number of rooms in worker' house, is positive and statistically significant. It indicates that, compared to those with deprived wealth status, the relatively wealthy workers have a higher likelihood to be insured. This outcome can be interpreted based on the fact that workers with comfortable housing are more prepared to satisfy the conditions of health insurance enrolment such as possessing identity cards and other relevant documents. However, this outcome may also indicate that the non-contributory insurance has been dedicated to bringing vulnerable people under health insurance umbrella is misallocated and unfairly distributed. In other words, the positive coefficient of wealth variable may stand as an indication that the "quota" of non-contributory health insurance has diverted to those who are relatively well-off and excludes those who live in poverty conditions.

The demographic characteristics of informal workers such as household size, gender, marital status and dependency show no significant effect on the likelihood of being enrolled in health insurance. On the contrary, the coefficient of the age variable is positive and statistically significant indicating the vital role of ageing in determining worker's health insurance status. The logic is that as the worker becomes older, the probability to host one or more chronic disease goes up and, thus, he or she may prefer to be insured. This result also confirms the statistical association between health insurance and respondent's age as outlined in the descriptive statistics section. Expectedly, the coefficient associated with the urban variable is negative and statistically significant. This outcome demonstrates that, compared to the rural population, urban residents have a lower likelihood to be insured. Astonishingly, the results indicate that the increase in years of schooling attended has no significant impact on workers' health insurance decisions. This signifies that attending more years of schooling doesn't affect the probability of joining health insurance program among informal workers. This result supports the outcome of cross tabulation outlined previously. The possible explanation for this undesirable outcome is that most informal workers had been pushed to drop from school earlier and, therefore, they did not attend high years of schooling. Thus, the moderate level of education turns out to be functionless with respect to informal workers' stance towards health insurance subscription.

The coefficient of wage employment variable is positive and statistically significant indicating that the likelihood of being insured if the informal worker is wage-employed is 24 percentage points higher compared to other types of informal employment. The implicit conclusion springs from this finding is that securing a relatively stable source of income would increase the opportunities of being insured among informal workers. This outcome also lends further support to our previous argument stating that there is a severe inequality in distributing the charitable fund allocated to secure free enrolment for the disadvantaged groups in Sudan. The interviews with health insurance officials inform that the criteria on which the charitable bodies determine who deserve and who doesn't to be insured freely is beyond the mandate of NHIF's administration. They add that local people committees at base levels usually list those who

satisfy the conditions of non-contributory insurance. Obviously, health insurance officials hinting at the fact that certain levels of nepotism might be have been exercised during the process of selecting non-contributory enrollees (Elamin, interview, September 2018).

Unexpectedly, the coefficient of health expenditure variable is negative and statistically significant. This indicates that incurring higher health expenditure imposes a negative effect on informal workers' odds to enroll in health insurance program. Obviously, this outcome has many interpretations. First, the current health insurance program may not succeed to provide people with adequate financial protection against spending incurred to cover health shocks. Second, the package of health care services which include sophisticated diagnostic examinations and medical screening may increase the number of checked diseases among insured clients. Therefore, compared to uninsured that mostly remain under diagnosed, insured workers are expected to conduct high OOPHE in order to sustain healthiness.

Third, according to interviews with health insurance administration in Kassala State, a large segment of health care seekers violates the medicinal protocols as proposed by Sudanese health authorities. Specifically, instead of admitting to the primary health care provider (primary medical practitioners) that usually stationed in health insurance centers, patients tend to go directly to specialists to get medical advice and treatments. This, of course, heightens the patterns of health expenditures undertaken by health care seekers including those who enjoy insurance coverage. Moreover, health insurance officials advise that insured people are not fully aware of the refunding policy being adopted by NHIF in case the prescribed health care services (i.e. consultancy, drugs or diagnostic tests) are not offered in health insurance centers. In addition, for a considerable part of the insured, the quality of health care provided by health insurer, particularly the parts related to drugs and diagnosis is not trustable. Thus, many participants might be pushed to buy health care services from outsiders at higher prices. Fourth, people have a high tendency to over report their health expenditures to grantee the continuity of consuming free health care services. Those who insured they may also report higher health spending so as to push health insurance authorities to expand the coverage to include more services.

As expected, the health characteristics of informal worker appear to be the main diver of participation in health insurance. The coefficients of chronic disease, morbidity and being hospitalized variables are positive and statistically significant indicating the key role of these factors in raising the probability of enrolling in health insurance program. The health insurance awareness and the convenient health-seeking behavior are also coupled with positive and significant coefficients signifying that those who aware of their health matters and behave reasonably when seeking health care services are more likely to sign up in health insurance. These findings point to the importance of health insurance awareness and appropriateness of health seeking behavior in bringing people under health insurance umbrella. They also give

further support to the cross tabulation analysis reported in the previous sub-section. Agreeing with prior expectations, the proximity to health care facilities shows a decisive role in deciding informal workers' participation in health insurance. The coefficient of proximity variable is negative and statistically significant demonstrating that the likelihood of the informal workers' enrolment in health insurance decreases as the distance to health care facilities increases. Finally, the accessibility to improved water is found to raise the probability of enrollment in health insurance among the informal workers. Having access to improved water sources may signify that the underlying informal worker lives in good sanitation and hygienic conditions. Sustaining these health inputs indicates that workers are fully aware of health matters and, therefore, have higher motive to join health insurance membership.

B. Kassala's sample results

We repeat the same exercise used for the full sample to examine the factors that affecting health insurance enrollment among informally employed workers in Kassala State. Table 9.10, reports the probit estimation of equation 2 for Kassala sample. It can be easily concluded that the reported estimates considerably diverge from those have been observed in model I (i.e. full sample). For instance, different from model I, the wealth variable emerges with a positive but statistically insignificant coefficient. Taken together with the insignificant effect of income variable, this indicates that the economic status of informal workers in Kassala State has no significant influence in deciding their enrolment in health insurance. It is worth to mention that, compared to Khartoum, Kassala State register high rates of poverty. Thus, the vulnerable people in the state, particularly those fell in the category of informally employed, are less likely to be enrolled. The responses of a large segment of respondents in the state reveal that many workers don't have health insurance coverage because their resources don't allow them to prepare the documents required for health insurance membership.

Table 9.10: Determinants of informal workers' enrolment in health insurance (Model II)

Dependent variable: insured informal worker				
	Coef.	Std. Err.	z	P-value
Income	0.066	0.078	0.85	0.396
Wealth	0.085	0.064	1.33	0.184
Household size	0.004	0.034	0.10	0.917
Age	0.019**	0.008	2.32	0.021
Male	0.624*	0.344	1.81	0.070
Married	-0.238	0.299	-0.80	0.426
Dependency	0.111	0.077	1.45	0.148
Urban	-0.472*	0.243	-1.95	0.052
Schooling	-0.002	0.022	-0.08	0.934
Wage employment	0.066	0.183	0.36	0.720
Health expenditure	-0.430***	0.081	-5.30	0.000
Chronic	0.612***	0.232	2.64	0.008
Morbidity	0.134	0.101	1.32	0.186
Being hospitalized	0.304	0.191	1.59	0.112
Health insurance awareness	1.565***	0.363	4.32	0.000

Health seeking behavior	0.844	0.528	1.60	0.111
Proximity	-0.018	0.419	-0.04	0.966
Water	0.337	0.262	1.28	0.200
Constant	-3.824***	0.942	-4.06	0.000
Number of Observations	325			
Pesudu R^2	24			
LR $Chi^2(18)$	100.45			
Prob > Chi^2	0.000			

Note: ***p<0.001,**p<0.01,*p<0.05

Furthermore, one may argue that the possession of personal documents also determines the possibility of diversifying sources of income by applying to affordable funders including banks, NGOs, charitable and microfinance facilities. On the whole, this reality reflects the miserable living conditions being experienced by this sector of the population. Similar to the result of model I, the coefficient of household's size variable is statistically insignificant indicating no effect on informal workers' health insurance status. Confirming the result obtained in model I, age is found to have a positive effect on the likelihood of undertaking health insurance among informal workers in Kassala State. Interestingly, the gender variable came out with a positive and statistically significant coefficient indicating that being a male and household head increases the odds of being insured by 62 percentage points relative to being a female head. Replicating the results of Model I, being married, has high number of dependents, attending more years of schooling appear with no significant effect on health insurance enrolment among informally employed workers. The negative and statistically significant coefficient in front of the urban variable indicates that the impact of urbanization on health insurance membership doesn't diverge from the outcome observed in model I. In other words, the finding again raises the flag that residing in urban area in Kassala State lowers the likelihood of up taking health insurance enrollment. In contrast to the results generated based on the pooled sample, being informal workers with a wage income in Kassala State exercises no effect on the probability of joining health insurance. This result may suggest that Kassala State is entirely occupied by extreme informality in terms of labor market.

The impact of health characteristics on informal workers' health insurance enrolment is, to some extent, depart from the results emerges with full sample's estimates. That is the coefficients associated with morbidity and being hospitalized variables are statistically insignificant. This indicates that increases in morbidity and being hospitalized are both have no significant influence on the odds of being a participant in health insurance coverage among respondents residing in Kassala State. Analogous to results observed in the full sample, being chronically ill increases the likelihood of being health insured. By the same token, sustaining high degrees of health insurance awareness boosts the likelihood of getting covered by health insurance among the informally employed workers. However, as the reported results indicate, the health seeking behavior in Kassala State doesn't encourage informal workers to sign up in health insurance. Different from pooled sample results, the proximity of health care services facilities, the

accessibility to improved waters are found to be having no significant effect on the odds of enrolling in health insurance program among informal workers in the state. Finally, the negativity and highly significant coefficient of the constant indicates that without the rest of the factors, informal workers' enrolment in health insurance program in Kassala State will be considerably low.

C. Khartoum's sample results

Table 9.11 displays the results of model III which examines the determining factors of health insurance enrolment among the informal workers in Khartoum State. A glance to results reveals that the obtained coefficients resemble those of model I and, to some extent, model II. For instance, similar to the case of the full sample, income emerges with no effect on the health insurance status of the informally employed workers. Agreeing with outcome in model I, increases in wealth boost the likelihood of being insured among this group of workers in Khartoum State. This ratifies the fact that wealth contributes positively to make informal workers get insured. This result also reveals that informally employed workers in Khartoum are relatively wealthier compared to those residing in Kassala.

Again, the results confirm that marital status and the number of dependents have no significant influence on the informally employed worker's health insurance status in Khartoum State. A notable difference between full, Kassala and Khartoum samples, however, came with some demographic variables. Departing from the case of Kassala and pooled samples, increases in households' size, lower the odds of undertaking health insurance subscription among informal workers in Khartoum. In the same way, compared to the female household head, being a male household head decreases the likelihood of enrolling in health insurance program. This largely opposes the outcome emerge with estimates of Kassala sample in which being a male household head increases the probability of joining health insurance.

Similar to estimates of models I and II, the coefficient of the age variable is positive and statistically significant. This confirms the fact that ageing represents one of the key factors in deciding a respondent's health insurance status. Likewise, reproducing outcomes appear with pooled and Kassala samples, the urban variable came with a negative and highly significant coefficient. This indicates that the informally employed workers in urban centers have less likelihood to enroll in the health insurance program compared to their rural counterparts. Agreeing with Kassala sample, increases in years of schooling and being wage employed are both statistically insignificant indicating no effect on health insurance subscriptions among informally employed. The coefficient of health care expenditure is found to be negative and statistically significant repeating the outcomes observed in pooled and Kassala samples. Similarly, the coefficients of hosting chronic diseases, morbidity and being hospitalized variables are all positive and statistically significant indicating that the health characteristics of informal workers play a critical role in their health insurance choice. As anticipated, the health insurance

awareness is found to have a positive and significant effect on informal workers' health insurance decisions. Just as in previous estimates, the proximity to health facilities seems to be playing a considerable role in deciding whether an informal worker will join health program or not.

Table 9.11: Determinants of informal workers' enrolment in health insurance (Model III)

Dependent variable: insured informal worker				
	Coef.	Std. Err.	z	P-value
Income	-0.064	0.070	-0.91	0.361
Wealth	0.181***	0.064	2.84	0.004
Household size	-0.061**	0.026	-2.29	0.022
Age	0.025***	0.007	3.38	0.001
Male	-0.706***	0.247	-2.85	0.004
Married	0.263	0.236	1.12	0.264
Dependency	-0.004	0.072	-0.06	0.952
Urban	-0.601**	0.248	-2.42	0.016
Schooling	0.005	0.017	0.26	0.795
Wage employment	0.218	0.158	1.38	0.166
Health expenditure	-0.166***	0.063	-2.62	0.009
Chronic	0.602***	0.168	3.58	0.000
Morbidity	0.211***	0.072	2.94	0.003
Being hospitalized	0.365**	0.166	2.19	0.028
Health insurance awareness	1.169***	0.208	5.60	0.000
Health seeking behaviour	0.398	0.256	1.56	0.120
Proximity	-0.577**	0.284	-2.03	0.043
Water	0.816***	0.304	2.68	0.007
Constant	-2.278***	0.666	-3.42	0.001
Number of Observations	411			
Pesudu R^2	30			
LR $Chi^2(18)$	166.74			
Prob > Chi^2	0.000			

Note: ***p<0.001,**p<0.01,*p<0.05

The coefficient of the constant is negative and statistically significant confirming that without all these factors there will be a great drop in health insurance enrolment among informal workers in Khartoum State.

D. Voluntary participants Sample Results

Finally, Table 9.12 reports the estimates of model IV which investigate the factors affecting informal workers' decisions to join health insurance by paying the subscription fees from their own resources. As expected, the results show that monetary income and wealth status variables are both associated with a positive and statistically significant coefficient. This indicates that

being having higher income or wealthier raises the probability of voluntary enrolment among informal workers. However, having a look at the significance of these coefficients one can observe that the coefficient of wealth variable is highly significant compared to that of monetary income.

Table 9.12: the determinants of informal workers' enrolment in health insurance (Model IV)

Dependent variable: insured informal worker				
	Coefficient	Std. Err.	z	P-value
Income	0.108*	0.063	1.69	0.091
Wealth	0.111**	0.047	2.34	0.019
Household size	-0.034	0.026	-1.31	0.191
Age	0.014**	0.007	2.10	0.036
Male	-0.423*	0.225	-1.88	0.061
Married	0.202	0.225	0.89	0.371
Dependency	0.041	0.065	0.64	0.524
Urban	-0.184	0.199	-0.93	0.354
Schooling	0.043**	0.017	2.55	0.011
Wage employment	0.143	0.144	0.99	0.321
Health expenditure	-0.269***	0.061	-4.44	0.000
Chronic	0.606***	0.161	3.76	0.000
Morbidity	0.239***	0.071	3.35	0.001
Being hospitalized	0.394***	0.149	2.63	0.009
Health insurance awareness	0.995***	0.223	4.47	0.000
Health seeking behavior	0.539*	0.279	1.93	0.054
Proximity	-0.335	0.293	-1.15	0.251
Water	0.548**	0.228	2.40	0.016
Constant	-3.762***	0.634	-5.94	0.000
Number of Obs	559			
Pesudu R^2	25			
LR $Chi^2(18)$	149.61			
Prob > Chi^2	0.000			

Note: ***p<0.001,**p<0.01,*p<0.05

A potential explanation for this outcome could be that wealth has a decisive role in upgrading respondents' financial capabilities to the level that allows paying the health insurance premium. In the Sudanese context, a great sector of the population depends heavily on their physical assets such as real estates, trucks, lands to sustain livelihoods. Compared to income, which mostly fluctuating and eaten by high inflation rates, the affluence of households can be better predicated by properties. This outcome may also suggest that the workers' physical and mental capabilities, the asset that the informal workers rely on in sustaining livelihoods, has less value when compared to material assets such as real estates. Furthermore, this argument can be supported by the insignificant coefficient associated with wage employment variable in the model under consideration.

In a complete match with estimates emerge with model III, the odds of enrolling privately in health insurance is found to be increasing with worker's age. Conversely, the likelihood of being voluntary enrolled in health insurance decreases with the informal worker being a male household head. This outcome ratifies the results obtained in Khartoum State and opposes that of Kassala State whereas in the latter being a male household head increases the odds of being health insured.

Unlike the results obtained in previous models, the odds of being self-enrolled in health insurance seems to be not affected by whether an informal worker is residing in urban or rural areas. This claim is confirmed by the coefficient appears in front of the urban variable which is statistically insignificant even at a conventional level. This fairly indicates that the area of residency doesn't have any significant impact on the informal workers' choice regarding voluntary enrollment.

As expected, but different from previous estimates, attending more years of schooling raises the odds of being self-enrolled in health insurance among informally employed workers. The justification for this outcome is that educated workers tend to utilize the available health care facilities effectively so as to sustain high levels of healthiness for self and dependents. Thus, they have a high likelihood to register in health insurance system.

Similar to the preceding results, the coefficient of health expenditure is found to be negative and extremely significant indicating that the incidence of out of pocket health expenditure lowers informal worker's likelihood to be self-enrolled. As anticipated, chronic illness shows an enormous impact on self enrolment. The coefficient of the variable is positive and statistically significant indicating that chronically ill informal workers are more likely to be self enrolled. As said previously, this is acceptable since workers with chronic illnesses attempt to provide themselves with financial protection afforded by health insurance coverage. The coefficient of morbidity variable is positive and statistically significant demonstrating that the incidence of high morbidity rates, as measured by the number of admission to health care facilities, increases the likelihood of being self insured. Specifically, an increase in times of admitting to health care centers by a one visit increases the odds of being self-enrolled in health insurance by 0.26 point. However, this coefficient must be interpreted with some caution. That is since part of the data has been collected from those who already insured, the frequent admission to health care providers (i.e. health care centers owned by the insurer) may be a result rather than a cause to enroll in health insurance.

The impact of morbidity on self enrolment can be also magnified by the frequency of hospitalization. The coefficient in front of being hospitalized variable is positive and statistically significant indicating that the frequent hospitalization raises the likelihood of self enrolment among the informal workers in the sample under consideration. The key conclusion arises from

the results emerge with health characteristics variables (i.e. chronic illness, morbidity and being hospitalization) in these four models strongly confirms that health insurance regime, as represented by NHIF and other involved insurers, doesn't exercise the so called "cream-skimming" policies. That is to say, NHIF and other insurers might have to tendencies to insure those with better health status. This conclusion is supported by the absence of a negative coefficient in front of these variables.

As expected, the coefficients of both health insurance awareness and health seeking behavior variables are associated with significant and positive signs. This indicates that a well-developed awareness about the importance of health insurance increases the probability of subscribing privately in health insurance. The proximity to health care providers' variable comes out with a negative and highly significant coefficient. This may point out to the fact that health care facilities in the areas studied are not well-distributed and, therefore, disturb the decisions made by the informal workers on health insurance enrolment. The improvements in water supply increase the likelihood of enrolment among workers. The coefficient of the variable is positive and statistically significant indicating that the informal workers with high access to improved water tend to join health insurance voluntarily. Finally, the negative and highly significant value of constant indicates that if all of the predictors are evaluated at zero, the predicted probability of an informal worker to be self enrolled will be extremely low.

On the whole, the specified models show the good fit of data. The sets of results reported in Tables 9.9, 9.10, 9.11 and 9.12 are consistent with most results in previous literature (i.e. Asenso-Okyere et al., 1997; Banighausen et al., 2007 and Onwujekwe et al., 2010). In addition, the directions of the most of the coefficients are as anticipated, and the significance of the models, as indicated by Pesudu R^2 and LR Chi^2, is quite solid in the face of modest changes in the samples used.

10. The results of qualitative analysis

Before delving in the results of the qualitative analysis, it is very useful to introduce some facts on health insurance coverage in Kassala and Khartoum States. According to available statistics, 41% and 76% of the total population in Kassala and Khartoum are covered by health insurance services. Of those who insured in Kassala State, 17% choose the contributory enrolment, while in Khartoum this category of enrollees reaches 22%. On the whole, the level of coverage in these two states doesn't resemble the level observed at the national level which accounted to 55.8% in 2017. Whatever the case is, the progress in insurance coverage seems to be sluggish although the huge efforts have been devoted by health insurance authorities and other stakeholders. To shed some lights on the casual roots of slower progress in health insurance coverage, we conducted qualitative data by interviewing a number of health insurance officials.

The results that were drawn from this branch of analysis ratify those obtained via key informant interviews. For instance, the interviews with health insurance officials in Kassala State reveal

that enrollees in general and informally employed workers, in particular, are not fully familiar with the content of health care services packages presented by NHIF in the form of medical consultancies, medication, drugs and diagnosis (Elamin, interview, September 2018). This unfamiliarity is demonstrated among both insured and uninsured. They further informed that a large sector of enrollees considers health care services served via HINF windows are with lower quality compared to services provided by private providers. Moreover, many enrollees don't know that they are allowed to get these services from the private sector at the expense of NHIF in case insurer fails to offer the needed health care services (drugs, consultancy, surgery,…., etc).

For those who still out of health insurance umbrella, the perception about NHIF and the role it performs is very gloomy to the extent that they are totally indifferent about enrollment. Also, it has been noted that the characteristics of the informal labor such as the lack of organization and the absence of trusted leadership discourage enrollment among informally employed workers (Fakhareldeen, interview, September 2018). For many reasons, including political and tribal disputes, a large segment of informal workers in Kassala State considers local people committees unfair and dishonest body. In the end, they neither enrolled nor money refunded to them. Moreover, many of insured intervene in the description of medication prescribed by physicians because they think the drug is not suitable for their case. For example, the client may suggest to a physician to give him a stronger antibiotic drug although the physician sees that his case doesn't require this type of drug. As consequence, the underlying insured feel unsatisfied with health care offered and, therefore, they may drop in long the long run (Fakhareldeen, interview, September 2018).

The analysis also reveals that the well off informal workers may intentionally prefer not to participate in health insurance scheme believing that the care presented via health insurance windows don't satisfy their health needs. Moreover, it has been reported that there is a significant heterogeneity in health care centers working on conveying health care services to enrollees. In some health centers, particularly those sell services to health insurance authorities, the physicians and other health staffs seem to be not fully monitored. Many of them use to come late and register high rates of absenteeism. Accordingly, people are pushed to claim medical care in health centers with a good reputation, at least from their point of views.

In the end, this situation leads to long queues in many health centers, while other centers left out of clients Elamin, interview, September 2018). Viewing people in queues for a long period of time may paint a bad image about health care services being delivered by the insurer and, therefore, discourage the probable entrants. According to health insurance officials, NHIF intends to buy health care services from other providers including public ones. However, when we ask them about how they can guarantee the quality of services presented? Their answers reveal that at the current stage, no guarantees can be proposed with respect to outside providers.

The interviewees also reveal that many health care seekers violate the prototype protocols approved by health authorities when admit to health care services. They said that patients used to

go directly to specialists rather than admitting to primary care as a first step. This contradicts the medication method being adopted by health insurance according to which patient need to be seen by a primary care practitioner before shifting to higher levels of consultancies (Elamin, interview, September 2018). The dominance of such reversed health seeking behavior, which starts with specialists rather than primary care practitioners, would undermine enrollment in health insurance in the long run. Similarly, the interviews with health insurance official in Khartoum State point to the lack of insurance awareness among both insured and uninsured. The majority of insured seems to be not fully aware of the packages of services given by the NHIF. The uninsured, on other hand, are highly affected by the political propaganda stating that the provision of services such as health and education is simply a duty for ruling government and, thus, should be served without charges. On the whole, the interviewees believe that this is one of the political practices obstructs the health insurance scheme in the country (Ramzi, interview, September 2018).

Indeed, in Khartoum State, the interviews report that one of the reasons that push people to quit enrollment is the poor quality of health care services offered by outside providers, especially public ones. The interviews also show that there are no administrative and bureaucratic complications facing those who wish to enroll. Health insurance administration conducted many campaigns to familiarize people with enrollment procedures. Moreover, in order to heighten the levels of insurance awareness and accelerate the process of application, health insurance authorities open supporting office in each locality. These efforts ease the process of enrollment making the subscription card needs only two days to be issued and handed to enrollees (Ramzi, interview, September 2018). The analysis also indicates the dominance of unevenly distributed health facilities across different geographical cites may contribute negatively to enrollment among unorganized labor. Moreover, the investigation also highlights that some informally employed workers drop out of coverage after recovering from sickness which they may initially insure against (Ramzi, interview, September 2018). This outcome raises red flags alarming for the existence of adverse selection practices in health insurance markets in Sudan.

11. Conclusion and Policy Implications

Despite the fact that the membership of health insurance becomes open to all segments of population in Sudan, however, the rate of penetration remains very low particularly among informally employed workers. With this concern in mind, this study aims at identifying the factors that affect enrolling this category of workers in health insurance in two Sudanese states, namely Khartoum and Kassala.

The study has been based on two types of data sources; quantitative and qualitative. The quantitative data has been collected from 742 informal workers distributed in 11 localities in Kassala and Khartoum States. The data has been classified in four samples, namely the full sample which contains the total data collected from both states, Kassala sample include data collected from Kassala State, Khartoum sample includes data collected from Khartoum State,

and self-enrolled sample containing data on voluntary enrollees in both states. Based on this sampling procedures, four empirical models were formulated, namely Models: full sample, Kassala, Khartoum and self-insured samples. In the full, Kassala, Khartoum models, contributory and non-contributory health insurance enrollees are grouped together with uninsured. The self-insured model, on the other hand, is based on the sample of contributory enrollees. The quantitative data has been analyzed using probit regression econometric technique. The qualitative data has been sourced from key informant interviews with health insurance officials in the two states under consideration. The aim behind collecting such type of data is to explore the probable obstacles that may undermine the enrollment of unorganized labor from supplier's point of view.

The findings from the four models under consideration reveal that the socio-economic, demographic, health and urbanization characteristics of respondents play a critical role in deciding their health insurance status. Specifically, the demographic factors such as age and gender contribute to raising the odds of being insured among the informally employed workers. Similarly, being chronically ill, having high morbidity rates and being frequently hospitalized boost the likelihood of subscribing in health insurance. The results also demonstrate that health insurance awareness and the adoption of appropriate health seeking behavior trigger informal workers' enrollment. However, in model II which is based on Kassala sample, the results show that health seeking behavior is found to be functionless in improving the likelihood of being insured. Interestingly, in the four models estimated, the proximity to health care facilities increases the likelihood of taking health insurance membership. Different from what is comes up with models I, II and III, in model IV, which concerned with the determinants of self enrolment among informal workers, monetary income and schooling are found to have a positive and significant effect on the likelihood of joining health insurance membership. The findings also reveal that, compared to those who reside in rural areas, informal workers residing in urban areas are less likely to be insured.

Interestingly, the results of qualitative analysis completely ratify the results emerge with quantitative analysis. Be not aware of the package of benefits offered by the insurer, adopting inconvenient health seeking behavior and lacking organization contribute negatively in lowering the informal workers participation. In the same way, the heterogeneity of health care services is found to be playing a negative influence on workers' enrollment. The analysis also shows that a large segment of informally employed workers doesn't trust local people committees as an intermediary to the insurer. Moreover, the presence of unevenly distributed health care facilities and poor care being served in some health centers makes workers feel unhappy about enrolling in health insurance programs.

Based on these findings, the study ends with some policy recommendations to improve informal workers' enrolment into health insurance. Specifically, we see that many measures need to be

adopted from those who engage in health insurance equation namely, NHIF and government. The proposed recommendations can be summarized as follows:

1. Awareness of the population towards the benefit of the health insurance should be paid further attention, since the majority of informal workers lack the sufficient knowledge about the health insurance scheme.

2. The inclusion of health insurance and risk-pooling theory in school curricula may enhance the public's knowledge on health insurance benefits.

3. The packages of health benefit offered by health insurance need to be revised in order to extend the coverage to most common sickness and drugs as many participants complain regarding the limited coverage.

4. Unorganized workers such as freelancers should be grouped into organized trade union in order to facilitate their enrolment in the health insurance system.

5. Making all formal transactions to be conditioned by health insurance uptake may raise health insurance membership among informally employed workers.

6. Since the health insurance premium is unified across different regions and population groups, NHIF should work honestly to offer homogeneous health care services across different geographical areas.

7. At the current stage of development, in which Sudan has undergone tough economic downturn, non-contributory health insurance may continue to cover a considerable proportion of population for many years

8. To circumvent the problem of adverse selection, NHIF and other involved insurers should modify their policies by raising the premium for enrollees with a high probability of dropping out.

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Appendix I: Cross tabulation Analysis / Chi square test

1. Relationship between insurance and education

Insurance Status	Highest Level of Education						
	illiterate	Khalwa	Primary	intermediate	Secondary	tertiary	Total
uninsured	71	51	117	37	116	39	434
	16.36	11.75	26.96	8.53	26.73	8.99	100.00
Insured	53	37	89	22	65	41	308
	17.21	12.01	28.90	7.14	21.10	13.31	100.00
Total	124	88	206	59	181	80	742
	16.71	11.86	27.76	7.95	24.39	10.78	100.00

Pearson chi2(6) = 6.6760 Pr = 0.352

2. Relationship between insurance and household size

Insurance status	Household Size			
	1-3	**4-7**	**More than**	**Total**
Non-insured	61	229	144	434
	14.06	52.76	33.18	100.00
Insured	44	155	109	308
	14.29	50.32	35.39	100.00
Total	105	384	253	742
	14.15	51.75	34.10	100.00

Pearson chi2(2) = 0.4721 Pr = 0.790

3. Relationship between insurance and respondents age

Insurance status	Age of Respondent					
	Less than 30 years	31-40	41-50	51-64	More than 64 years	Total
Non-insured	77	120	138	78	21	434
	17.74	27.65	31.80	17.97	4.84	100.00
Insured	23	67	82	90	46	308
	7.47	21.75	26.62	29.22	14.94	100.00
Total	100	187	220	168	67	742
	13.48	25.20	29.65	22.64	9.03	100.00

Pearson chi2(4) = 48.6274 Pr = 0.000

4. Relationship between health insurance and household income

Insurance status	Monthly Income						
	Less than 500 SDG	500-1499 SDG	1500-2499 SDG	2500-3499 SDG	3500-5000 SDG	More than 5000 SDG	Total
Non-insured	8	37	78	134	78	99	434
	1.84	8.53	17.97	30.88	17.97	22.81	100.00
Insured	6	25	56	98	64	59	308
	1.95	8.12	18.18	31.82	20.78	19.16	100.00
Total	14	62	134	232	142	158	742
	1.89	8.36	18.06	31.27	19.14	21.29	100.00

Pearson chi2(5) = 1.9740 Pr = 0.853

5. Relationship between health insurance and chronic disease

Insurance status	Chronic Disease Status		
	Chronic	**No-chronic**	**Total**
Non-insured	365	69	434
	84.10	15.90	100.00
Insured	176	132	308
	57.14	42.86	100.00
Total	541	201	742
	72.91	27.09	100.00

Pearson chi2(1) = 66.2893Pr = 0.000

6. Relationship between health insurance and number of admission to health care

Insurance status	Number of admission					
	0	1	2	3	4	Total
Non-insured	16	44	62	90	222	434
	3.69	10.14	14.29	20.74	51.15	100.00
Insured	4	21	33	39	211	308
	1.30	6.82	10.71	12.66	68.51	100.00
Total	20	65	95	129	433	742
	2.70	8.76	12.80	17.39	58.36	100.00

Pearson chi2(4) = 23.9271 Pr = 0.000

7. Relationship between Health Insurance and Type of Job

Insurance status	Type of employment		
	Wage employment	**Self employment**	**Total**
Non-insured	181	253	434
	41.71	58.29	100.00
Insured	150	158	308
	48.70	51.30	100.00
Total	331	411	742
	44.61	55.39	100.00

Pearson chi2(1) = 3.5686 Pr = 0.059

8. Relationship between health insurance and insurance awareness

Insurance status	Aware of importance of health insurance		
	yeas	No	Total
Non-insured	297	137	434
	68.43	31.57	100.00
Insured	290	18	308
	94.16	5.84	100.00
Total	587	155	742
	79.11	20.89	100.00

Pearson chi2 (1) = 72.1284 Pr = 0.000

9. Relationship between health insurance and Suitability of health insurance premium

Insurance status	Suitability of health insurance premium			
	High	Suitable	Low	Total
Non-insured	206	204	24	434
	47.47	47.00	5.53	100.00
Insured	190	114	4	308
	61.69	37.01	1.30	100.00
Total	396	318	28	742
	53.37	42.86	3.77	100.00

Pearson chi2 (2) = 19.5720 Pr = 0.000

Appendix 2: Descriptive Statistics of the Variables Used in the Regression Analysis

Variable	Definition	Mean	Std. Dev.
Insurance	Dummy Variable (1= if has health insurance and 0= otherwise)	0.415	0.493
Income	Household income in SDG	4.213	1.298
Wealth	Wealth, measured by number of room in households	3.050	1.493
Household size	Number of household' members	6.670	3.095
Age	Age of respondent	45.570	12.663
Male	Gender of the head of household (1 = male; 0 = female)	0.868	0.339
Married	Dummy, (1= married; 0= otherwise)	0.849	0.358
Dependency	Number of dependents	1.206	1.203
Urban	Dummy variable (1= urban, 0= rural)	0.671	0.470
Schooling	Number of years of schooling completed	6.908	4.934
Wage employment	Dummy variable (1= wage employment, 0= otherwise)	0.446	0.497
Health expenditure	Out of pocket health expenditure	0.332	0.471
Chronic	1= if reports a chronic disease and 0= otherwise	0.271	0.445
Morbidity	Times of a admission to health care providers	3.199	1.125
Being hospitalized	Times the respondent being hospitalized	0.395	0.489
Health insurance awareness	Recognizing the importance of health insurance	0.791	0.407
Health seeking behavior	Place to seek medication first	0.942	0.234
Proximity	Proximity to health care providers	0.065	0.246
Water	1= if have access to piped water and 0= otherwise	0.729	0.445