

FACTORS AFFECTING OUT OF POCKET HEALTH CARE EXPENDITURE  
AMONG SUDANESE HOUSEHOLDS

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บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)  
เป็นแฟ้มข้อมูลของนิสิตเจ้าของวิทยานิพนธ์ที่ส่งผ่านทางบัณฑิตวิทยาลัย

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ารวิเคราะห์ปัจจัยที่มีผลต่อค่าใช้จ่ายด้านสุขภาพของครัวเรือนในประเทศชูดาน

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต

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การมีสุขภาพที่ดีเป็นสิทธิของมนุษยชาติ แต่ค่าใช้จ่ายจริงที่ประชาชนต้องจ่ายเองนั้นเป็นปัจจัยที่สร้างความขัดสนให้กับประชาชนในประเทศชูดาน งานวิจัยเรื่องนี้มีวัตถุประสงค์เพื่อระบุปัจจัยที่มีผลกระทบต่อค่าใช้จ่ายจริงของประชาชนสำหรับการรับบริการทางสุขภาพประเภทต่าง ๆ และค่าใช้จ่ายเกี่ยวกับการดูแลสุขภาพโดยรวม ข้อมูลที่ใช้ในงานวิจัยเป็นข้อมูลทุติยภูมิจากการสำรวจเรื่องการใช้สิทธิและค่าใช้จ่ายเกี่ยวกับบริการทางสุขภาพของครัวเรือนในประเทศชูดานในปี ค 2010 .ศ.ที่ทำการเก็บข้อมูลจาก พลวิจัยจำนวน 15,000 คนจาก 75,184 1 น โดยการวิเคราะห์แบบถดถอยสองประเภทคือครัวเรือ) การวิเคราะห์แบบ OLS (Ordinary Least Square) สำหรับการวิเคราะห์การดูแลสุขภาพที่ดูราวกับว่าไม่มีความสัมพันธ์กัน และ 2) การวิเคราะห์แบบ Tobit สำหรับการวิเคราะห์การดูแลสุขภาพที่เกี่ยวข้องกันทั้งหมด การดูแลโรคที่โรคเรื้อรัง การดูแลโรคเรื้อรัง การดูแลแบบป้องกัน การดูแลสุขภาพฟัน และค่าใช้จ่ายไม่ใช่โผลการศึกษาแสดงให้เห็นว่าต (เกี่ยวกับสุขภาพในต่างประเทศัวแปรที่มักจะมีผลกระทบในทางบวกต่อค่าใช้จ่ายจริงคือ กลุ่มอายุ ระดับการศึกษา การเป็นหม้าย ความสามารถในการผลิตของที่ดิน อัตราการรักษาของโรงพยาบาล และอัตราการครองเตียงของโรงพยาบาล ส่วนตัวแปรที่มักจะมีผลกระทบในทางลบต่อค่าใช้จ่ายจริงคือ การหย่าร้าง ประเภทของบุคลากรทางการแพทย์ และ รูปแบบจำลองของรัฐ นอกจากนี้ยังพบว่าตัวแปรของค่าใช้จ่ายจริงเกิดจากการรวมค่ารักษาพยาบาลค่าอาหาร ค่าที่พักสำหรับญาติผู้มีส่วนร่วมในการดูแล และค่าเดินทางเข้าด้วยกัน ค่าเดินทางนั้นจะมีอัตราสูงสำหรับการดูแลสุขภาพในทุกรูปแบบ ซึ่งแสดงให้เห็นว่าการกระจายบุคลากรทางการแพทย์และสิ่งอำนวยความสะดวกทางการแพทย์นั้นยังไม่มีความเสมอภาคกัน

สาขาวิชาเศรษฐศาสตร์สาธารณสุขและการจัดการบริการสุขภาพ

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BACKGROUND: Health is a human right yet out of pocket Health expenditure seems to be a factor that impoverishes people in Sudan. OBJECTIVE: This study was conducted to identify factors affecting individual OOP health expenditure for different types of health care and total health care expenditure. METHOD: This is using Secondary data from Sudan Household health utilizations and expenditure survey 2010.a total of 15000 households and 75184 individuals were included in two types of regressions. OLS, seemingly unrelated regression and Tobit were used for all related type of care (non-chronic care, chronic care, preventive care, dental care, and health expenditure abroad) RESULTS: Variables that usually positively impact OOP spending include age groups, education level, widowed, land capacity, hospital rate, bed rate. Variables that usually negatively impact OOP spending include divorce, type of medical personnel as well as some of state dummies. Recall that the OOP variables come from the summation of treatment cost, cost of food, and accommodation for the co patient and transportation cost. Transportation costs seem to be very high for all type of care. This suggests that the distribution of medical personnel and medical facilities is unequal.

Field of Study: Health Economics and Health Care Management  
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Student's Signature ....  
 Advisor's Signature....

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For any errors or inadequacies that may remain in this work, of course, the responsibility is entirely my own.

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## LIST OF ABBREVIATIONS

MDGs	Millennium Development Goals
OOP	Out Of Pocket Health Care Expenditure
SDG	Sudanese Bound
UNDP	Unit Nation Development Program
MOH	Ministry of Health
FFS	Fee for Service
PHCU	primary health care units
DS	Dressing Stations
FMOH	Federal Ministry of Health
SMOHs	State Ministries of Health
CHWs	Community Health Workers
THE	Total Health Expenditure
SHHUES	Sudan household Health Utilization and Expenditure Survey
KAP	Knowledge Attitude and Practice

# CHAPTER I

## INTRODUCTION

### 1.1. Introduction

#### 1.1 Problems and Significance

The financing of health care is a complex issue for policy makers. In many studies, high out-of-pocket spending has been found to further impoverish the poor who have limited income.(Mustafa; and Alsiddiq; 2007) the poor need to divide their low income among basic necessities, including food, shelter and health care and it is possible that health care could lead to catastrophic expenditure for the household. The Millennium Development Goals (MDGs) may be difficult to attain. This is an issue of serious concern and highlights the need for this kind of study.

In recent years there has been concern about whether or not the poor and poorest countries will be able to meet the rising health expenditures. Many scholars, decision makers and politicians have started to doubt whether they can reach the level that cover the needs of their citizen or not, in light of the World Bank's debt sustainability measures and the goals of the millennium, and under the pressure of public debt in their countries.

Sudan as one of the low income countries tries achieving Millennium Development Goals (MDGs) in reducing poverty. Many factors affect health of individuals and communities. Whether people are healthy or not is determined by their environment. To a large extent, factors such as where we live, the state of our environment, genetics, our income and education level, and our relationships with friends and family all have considerable impact on health, whereas the more commonly considered factors such as access and use of health care services often have less of an impact(Mustafa; and Alsiddiq; 2007)

One of the main factors that put people in poverty is catastrophic health expenditure, which is defined as out of pocket health care expenditure (OOP) that exceeds the amount that a family can afford. In this study, factors affecting OOP

payment, particularly household characteristics, will be identified through an econometric estimation. Households' utilization pattern of health care services will also be analyzed. Also this study will investigate different types of health care expenditures for inpatient and outpatient care, chronic diseases, non-chronic disease, prevention care and health expenditure abroad and see if they could all be explained by household characteristics.

Poverty in Sudan is high. In 2012, the consumption of food was below the poverty line (equivalent to 69 SDG) for about 44.8% of the population of North Sudan. The poverty index in rural areas was 55% and in urban areas it was 28%. The Gini coefficient in the year 2012 was estimated at 0.353. The employment rate was 31.06% and the unemployment rate reached 17% for the overall population. For those in the age group of 15-24, unemployment rate was 25.4%. The nutrition situation in Sudan is also poor, characterized by a high number of underweight children and children with chronic malnutrition, as well as persistently increasing levels of acute malnutrition. Nationally, one third (32.2%) of children under five years old in Sudan was severely underweight in 2012(UNDP 2012)

## 1.2. Background

### 1.2.1. *Health and Inequality in Sudan*

*Table I-1 Sudan's main health status indicators in 2008-2013*

Demographic indicators	Ratio
Crude birth rate (per 1000)	37.8
Crude death rate (per 1000)	11.5
Total fertility rate (per woman)	5.9
Life expectancy at birth (years)	56.6
Infant mortality rate (per 1000 live births)	81
Under five mortality rate (per 1000 live births)	112
Maternal mortality ratio (per 100 000 live births)	1107

Resource: World Health Organization 2009: Country Cooperation Strategy for W.H.O. and Sudan 2008–2013

Table I-1 contains main health status indicators in 2008 - 2013. Life expectancy rate was 56.6 years old at birth; it was very low. The crude death rate was 11.5 per 1000 people, which was not high at all. Total fertility rate was 5.6 per woman. So there was decrease in the life expectancy. Also for children - under five years old – the mortality rate was 112 per 1000 population, which was very high

*Table I-2 Sudan's main poverty status indicators in 2009*

<b>Indicators</b>	
Out-of-pocket health expenditure (% of private expenditure on health)	96.17
GINI index	35.29
Income share held by fourth 20%	22.73
Income share held by highest 10%	26.72
Income share held by highest 20%	42.41
Income share held by lowest 10%	2.74
Income share held by lowest 20%	6.81
Income share held by second 20%	11.65
Income share held by third 20%	16.4
Poverty gap at \$1.25 a day (PPP) (%)	5.46
Poverty gap at \$2 a day (PPP) (%)	15.38
Poverty gap at national poverty line (%)	16.2
Poverty gap at rural poverty line (%)	21.3
Poverty gap at urban poverty line (%)	7.1
Poverty headcount ratio at \$1.25 a day (PPP) (% of population)	19.8
Poverty headcount ratio at \$2 a day (PPP) (% of population)	44.14
Poverty headcount ratio at national poverty line (% of population)	46.5
Poverty headcount ratio at rural poverty line (% of rural population)	57.6
Poverty headcount ratio at urban poverty line (% of urban population)	26.5

Source: World Data Bank, 2012

Table 2 contains main poverty status indicators in Sudan in 2009. OOP health expenditure made up a very high percentage of private health care expenditure in

Sudan (around 96%). The Gini coefficient was 35.29, which seems to indicate a relatively equal society. However, the income share held by the richest 20% of the population was 42%. This suggests that the richest 20% had almost half of the nation's wealth. The Gini coefficient was relatively low not because there was equality but because most of the population in Sudan was poor; according to the national poverty line, 46% of the population was poor in 2009.

Also table I-2 contains information about poverty headcount ratio in urban areas and rural areas. For rural residents it was about 50%, and, it was over 26% for urban residents. There was also a high level of OOPE (96.17%). This led us to say that for those who live under the poverty line in urban and rural areas are likely to suffer from high OOPE.

### ***1.2.2. Health System in Sudan***

The history of health in Sudan dated back to the Turkish and Egyptian bilateral relations in 1899. All health facilities were directed by army members and the armies built some hospitals. The main responsibility of health facilities was to implement vaccination campaigns against smallpox. In 1905, the Health Council created a central sanitary board. In 1949, the ministry of health was established with the first Sudanese doctor graduating from the first batch of the Kitchener Medical School. The Sudan Ministry of Health (MOH) was later established and was administered under the Health Local Government Act of 1951(EMRO 2006)

The adoption of the federal system started in 1991. Regions were upgraded into nine States that further became 26 in 1994. A single ministry of health and social affairs was founded in each state, although ministries of health and social affairs were separately founded in Khartoum. A new act was provided to manage health care in Sudan under a Fee for Service (FFS) system in order to finance the health sector. Replacing free provision of care by local governments, this new payment mechanism has affected health expenditure among all people and caused more poverty according to out of pocket expenditures for health(EMRO 2006)

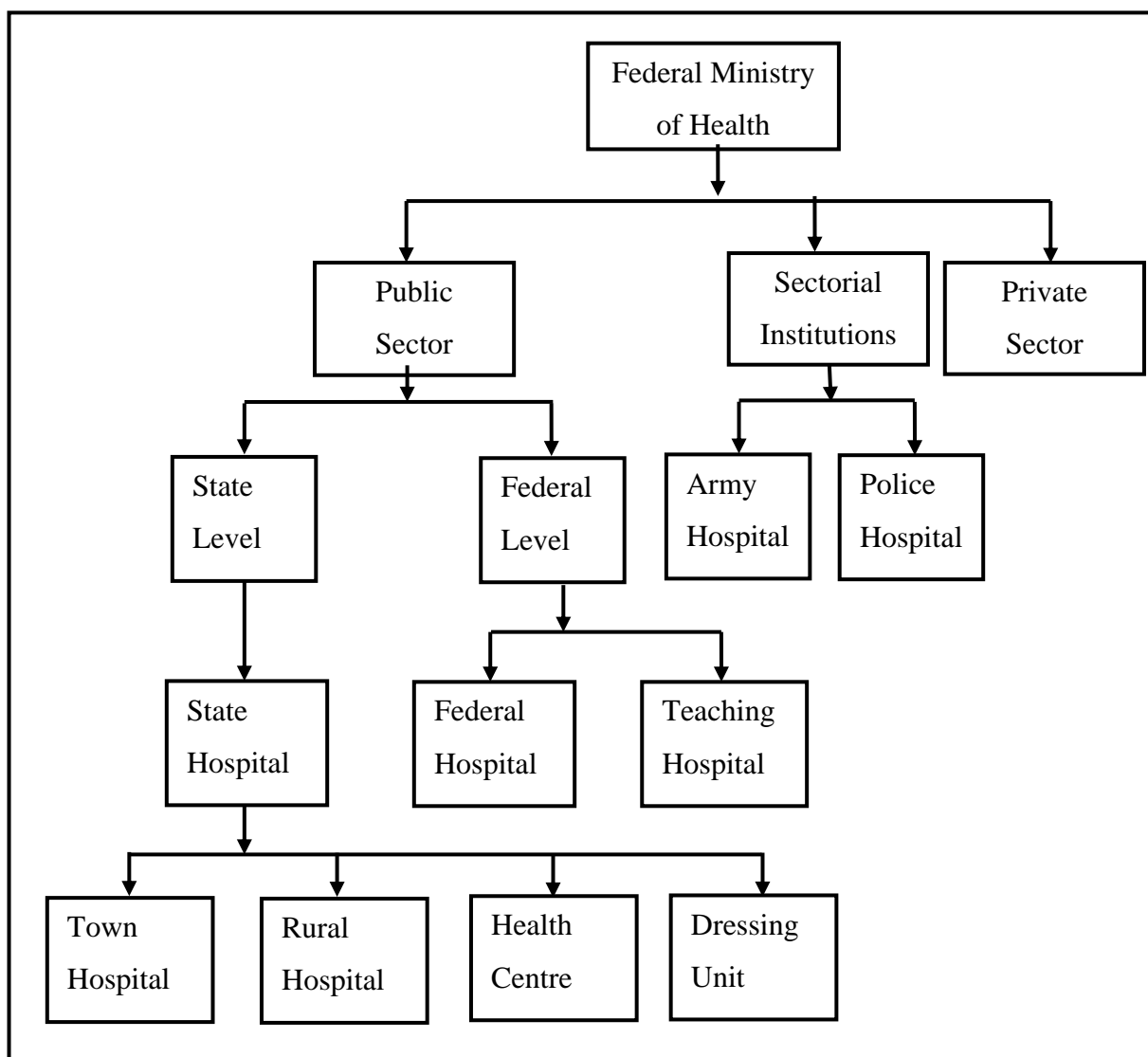


The health system in Sudan is provided in a three-tiered network. Primary health care has been adopted as a main strategy for health care provision in Sudan since 1976 and has been re-emphasized in the National Comprehensive Strategy for Health in 1992 and in the 25-Year Strategic Health Plan 2003-2027.

Primary health care facilities are primary health care units (PHCU), dressing stations (DS), dispensaries, health centers and rural hospitals. In principle, primary health care units (PHCU) are staffed by community health workers (CHWs), dressing stations are staffed by a nurse, and dispensaries are headed by a medical assistant. According to a federal ministry of health (FMOH) document, there has been a recent proposal to upgrade dressing stations and dispensaries to the PHCU level (Observatory 2006). Health center is a referral point for lower-level facilities. It is headed by a physician (medical officer) and managed by the localities. Rural hospitals, on average, have a capacity of 40 to 100 beds and are managed by state ministries of health (SMOHs).

Providing tertiary care, tertiary hospitals, including teaching, specialized, and general hospitals, are located in State capitals and are operated by the state ministry of health's (SMOHs). In addition, the federal ministry of health (FMOH) operates 21 tertiary-level hospitals and specialized centers. (Observatory 2006)

Figure I-1: Health system in Sudan



Source: Author

### 1.2.3. Sudan health care expenditure at the national level

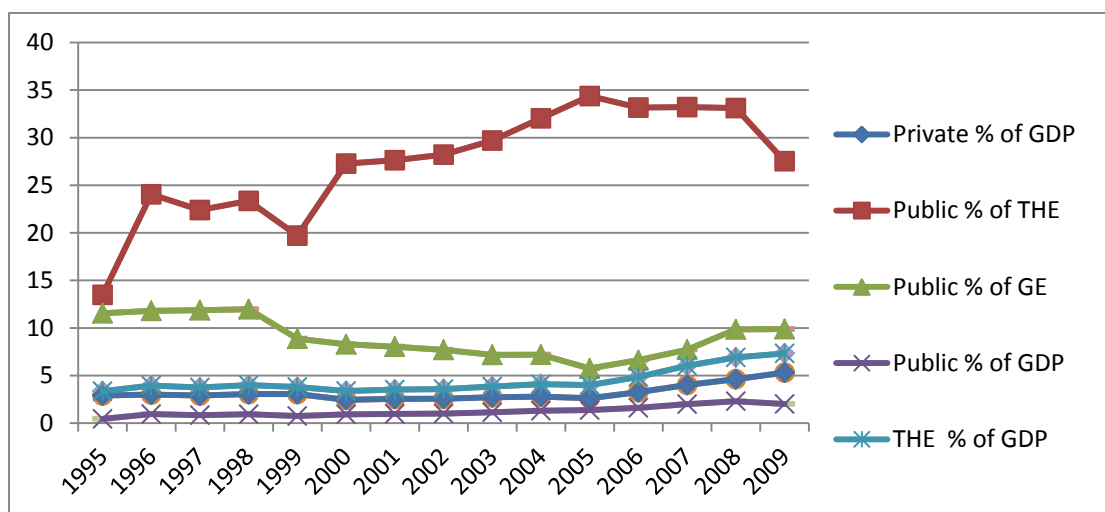
At the national level, health expenditure consists of recurrent and capital spending. Capital spending refers to spending on infrastructure and the establishment of medical facilities. It is financed by a mix of public and private spending, donations, social health insurance and philanthropists. Recurrent expenditure is comprised of out of pocket (OOP) expenditure, health insurance (social and private) premium, and a contribution from family, employers, friends, neighbors and philanthropists. The biggest item for recurrent expenditure is the out of pocket spending.

*Table I-3 Sudan health expenditure as a percentage of GDP in 1995 - 2009*

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Private % of GDP	2.91	3	2.91	3.06	3.05	2.45	2.55	2.57	2.71	2.79	2.62	3.25	4.02	4.62	5.31
Public % of THE	13.48	24.04	22.4	23.35	19.71	27.27	27.63	28.21	29.69	32.04	34.37	33.17	33.22	33.12	27.52
Public % of GE	11.55	11.8	11.86	11.97	8.87	8.29	8.04	7.69	7.17	7.2	5.74	6.62	7.71	9.85	9.89
Public % of GDP	0.45	0.95	0.84	0.93	0.75	0.92	0.97	1.01	1.14	1.31	1.37	1.61	2	2.29	2.01
THE % of GDP	3.36	3.95	3.75	3.99	3.8	3.37	3.52	3.58	3.85	4.1	3.99	4.86	6.03	6.9	7.33

Source: World Health Organization National Health Account database 2013

Figure I-2 Sudanese health expenditure as a percentage of GDP



Source: Author.

Table I-3 shows that public health expenditures increased when compared with Total Health Expenditures (THE) during the period 1999-2008 but decreased in the same period when compared with Government Expenditures (GE). It is possible that no additional resource was allocated to the health sector during this period. The contribution of the public sector was also less than the private sector as a percentage of GDP; consistent with the fact that out of pocket health expenditure (OOPHE) was the main source of health expenditure. And according to the Millennium Development Goals (MDGs) health was one of the human rights and the government should prevent its citizen from the effects of the health status that caused poverty.

Table I-4 Sudan - health expenditure

	SDG	US \$
Total Health Expenditure (THE)	7,135,865,890	3,398,031,376
Share of THE from GDP	6%	
Share of out-of-pocket health expenditure from THE	64.3%	
Total out- of – pocket health expenditure	4,585,980,410	2,183,800.195
Per capita out- of – pocket health expenditure	135	71.14
Share of public sector health expenditure from THE	28.90%	
Share of MOH from THE	21.7 %	
Total Government Health Expenditure % of Total GE	8.7%	
Per-capita total health expenditure	232	111
Total Expenditure for curative care.	5,992,264,921	2,853,459,486
Share of curative care expenditure from THE	84%	
Per- capita expenditure on medicine	92.28	43.94
Share of medicine expenditure from THE	39.7%	
Share of medicines from out-of-pocket expenditure	29%	
Total expenditure on PHC & vertical programs	393,260,534	87,266,920
Share expenditure on PHC care expenditure from THE	6%	
Share of Donors expenditure from THE	4.16%	
Share of private sector & out of pocket expenditure from THE	66.94%	

Source: Federal Ministry of Health –Sudan National Health Account 2008

Table I-4 contains information about Sudan Health Expenditure and its components in details. The share of Total Health Expenditure (THE) was very low only 6% of GDP. Also, even that the curative care expenditure was almost high, but the spending in primary health care was very weak. The share of OOP from THE was almost 64.3 % or around, US \$71.14 per capita, which was surely high and proved that it was important component of health expenditure. Other components of the share of private sector in Total Health Expenditure (THE) was only 2.64% of THE. If we

consider the spending on medicine, more than one-quarter (29%) was OOP expenditure. Here we can say that overall the main component of the health care expenditure came from OOP.

#### ***1.2.4. National Health Insurance Fund***

According to Mohamed (2007) the Law of Health Insurance was formulated in 1994. And the Health Insurance Law was introduced by government to provide secures treatment to all residents in urban areas and rural areas. Through this law, the government has addressed Sudanese health needs with the provision of a Health Insurance Card. This card is a national pledge to spread medical care and affordability. Health equality had been insured through the easy availability of medical services for the insured members (Mohamed 2007).

Health Insurance has been introduced as an alternative option to overcome the drawbacks of payment at the point of service delivery, which emerged from health financing reform: user charges. Examples of drawbacks of user charges are the inability to pay and low revenue generation. Health Insurance Scheme (HIS), therefore, aims to promote equity in the access to health facilities, to improve the quality of curative medical services and to raise revenues for the health sector in Sudan. According to the Health Insurance Scheme Act of 2001 paragraph (7), all active individuals in both formal sectors (all employees of public and private sectors) and informal sectors should be insured (i.e. Health Insurance is compulsory according to this Act). The family of an insured person is included, and enjoys benefits from the insurance plan with the same premium. The family includes the wife, siblings, father and mother (Mohamed 2007).

Government resources have been made available for funding the public provision of health services at the state and locality levels. They basically include allocations from higher levels of government and the local government's own revenues. At State level this means

- 1) The portion allocated by the State government from federal block transfers as well as own state revenues.
- 2) Any earmarked transfers for health activities from the federal level
- 3) And user fees retained in or earmarked for the health sector.

This also includes payment for services by the National Health Insurance Fund, private insurance companies and Zakat, and National Health Accounts 2008 (FMOH 2011). Similarly, at locality level the sources are 1) budget allocation from the locality budget which is based on transfers from the state level as well as locality own revenues, 2) any earmarked transfers from the state or federal level for health activities and 3) any user fees retained in or earmarked for the health sector(EMRO 2011).

All states rely on the amount allocated from federal government and its own revenues from tax and user charge. The States actual revenues have increased significantly over the period 2006-2009 with an average annual growth rate of 8.7%. While the structure of the resource has shifted in the years 2000 up to 2006 with an increasing in importance of the federal transfers, the federal transfers have consistently contributed around 62% of the resource for the period 2006-09 (EMRO 2011).

As more resources have become available, state spending had increased. Furthermore, over the period 2006-09 the growth has been higher in developing infrastructure expenditures than in current expenditures resulting in a shift in the composition of expenditures from current expenditures accounting for 68% of expenditures in 2006 to 61% in 2009. Health expenditures in the Northern states in total as a percentage of aggregated spending have varied between 9 % and 11% since 2001 with no clear trend. This suggests the health sector has benefited in line with the overall growth in resource availability (EMRO 2011)

### ***1.2.5. Providing Healthcare Mechanism in Sudan***

In Sudan there are many providers and purchasers of the health services. The main provider of health services is the Ministry of Health through public hospitals and health centers in the level of federal, state and localities. The ministry of health (MOH) provides care at the primary and secondary and tertiary level. National Health Insurance Fund also provides health care through its own health centers as direct provision of health services; NHIF provides primary and secondary care. The Military and police sectors through their own hospitals provide health services to their personnel. The private sector provides secondary and tertiary health services, as do some NGOS health facilities and the Universities through many university hospitals (EMRO 2006).

### **1.3. Research Question**

What are household and individual characteristics that affect individual out-of-pocket health care expenditure?

### **1.4. Objectives of study:**

#### ***1.4.1. Overall objective***

To determine the socioeconomic factors affect Out Of Pocket health expenditure of individuals in Sudan.

#### ***1.4.2. Specific objective***

- To identify factors that affect Out Of Pocket health expenditure for various types of health care at the individual level



### **1.5. Scope:**

This study will be based on the Sudan household Health Utilization and Expenditure Survey (SHHUES). This survey was conducted as part of Knowledge Attitude and Practice (KAP) in 2010 and took place in 15 states. The sample taken from each state was equal to 1000 households, and the total number of individuals in this survey was equal to 75184 persons. The unit of analysis is the individual.

### **1.6. Research hypotheses**

- Household and individual characteristics do not affect out of pocket health care expenditure.
- Household and individual characteristics impact different types of health care expenditure, including for inpatient, chronic disease, non-chronic disease, preventive care as well as health expenditure made outside the country differently.

### **1.7. Possible benefits**

The benefits of this study can be summarized as follows:

- To understand how individuals purchase different type of health care
- To understand the households' care utilization the pattern of healthcare spending.
- To identify household characteristics that impact based on healthcare expenditure.

The government can have an idea about how much they should subsidize in order to reduce the burden of out-of-pocket expenditure on household. In addition this study will also allow the government to identify main health problems in the country in order to come up with appropriate health interventions and to meet people's demand for health care services.

## **CHAPTER II LITERATURE REVIEW**

### **2.1. Literature review**

#### **2.1.1. Expenditures**

Health care expenditure has been studied at many levels (national versus state versus individuals) and in many countries. In Sudan, the Federal Ministry of Health (2011) used Sudan Household Health Utilization & Expenditure Survey in Northern States 2009, and published a report. There were many key points to be considered. The main conclusion in this report was that Out of Pocket (OOP) was the main source for healthcare expenditure, followed by Health Insurance (HI), contribution from relatives, debt, and sold assets respectively. They reported about 42% of per capita (OOP) health expenditure was spent at the primary health care level (PHCL). Females had more spending in PHCL than males, residents in urban areas more than those in rural areas. Spending on chronic diseases, dental care and acute morbidity was more concentrated in urban areas, implying that there was an increase in outpatient diseases that come with an improved standard of living. The main causes of were malaria and respiratory disease and they were registered in episodes declarations in inpatient care among all residents. Hypertension and diabetes were the highest type's chronic diseases among population in the high wealth quintile, and malnutrition was high among the lowest quintiles. The information collected about abroad treatment was not enough to give representative conclusions(SFMoH 2011).

Onoka (2010) measured catastrophic health care expenditures in Nigeria, with implications for financial risk protection. They used data collected from 1128 households (4988 individuals) between January and June 2008. Households were randomly selected from Local Government Areas in Enugu and Anambra states, Southeast Nigeria (one rural area and one urban area in each state). Diaries were used to gather information on illness, expenditure on health, transportation, food, education, entertainment, clothing, cooking and fuel over a one month period. Diary

entries were supervised by trained field workers and replaced weekly. Beginning with variable threshold levels of 5% and 40%, ratios of food expenditure of different socioeconomic status groups were used as weights to determine the levels of catastrophe appropriate for various socioeconomic status groups. They reanalyzed these data classifying household into thresholds. They found that the level of catastrophic expenditures is 45% for the poorest households and 12% for the richest households. The percentages of richest and poorest households facing catastrophic health care expenditures are 8% and 43% respectively. The poorest experience catastrophic healthcare expenditure 5.6 times more than the least poor (Onoka, Onwujekwe et al. 2010).

Catharina (N.D.) considered household health expenditure in Zambia. She used the data from the “Living Conditions Monitoring Survey (LCMS) 1998. This survey was collected to capture living standards of households and persons in areas of education, health, income sources, etc. The (LCMS) covered 16710 households with a sample fraction 1 household per every 113 households. It covered 8487 household in rural areas and 8223 households in urban areas. She used Probit and OLS regression models. Total health care expenditure is the independent variable. For the explanatory variables, there are three groups: first: household characteristics, second: access variables, and third: component of income. In her conclusion, she admitted that not all variables are significant. However, different poverty groups are more sensitive to levels of healthcare expenditure compared to the richest. She concluded also there is no any equality in distributions of facilities (Hjortsberg nd ).

Parker and Wong (1997) used the Mexican National Survey of Income and Expenditures of 1989. They used log expenditures and income capturing possible non-linearity. They found that health expenditure was sensitive to changes in household income, especially in low income uninsured group. Despite the government’s efforts from to make health care available to low-income uninsured people still had to pay for health care more than those in the upper income and insured

group. There is a limitation of the study; they are unable to observe the health care needs of the household members(Parker and Wong 1997).

Monda, et al (2010), studied catastrophic out of pocket payment for health care and its impact on households. They used a survey of 3150 households with 15277 individuals selected during the survey in West Bengal, India in 2007. The survey contained various categories of health expenditure data, hospitalization care, childbirth, outpatient and chronic illness respectively. All the information was collected at the last time of reported morbidity. Household health care expenditure was defined as the out-of-pocket expenditures on drug and medicines, consultation fees, hospital bed charges, transport charges to the treatment site and daily leaving cost, including food and lodging for the escorts of the ailing household member. They used multivariate logistic regression models in analyzing data The Output of the study can be summarized as: 1) There were catastrophic health expenditures for minor illness and 2) health expenditures even for minor ailments had an impact on the households, the current food consumption, and children's education, chronic illness, hospitalizations, and institutional birth deliveries were main factors leading to catastrophic expenditure (Swadhin Monda, Barun Kanjila et al. June 2010).

Ke Xu et al (2006) analyzed Kenyan health utilization and accessibility to health services in the past. They used a logistic model, and showed that the Kenyan government needed to deal with problems of access to health care. The population should have also been granted a social insurance, avoiding catastrophic health care expenditure by financing against the cost of illness of all members(Ke Xu, Chris James et al. 2006).

Akinkugbe, Mirriam, Chama-Chiliba, and Tlotlego (2012) used data collected by the Household and Expenditure Survey (HIES) 2002/2003 for Botswana and by the Household Budget Survey (HBS) 2002/2003 for Lesotho. They found that in Botswana the proportion of households facing Catastrophic Health Expenditure was between 11 and 7 per cent for first and second quintile respectively, and the share of

out-of-pocket health spending was about 0.93 per cent. For Lesotho the proportions of those facing Catastrophic Health Expenditure were 3.22 and 1.25 per cent in the first and second thresholds, and the share of out-of-pocket payment in total monthly spending was 1.34 per cent. Also they found from analyses that having at least one old household member in Lesotho imposes a higher risk for Catastrophic Health Expenditure; for Botswana gender and education status of household head influence the probability of facing Catastrophic Health Expenditure. In designing health systems, policy makers need to ensure that households are not only able to access health services when needed, but that they are also protected from facing financial catastrophe by reducing out-of-pocket payments(Akinkugbe., Chama-Chiliba. et al. 2012)

Havrda, D. E. et al 2005 determined the impact of new drug discount card and prescription benefits on health care expenditures over low income individuals in Northern Virginia. They used non-randomized sample data for 137 patients. They found there was a decrease in medication expenditures for those enrolled in all programs for all income categories more than those without pharmaceutical assistance. Also they found that persons ineligible for low-income subsidies had a smaller reduction in out-of-pocket costs and variable monthly expenditures; as a result all beneficiaries' from the program realized that the program was a superior savings scheme (Havrda, Omundsen et al. 2005).

Yardim, M. S Cilingiroglu, N. Yardim, N (2010), in their study identified household factors that led to catastrophic health expenditure. They illustrated that the socioeconomic factors that were related with high health expenditures were the head's insurance status, rural residence, having preschool children, and those elderly people and disabled all increasing the risky catastrophic expenditure(Yardim, Cilingiroglu et al. 2010).

Su, Kouyaté, & Flessac (2006) studied catastrophic household health care expenditure in Nouna District, Burkina Faso. They measured and identified the extension of catastrophic household health care expenditure and factors that had a

high response to it. However they used data collected for 800 household in the period 2000 – 2001, moreover, the multivariate logistic regression method was used. Wealth, elderly in the family, one or more member with chronic disease and seeking for modern care were main factor related with catastrophic health care expenditure. The uses of threshold or one cut-off value tend to give an inaccurate estimation leading to misinterpretation of important factors. So far, the poorest in Nouna district more experienced catastrophic health spending (Tin Tin Su, Bocar Kouyaté et al. 2006).

### **2.1.2. Subsidies**

Elisa C. T. Cabrera (2010) studied the system of subsidies in Colombia. The subsidies dated back to 1990's and they created General System of Social Security in Health with two levels. The contributive regime was for the richest people who can pay for their healthcare and the subsidized system for the poor. The beneficiaries of both schemes have the right to access similar benefit package, but beneficiaries of the contributive regime enjoy additional services. Also, the government provides national equalization scheme for all people in the country without any kind of discrimination. The subsidies of health insurance scheme should be targeted to the poor and informal workers. The selection of the poor and informal workers for subsidies will be under certain test

Liebman and Zeckhauser (2008) tried to analyze the situation of health and system subsidies, considering gained from the subsidies. As a conclusion, they argued that health subsidies should be equal according to the need of people. The government needs to determine the measurement that can be used in the subsidies of poor and employers and put it as a contract for them (Jeffrey Liebman and Zeckhauser 2008).

Jack (2008) argued that the government always wants to maximize the welfare of its population. And under optimal conditions, the government should maximize the total taxation revenues, and should calculate the optimal amount using the Lagrange multiplier to find out the optimal taxation revenue. Additional amount can be

collected as individual income increase. He argued further that the amount of taxes assigned to health expenditure subsidies should be equal to the lump-sum tax plus the positive marginal health expenditure. These subsidies can be useful to redistribute the revenue and should be only to those with low-income. Tax treatment of health expenditure depends on the consumption of health and is correlated with health status, income, an elasticity of demand for health care and supplies of labor (Jack 2008).

Bernell (2012) studied the relationship between food subsidies and health care expenditures. He argued that those who have high weight consume more health care exactly the costly services. They are more likely to get diseases and bad health conditions, including but not limited to the following: hypertension; type 2 diabetes; coronary heart disease and stroke. These subsidies will increase health expenditure. (Bernell 2012)

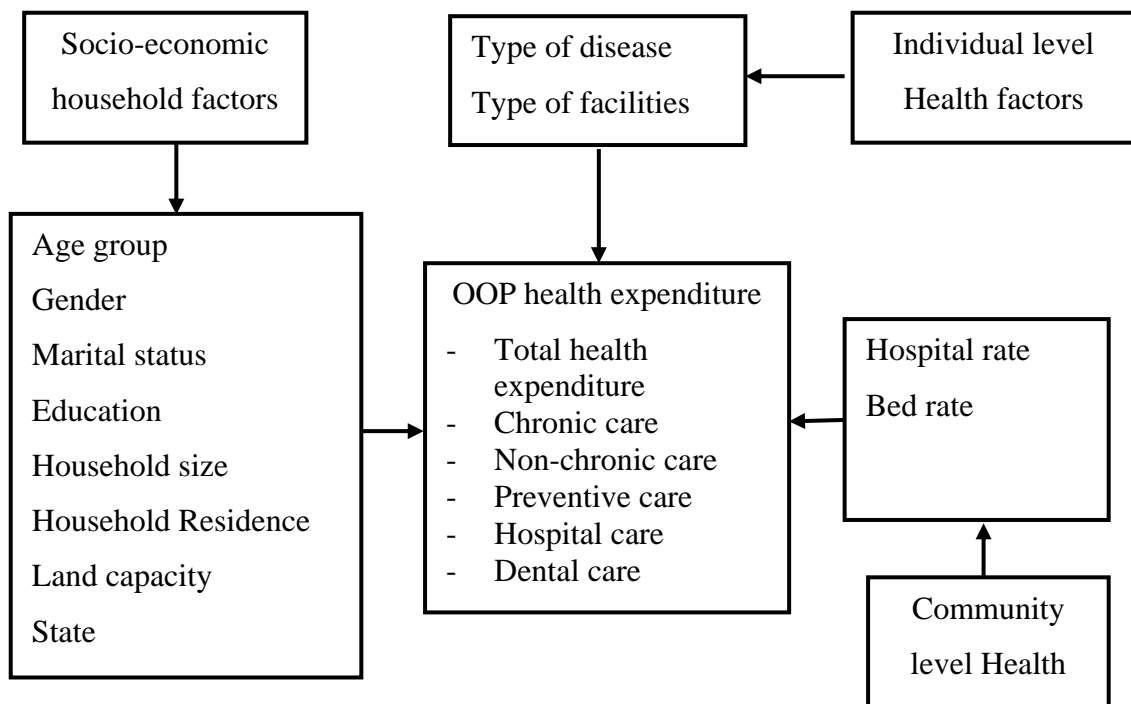
Makinen and et al (2000) studied equity in the financing of social security for health in Chile and they argued that since 1990's health care spending has been increasing by more than 100 %. Decision makers were targeting subsidies to the public by creating and introducing public insurance. They found that in the calendar of the year 1995 subsidies were targeted to the indigent and low-income beneficiaries and did not cover those who had private insurance. Higher- income beneficiaries benefited from the program as well as low-income beneficiaries and the providers in public sector delivered health care as needed without looking to the contributions of the patients. However, these subsidies will be more significant if the coverage is compulsory for all workers (Makinen, Waters et al. 2000)

## CHAPTER III RESEARCH METHODOLOGY

### 3.1. Conceptual framework

This study includes urban and rural residents and tries to assess factors that affect health expenditure according to different types of diseases and services as well as other related expenditure like transportation, the expense for the co-patient (the care taker) and other indirect health expenditure.

Factors that may affect OOP spending in the study include health situations, age group, marital status, education level, household size, urban or rural residents state residence, wealth quintile, and land capacity all of which represent the socio-economic situation of the individuals. There are also health factors that have an effect on health expenditure too. They include type of disease, type of facilities, hospital rate, bed rate, doctor's rate, pharmacist rate, dentist rate, medical assistant rate, and other health workers rate





## **3.2. Research design**

This study is based on one year data the data I use in this research the Sudan Household Health Utilizations and Expenditure Survey 2010. The survey took place in all Sudan north state (15 states) in 2010 coming from 15000 households, 75184 individuals responded the survey and answered about their health status, how they utilized health facilities and how much they spent for the services.

### **3.2.1. Data source**

The secondary data used in this study is Sudan Household Health Utilizations and Expenditures Survey 2010. The Household survey was conducted in three rounds to see the effect of seasonality on the impact of disease and how people utilize the health facilities in the same year. Note that because the data were collected in the same year and information of the same person does not vary too much, no panel data analysis will be conducted in this study.

The survey has been conducted as part of Knowledge Attitude and Practice (KAP) to assess the situation of expenditure on health care. Survey tools are based on the models and standards developed by the global MICS project, to collect information on the situation of utilizing and spending in different type of care in 15 states.

The survey contains healthcare expenditure data for various categories of treatment like hospitalization care, outpatient care, birth delivery and chronic illness etc. The reference period however is different for each of the cases, i.e., the recall period of a year is for both hospitalization care and childbirth; three months for outpatient care and a period of one-month for chronic illness. Chronic illness is defined as a condition that is long-lasting (e.g. More than 3 weeks and in many cases lifelong), which needs to be managed on a long-term basis. All information is based on the last episode of illnesses (reported morbidity). Household health care expenditure is defined as the out-of-pocket expenditures on drug and medicines, consultation fees, hospital bed charges, transport charges to the treatment site and daily leaving cost, including food and lodging for the escorts of the ailing household member.

Questionnaires were designed and divided into many sections covering areas such as demographic and socio-economic characteristics; Outpatient curative health care for chronic diseases and acute diseases; Hospital admission; Dental care; Health insurance status; Preventive health care; Expenditure on medical equipment; Household monthly and annual general expenditure and income from different sources and the mechanisms adopted by the households when faced with the OOP expenditure on health care.

*Table III-1 the number of households in rural and urban area 2008*

State	Total Household	Urban Household	Rural Household	Urban Household (%)	Rural Household (%)
Northern	117,743	19,593	98,150	17%	83%
River Nile	200,032	54,334	145,698	27%	73%
Red Sea	258,058	109,096	148,962	42%	58%
Kassala	321,188	85,079	236,109	26%	74%
Alghadarif	239,590	64,840	174,750	27%	73%
Khartoum	871,142	693,974	177,168	80%	20%
Alghazeira	592,781	108,660	484,121	18%	82%
White Nile	300,071	93,765	206,306	31%	69%
Sinnar	222,293	47,303	174,990	21%	79%
Blue Nile	145,723	34,947	110,776	24%	76%
Northern Kordofan	543,956	94,228	449,728	17%	83%
Southern Kordofan	240,358	53,299	187,059	22%	78%
Northern Darfur	373,060	59,983	313,077	16%	84%
Western Darfur	270,688	43,272	227,416	16%	84%
S. Darfur	693,452	144,473	548,985	21%	79%
Total	5,763,195	1,766,829	3,996,372	31%	69%

Source: Sudan 5<sup>th</sup> Census 2008

Table III-1 describes the number of households in rural areas and urban areas as shown in Sudan 5<sup>th</sup> census in 2008. This table shows that all states are more rural

than urban, except Khartoum where almost all areas are urban, and to somehow Red Sea state where it's half and half. Overall the country is mainly rural with 69% of the population being rural resident. In most developing countries, people are concentrated in rural areas but the governments provide health services in mainly urban areas. This may impact health expenditure among the rural residents as they have to pay for transportation, pay for the treatment, and his or her co-patient (care taker). It may reduce the utilization rate of rural residents.

*Table III-2 the number of households in SHHUES by state and mode of life*

State	# of HH sampled	Urban	Rural	Total sample Individual	Percentage of sampled HH
Northern	1000	1,550	3,188	4,738	0.85%
R. Nile	1000	1,513	3,312	4,825	0.50%
R. Sea	1000	1,687	2,648	4,335	0.39%
Kassala	1000	1,626	2,833	4,459	0.31%
Algadareif	1000	1,736	3,333	5,069	0.42%
Khartoum	1000	3,416	1,530	4,946	0.11%
Algazeira	1000	1,718	3,695	5,413	0.17%
W. Nile	1000	1,657	3,440	5,097	0.33%
Sinnar	1000	1,687	3,781	5,468	0.45%
B. Nile	1000	1,803	3,485	5,288	0.69%
N. Kordufan	1000	1,690	3,281	4,971	0.18%
S. Kordufan	1000	1,955	3,769	5,724	0.42%
N. Darfur	1000	1,883	3,475	5,358	0.27%
W. Darfur	1000	1,649	2,715	4,364	0.37%
S. Darfur	1000	1,747	3,382	5,129	0.14%
Total	15000	27,317	47,867	75,184	0.02%

Source: author

Table III-2 provides information about the sample taken in the survey of 2010. It provides information about how much the sample is taken from every state and gives a picture of the distinction between rural areas and urban areas. The total number of individuals is different between the states. The percentage of the sample is less than 1% in all states. Even it is a very small percentage but the total number is quite enough for the analysis.

### 3.3. Data summary:

#### 3.3.1. Variables used in the analysis:

The dependent variables are out of pocket health expenditures (OOPHE) on different type of care. Different regressions will be run on 1) total OOP expenditure, 2) inpatient care OOP expenditure (hospitalization), 3) chronic care OOP expenditure, 4) non-chronic care OOP expenditure, 5) preventive care OOP expenditure and 6) dental care OOP expenditure

No.	Variables	Abbreviation	Meaning of the variable
1	Total Out Of Pocket health expenditure	TOOP	The amount of money that patient or household spent on receiving different type of health care with additional to expenditure spent on transportation, accommodation and food for the patient and co- patient
2	inpatient care Out Of Pocket health expenditure (hospitalization)	HSOOP	The amount of money that patient or household spent on receiving hospitalization care with additional to expenditure spent on transportation, accommodation and food for the patient and co- patient
3	chronic care Out Of Pocket	CROOP	The amount of money that patient or household spent on receiving health care

	health expenditure		related to chronic disease with additional to expenditure spent on transportation, accommodation and food for the patient and co- patient
4	non-chronic care Out Of Pocket health expenditure	ACOOOP	The amount of money that patient or household spent on receiving health care related to non-chronic disease with additional to expenditure spent on transportation, accommodation and food for the patient and co- patient
5	preventive care Out Of Pocket health expenditure	PROOP	The amount of money that household spent on receiving health care related to immunization with additional to expenditure spent on transportation, accommodation and food for the patient and co- patient
6	dental care Out Of Pocket health expenditure	DNOOP	The amount of money that patient or household spent on receiving health care related to dental disease with additional to expenditure spent on transportation, accommodation and food for the patient and co- patient

Source: author

*Table III-3 The dependent variables*

Variable	Observation	Mean	Std. Dev.
Non chronic care OOP expenditure	75184	5.24	221.54
chronic care OOP expenditure	75184	3.59	83.71
Dental care OOP expenditure	75184	3.40	234.27
Hospital care OOP expenditure	75184	8.94	253.50
Prevention care OOP expenditure	75184	0.91	25.53
Total health care OOP expenditure	75184	24.83	456.83
Health care OOP expenditure abroad	75184	2.75	157.27
Log non chronic care OOP expenditure	75184	0.25	0.96
Log chronic care OOP expenditure	75184	0.11	0.69
Log dental care OOP expenditure	75184	0.10	0.63
Log hospital care OOP expenditure	75184	0.11	0.77
Log health care OOP expenditure abroad	75184	0.00	0.19
Log prevention care OOP expenditure	75184	0.05	0.43
Log total health care OOP expenditure	75184	0.56	1.47

Source: Author

Table III-3 contains information on the dependent variables. According to the data from Sudan Household Health Utilizations and Expenditures Survey 2010, I generated variables from original data to calculate out of pocket expenditure by summing up expenditure for each type of care and deducting from it total subsidies for each type of care I come up with the value in table III-3.

Some features of OOP expenditure in Sudan need to be explained.

1. Negative value of OOP:

When I calculated the OOP from the data of Sudan household health care utilization and expenditure, I found that there are many individuals with a negative value of OOP health care expenditure. But this is not correct and cannot happen

because maybe there was misunderstanding from the patients or the person who interviewed the patients, the question in the questioner was wrong in asking about the subsidies, for example, the question about the insurance in subsidies was very wrong. Here we can ask about the insurance status just and don't include insurance in the subsidies. But if the patient has no insurance and get any kind of subsidies from insurance company they can include this as private sector.

In the regression, negative values of OOP are discarded.

2. The co-patient:-

The data contain information about a person who goes with a patient to help him during his period of treatment; like a case taker, he/she is one of the family members say the patient son, daughter, mother, father, or brother; Sometime more than one and this happen because there's no nursing care in Sudan. So here we include all expenditure for this person as part of the treatment of the patient. Because some family, pay for kind of nursing to take care about their patient.

Independent variables include age, gender, education, household size, marital status, sickness, hospital rate, bed rate, job type of the person who consult, as well as state level variables. Individual and household characteristics are shown in table III-4.

Table III-4 *Independent variables*

Variable	Abbreviation	Type	Obs	Mean	Std. Dev.
Age group (newage =1 if individual age between 16 and 59 years old)	newage	Dummy	75184	0.49	0.50
Gender (male =1)	sex	Dummy	75184	0.49	0.50
Number of people have basic education (primary & secondary)	Basic_education	Dummy	75184	0.53	0.50
Number of people have tertiary education	university	Dummy	75184	0.05	0.22
Resident (urban_ru = 1 if person live in urban areas)	urban_ru	Dummy	75184	0.36	0.48
Marital status (married) (married =1 if person married)	married	Dummy	75184	0.32	0.47
The number of people that lost their partners	widvorce	Dummy	75184	0.04	0.19
Number of people that live in one Kilometer square	landcap	Continuous	75184	43.72	56.60
Number of hospital in the area	hrate	Continuous	75184	1.48	0.83
Number of bed in hospital	bedrate	Continuous	75184	91.03	44.16
The variable is to measure the effect of state (popstate =1 if the person live outside Khartoum)	popstate	Dummy	75184	0.93	0.25
This variable measure the morbidity	dii	condition	75184	0.36	0.48

Source: Author



State level variables are added to the analysis. They are included in table III-5 to table III-8

*Table III-5 Sudan health facilities and population and areas by state*

State	No. Of Hospital	No. Of beds	No. Of PHCU	Population	Land size (Km2)
Northern	28	1128	606	739,272	348,697
River Nile	47	2155	680	1,184,884	124,000
Red Sea	23	884	526	1,476,408	212,800
Kassala	30	1289	632	1,892,749	36,710
Algadareif	34	1370	628	1,425,932	33,622
Alkhartoum	149	6460	1158	5,577,678	28,165
Algazeira	76	4254	1516	3,780,915	23,373
White Nile	33	1039	554	1,830,125	39,701
Sinnar	32	1427	908	1,358,970	40,680
Blue Nile	17	1156	830	879,972	45,844
North Kordufan	29	1934	1232	3,088,996	190,840
South Kordufan	20	1529	156	1,487,295	82,000
North .Darfour	20	1088	752	2,235,192	390,000
West Darfur	9	766	510	1,383,469	796,460
South Darfur	20	1014	856	4,329,040	137,800

Source: Federal Ministry of Health, Annual Health Statistical Report (2010)

Table III-5 shows information about the number of medical facilities and hospital beds as well as the total number of population and total area in every state. I use this information to calculate some variables for my regression analysis later.

*Table III-6 Sudan health care human providers*

	Doctors	Pharmacist	Dentists	Med. Assistant	health workers
Northern	194	24	8	1133	556
R. Nile	246	41	18	1325	898
Red Sea	130	20	1	654	658
Gadarief	249	2	0	1845	957
Kassala	187	19	5	1226	722
Khartoum	1423	156	162	4016	3212
Gezeria	882	23	37	2982	2083
Sinnar	217	20	4	1326	801
White Nile	209	43	8	1469	1281
Blue Nile	102	22	4	611	816
N. Kordofan	261	40	9	2154	2173
S. Kordofan	97	12	1	1216	879
N. Darfour	164	13	6	1051	1074
W. Darfour	45	21	1	642	1148
S. Darfour	135	62	11	780	906

Source: Federal Ministry of Health, Annual Health Statistical Report (2010)

Table III-6 shows the figures of the number of health workers in different fields. It shows how medical personnel were distributed in Sudan. In general, there is no equality in distribution within the country, especially in field of pharmacists and dentists and to some extent for the medical doctors (general practitioner and specialist). The number of medical assistants is very large when compared with medical doctors.

*Table III-7 Total number of populations, hospitals, beds and rate per 100,000*

state	Population	Land size (Km2)	NO. Of hospitals	No. of Beds	Hospital per 100,000	Beds per 100,000	Land capacity
Northern	740,513	348,697	27	1529	3.6	206.5	2
R. Nile	1,186,873	124,000	33	1934	2.8	162.9	10
Red Sea	1,478,887	212,800	16	1156	1.1	78.2	7
Kassala	1,895,926	36,710	16	1039	0.8	54.8	52
Gadarief	1,428,325	33,622	28	1427	2.0	99.9	42
Khartoum	5,587,042	28,165	49	7003	0.9	125.3	198
Gezeria	3,787,263	23,373	66	3711	1.7	98.0	162
White Nile	1,833,197	39,701	29	1289	1.6	70.3	46
Sinnar	1,361,251	40,680	25	1370	1.8	100.6	33
Blue Nile	881,449	45,844	17	884	1.9	100.3	19
N. Kordofan	3,094,181	190,840	28	2155	0.9	69.6	16
S. Kordofan	1,489,791	82,000	19	1128	1.3	75.7	18
N. Darfour	2,238,945	390,000	20	1088	0.9	48.6	6
W. Darfour	1,385,791	796,460	6	766	0.4	55.3	2
S. Darfour	4,336,308	137,800	17	1014	0.4	23.4	31

Source: Federal Ministry of Health, Annual Health Statistical Report (2010)

*Table III-8 Private sector health services 2010*

	Hospital & H. Centers	Beds	Specialists clinics	G. P. Clinic	Dental clinics	Private labs	X- Ray Units	Physiot Pharmacy	Public Pharmacy	Private Pharmacy	Vetrinosy Drug Store
Northern	1	6	27	4	7	29	3	0	0	58	58
R. Nile	15	254	71	18	11	53	21	0	12	82	36
Red Sea	7	194	46	42	10	60	2	1	27	69	26
Gadarief	2	43	30	23	6	35	2	3	15	38	25
Kassala	18	20	45	16	13	117	2	5	5	91	41
Khartoum	99	1696	602	336	0	535	0	0	15	1356	21
Gezeria	10	-	125	85	17	181	13	4	14	199	44
Sinner	8	74	46	34	7	59	4	1	4	63	44
W. Nile	3	201	0	42	9	71	25	1	14	102	49
B. Nile	0	0	11	5	2	12	0	0	0	22	95
N. Kordufan	1	20	72	54	7	69	10	5	3	88	167
S. Kordufan	1	8	5	10	1	8	0	0	4	17	205
N. Darfur	0	0	0	14	4	25	4	0	6	23	88
W. Darfur	3	70	6	0	0	6	1	0	7	16	31
S. Darfur	3	16	24	8	3	40	2	0	4	49	96

Source: Federal Ministry of Health, Annual Health Statistical Report (2010)

### 3.4. Econometric models

Two models will be used in analyzing the data. The first regression is OLS, the second one is Tobit.

#### 3.4.1. Ordinary Least Squares (OLS) model

The first model is Ordinary Least Squares (OLS) model. This model has classical assumptions. In this model we assume that the error term is distributed randomly and the standard error is not a function of the observed variables. The error term has mean 0 and variance  $\sigma^2$ . The dependent and independent variable should have the property of linearity in the parameters (Gujarati 2003). The specification as follows:-

$$\begin{aligned} \text{Log}(\text{HOOPHEij}) = & \beta_0 + \beta_1 * \text{newage}_i + \beta_2 * \text{sex}_i + \beta_3 * \text{basic\_education}_i + \beta_4 * \text{university}_i + \\ & \beta_5 * \text{urban\_ru}_i + \beta_6 * \text{married}_i + \beta_7 * \text{widevorce}_i + \beta_8 * \text{landcap}_i + \beta_9 * \\ & \text{hrate}_i + \beta_{10} * \text{bedrate}_i + \beta_{11} * \text{popstate}_i + u_i \end{aligned}$$

Where HOOPHEij is a continuous measure of household out of pocket health expenditure, where i indicates the individual and j indicates the type of healthcare 1) non-chronic care, 2) chronic, 3) hospital care, 4) preventive care, 5) dental care. Independent variables are in table (III-4) and u is the error term

### 3.4.2. Tobit model

According to Gujarati (2004) Tobit takes the following form

$$Y_i^* = \begin{cases} \beta_1 + \beta_2 X_i + u_i & \text{if } Y_i^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

Where Y is household out of pocket health expenditure, where i indicate the individual and j indicates the type of healthcare 1) non-chronic care, 2) chronic care 3) hospital care, 4) prevention care, 5) health care abroad. Independent variables as in table (III-4) and  $\delta$  is the error term. Here the independent variable is non-negative and the specification is:-

$$HOOPHE_i^* = \begin{cases} \gamma_0 + \gamma_1 * newage + \gamma_2 * sex_i + \gamma_3 * Basic\_education_i + \gamma_4 * university_i + \gamma_5 * urban\_ru_i + \gamma_6 * married_i + \gamma_7 * widevorce_i + \gamma_8 * landcap_i + \gamma_9 * hrate_i + \gamma_{10} * bedrate_i + \gamma_{11} * popsdrfr + \delta_i & \text{if } HOOPHE_i^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

Where HOOPHE is household health expenditure and the independent variables as in table (III-4) and u is the error term.

## **CHAPTER IV RESULTS AND DISCUSSION**

According to the research methodology, 75184 persons were interviewed. Data were collected about their health expenditure for different types of care in 2010. This chapter answers the research question “What are household and individual characteristics that affect individual out-of-pocket health care expenditure?” Two different types of regression were to find out each factor that affects out of pocket health care expenditures. The first one is OLS model and the second is Tobit model. In both of them, log values of the dependent variables are used to capture the relationship between the dependent and the independent variables. The results between the two models are quite similar.

For OLS I also run a seemingly uncorrelated analysis between different types of OOP to see if the error terms of different types of OOP are correlated. But I found that there is no change in the results, so I can say there is no correlation between the error terms. Individuals seem to choose to spend OOP on different types of care independently.

#### 4.1. OLS regressions

*Table IV-1 Total Out of pocket health expenditure*

Source	SS	df	MS	Number of obs	=	27078
Model	11545.61	11	1049.601	F( 11, 27066)	=	268.81
Residual	105683.8	27066	3.90467	Prob > F	=	0
Total	117229.4	27077	4.329483	R-squared	=	0.0985
				Adj R-squared	=	0.0981
				Root MSE	=	1.976

logtoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	0.333163	0.034364	9.7	0	0.265807	0.400519
sex	0.063663	0.024918	2.55	0.011	0.014823	0.112503
Basic_education	0.477237	0.028054	17.01	0	0.42225	0.532223
university	0.626143	0.071421	8.77	0	0.486154	0.766131
urban_ru	0.0138	0.025978	0.53	0.595	-0.03712	0.064718
married	0.655606	0.032708	20.04	0	0.591497	0.719714
widvorce	0.683763	0.057684	11.85	0	0.570699	0.796827
landcap	0.003672	0.000359	10.24	0	0.002969	0.004376
hrate	0.406106	0.057008	7.12	0	0.294367	0.517845
bedrate	-0.00276	0.001104	-2.5	0.012	-0.00493	-0.0006
popstate	0.148269	0.117237	1.26	0.206	-0.08152	0.378059
_cons	0.209683	0.137284	1.53	0.127	-0.0594	0.478768



Table (IV-1) shows the coefficients, standard errors and the significance related to the independent variables from OLS run on the log value of the Total out of Pocket Health Expenditure (TOOPHE).

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the F-value shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on TOOPHE with (33.3 %). For gender (male = 1) the regression shows that there is a positive and significant coefficient. In comparison with the non-educated people, having education and tertiary level will increase TOOPHE by 47.7 % and 62.6 % respectively with a significant p-value. Married people and those who lost their partners have a higher TOOPHE by 65.6 % and 68.4 % respectively compared to single ones. Land capacity will add less than 1% to TOOPHE and the number of hospitals will augment the TOOPHE by 40.6 %. But the number of beds in hospitals will decrease TOOPHE by less than 1%. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) and the dummy showing people living in other states than Khartoum, the regression shows insignificant p-values.

*Table IV-2 Out of pocket health expenditure for non-chronic care*

Source	SS	df	MS	Number of obs	=	27078
Model	611.6715	11	55.6065	F( 11, 27066)	=	26.02
Residual	57850.33	27066	2.13738	Prob > F	=	0
Total	58462	27077	2.159102	R-squared	=	0.0105
				Adj R-squared	=	0.0101
				Root MSE	=	1.462

logacoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	0.09348	0.025425	3.68	0	0.043646	0.143314
sex	-0.00944	0.018436	-0.51	0.608	-0.04558	0.02669
Basic_education	0.185896	0.020756	8.96	0	0.145214	0.226578
university	0.01411	0.052841	0.27	0.789	-0.08946	0.117681
urban_ru	-0.06041	0.01922	-3.14	0.002	-0.09808	-0.02274
married	-0.06012	0.024199	-2.48	0.013	-0.10755	-0.01269
wideworce	-0.04738	0.042678	-1.11	0.267	-0.13103	0.03627
landcap	0.001095	0.000265	4.13	0	0.000575	0.001616
hrate	0.311315	0.042178	7.38	0	0.228644	0.393986
bedrate	-0.00445	0.000817	-5.44	0	-0.00605	-0.00285
popstate	-0.16833	0.086739	-1.94	0.052	-0.33835	0.00168
_cons	0.686176	0.101571	6.76	0	0.487092	0.885261

Table (IV-2) shows the coefficients, standard errors and the significance related to the independent variables from OLS run on the log value of the Out of Pocket Health Expenditure for non-chronic disease (ACOOP).

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the F-value shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on ACOOP with (9.3 %). For gender (male = 1) the regression shows that there is a negative and insignificant coefficient. In comparison with the non-educated people, having basic education will increase ACOOP by 18.6 % and tertiary education insignificant coefficient. Married people will decrease ACOOP by 6% but those who lost their partners the regression shows insignificant relationship with ACOOP compared to single ones. Land capacity will add less than 1% to ACOOP and number of hospitals will increase ACOOP with 31.1 % but the number of beds in hospitals will decrease ACOOP by less than 1%. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) and the dummy people living in other states than Khartoum, the regression shows negative sing and significant p-values.

*Table IV-3 Out of pocket health expenditure for chronic care*

Source	SS	df	MS	Number of obs	=	27078
Model	1855.433	11	168.6757	F( 11, 27066)	=	146.19
Residual	31229.1	27066	1.153813	Prob > F	=	0
Total	33084.53	27077	1.221868	R-squared	=	0.0561
				Adj R-squared	=	0.0557
				Root MSE	=	1.0742

logcroop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	-0.10358	0.01868	-5.54	0	-0.14019	-0.06696
sex	-0.06872	0.013545	-5.07	0	-0.09527	-0.04217
Basic_education	0.090975	0.01525	5.97	0	0.061084	0.120865
university	0.101281	0.038824	2.61	0.009	0.025184	0.177378
urban_ru	0.055644	0.014122	3.94	0	0.027965	0.083324
married	0.452928	0.01778	25.47	0	0.418079	0.487778
wideworce	0.692039	0.031357	22.07	0	0.630578	0.7535
landcap	0.000387	0.000195	1.99	0.047	4.92E-06	0.000769
hrate	-0.1935	0.030989	-6.24	0	-0.25424	-0.13276
bedrate	0.005741	0.0006	9.57	0	0.004565	0.006918
popstate	0.24559	0.06373	3.85	0	0.120677	0.370503
_cons	-0.37001	0.074627	-4.96	0	-0.51628	-0.22373

Table (IV-3) shows the coefficients, standard errors and the significance related to the independent variables from OLS run on the log value of the Out of Pocket Health Expenditure for chronic disease (CROOP).

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the F-value shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a negative effect on CROOP with (10.3 %). For gender (male = 1) the regression shows that there is a negative and significant coefficient. In comparison with the non-educated people, having education and tertiary level will increase CROOP by 9.1 % and 10.1 % respectively with a significant p-value. Married people and those who lost their partners have a higher CROOP by 45.9 % and 69.2 % respectively compared to single ones. Land capacity will add less than 1% to CROOP and the number of hospitals will decrease the CROOP by 19.4 %. But the number of beds in hospitals will increase CROOP by less than 1%. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) and the dummy variable people living in other states than Khartoum, the regression shows positive coefficient by 5.6% and 24.6 % respectively and significant p-values.

*Table IV-4 Out of pocket health expenditure for hospital care*

Source	SS	df	MS	Number of obs	=	27078
Model	278.5142	11	25.31947	F( 11, 27066)	=	16.94
Residual	40446.69	27066	1.494373	Prob > F	=	0
Total	40725.2	27077	1.504051	R-squared	=	0.0068
				Adj R-squared	=	0.0064
				Root MSE	=	1.2224

loghsoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	0.083247	0.021259	3.92	0	0.041578	0.124916
sex	0.000673	0.015415	0.04	0.965	-0.02954	0.030887
Basic_education	0.02615	0.017355	1.51	0.132	-0.00787	0.060167
university	0.01516	0.044184	0.34	0.732	-0.07144	0.101763
urban_ru	-0.02008	0.016071	-1.25	0.211	-0.05158	0.011419
married	0.103362	0.020234	5.11	0	0.063702	0.143023
wideworce	0.051744	0.035686	1.45	0.147	-0.0182	0.121689
landcap	0.001011	0.000222	4.55	0	0.000575	0.001446
hrate	0.113529	0.035268	3.22	0.001	0.044403	0.182656
bedrate	-0.00172	0.000683	-2.51	0.012	-0.00305	-0.00038
popstate	0.062039	0.072527	0.86	0.392	-0.08012	0.204197
_cons	0.100541	0.084929	1.18	0.236	-0.06593	0.267007

Table (IV-4) shows the coefficients, standard errors and the significance related to the independent variables from OLS run on the log value of the Out of Pocket Health Expenditure for chronic disease (CROOP).

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the F-value shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on HSOOP with (8.3 %). For gender (male = 1) the regression shows that there is a positive relationship with HSOOP and insignificant coefficient. In comparison with the non-educated people, having basic education and tertiary level the regression shows that there is a positive relationship with HSOOP and insignificant coefficient. Married people will increase HSOOP with significant P-value and those who lost their partners show insignificant coefficient compared to single ones. Land capacity will add less than 1% to HSOOP and the number of hospitals will augment the HSOOP by 11.4 %. But the number of beds in hospitals will decrease HSOOP by less than 1%. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) and the dummy people living in other states than Khartoum, the regression shows insignificant p-values.

*Table IV-5 Out of pocket health expenditure for preventive care*

Source	SS	df	MS	Number of obs	=	27078
Model	711.8804	11	64.7164	F( 11, 27066)	=	142.17
Residual	12320.86	27066	0.455216	Prob > F	=	0
Total	13032.74	27077	0.481322	R-squared	=	0.0546
				Adj R-squared	=	0.0542
				Root MSE	=	0.6747

logpropoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
newage	0.06754	0.011733	5.76	0	0.044542 0.090538
sex	0.157902	0.008508	18.56	0	0.141226 0.174578
Basic_education	0.034288	0.009579	3.58	0	0.015513 0.053062
university	0.149674	0.024386	6.14	0	0.101876 0.197471
urban_ru	0.005018	0.00887	0.57	0.572	-0.01237 0.022403
married	0.186427	0.011168	16.69	0	0.164538 0.208317
wideworce	-0.05783	0.019696	-2.94	0.003	-0.09643 -0.01922
landcap	0.001008	0.000123	8.22	0	0.000767 0.001248
hrate	0.022807	0.019465	1.17	0.241	-0.01535 0.06096
bedrate	6.26E-05	0.000377	0.17	0.868	-0.00068 0.000802
popstate	0.177581	0.04003	4.44	0	0.09912 0.256041
_cons	-0.31661	0.046875	-6.75	0	-0.40848 -0.22473



Table (IV-5) shows the coefficients, standard errors and the significance related to the independent variables from OLS run on the log value of the Out of Pocket Health Expenditure for preventive care (PROOP).

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the F-value shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on TOOPHE with (6.8 %). For gender (male = 1) the regression shows that there is a positive and significant coefficient. In comparison with the non-educated people, having education and tertiary level will increase PROOP by 3.4 % and 15.0 % respectively with a significant p-value. Married people will increase PROOP by 18.6 and those who lost their partners will decrease PROOP by 5.8 % compared to single ones. Land capacity will add less than 1% to PROOP. Number of hospitals, number of beds in hospitals and urban resident variable (Urban\_ru = 1 if person live in urban areas) the regression shows they are insignificant. For the dummy people living in other states than Khartoum, the regression shows significant p-values with positive effect by 17.8 %.

*Table IV-6 Out of pocket health expenditure for dental care*

Source	SS	df	MS	Number of obs	=	27078
Model	1733.958	11	157.6326	F( 11, 27066)	=	162.77
Residual	26211.06	27066	0.968413	Prob > F	=	0
Total	27945.02	27077	1.032057	R-squared	=	0.062
				Adj R-squared	=	0.0617
				Root MSE	=	0.98408

logdnoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	0.228012	0.017114	13.32	0	0.194468	0.261556
sex	0.03935	0.012409	3.17	0.002	0.015027	0.063673
Basic_education	0.173494	0.013971	12.42	0	0.14611	0.200878
university	0.458504	0.035568	12.89	0	0.388788	0.528219
urban_ru	0.032403	0.012938	2.5	0.012	0.007045	0.057761
married	0.161297	0.016289	9.9	0	0.12937	0.193224
widvorce	0.168602	0.028727	5.87	0	0.112295	0.224909
landcap	0.000645	0.000179	3.61	0	0.000295	0.000995
hrate	0.122905	0.028391	4.33	0	0.067257	0.178552
bedrate	-0.00153	0.00055	-2.78	0.005	-0.00261	-0.00045
popstate	-0.08236	0.058385	-1.41	0.158	-0.1968	0.03208
_cons	0.0053	0.068369	0.08	0.938	-0.12871	0.139306

Table (IV-6) shows the coefficients, standard errors and the significance related to the independent variables from OLS run on the log value of the Out of Pocket Health Expenditure for dental care (DNOOP).

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the F-value shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on TOOPHE with (22.8 %). For gender (male = 1) the regression shows that there is a positive and significant coefficient. In comparison with the non-educated people, having education and tertiary level will increase DNOOP by 17.3 % and 45.9 % respectively with a significant p-value. Married people and those who lost their partners have a higher DNOOP by 16.1 % and 16.9 % respectively compared to single ones. Land capacity will add less than 1% to DNOOP and the number of hospitals will augment the DNOOP by 12.9 %. But the number of beds in hospitals will decrease DNOOP by less than 1%. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) will increase DNOOP by 3.2 % and the dummy for people living in other states than Khartoum, the regression shows insignificant P-values.

## 4.2. Tobit regression

Table IV-7 Total out of pocket health expenditure

Tobit regression	Number of obs	=	27078
	LR chi2(11)	=	2903.27
	Prob > chi2	=	0
Log likelihood = -39745.5	Pseudo R2	=	0.0352

logtoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	0.831063	0.082315	10.1	0	0.669722	0.992404
sex	0.181435	0.061982	2.93	0.003	0.059948	0.302922
Basic_education	1.254664	0.068152	18.41	0	1.121083	1.388245
university	1.353298	0.165171	8.19	0	1.029555	1.677041
urban_ru	0.122531	0.064051	1.91	0.056	-0.00301	0.248075
married	1.473233	0.078167	18.85	0	1.32002	1.626445
wideworce	1.596242	0.13747	11.61	0	1.326794	1.86569
landcap	0.009715	0.000848	11.46	0	0.008053	0.011376
hrate	1.409721	0.144777	9.74	0	1.125951	1.693492
bedrate	-0.01359	0.002765	-4.91	0	-0.01901	-0.00817
popstate	-0.138	0.283915	-0.49	0.627	-0.69449	0.418484
_cons	-3.62194	0.333543	-10.86	0	-4.27571	-2.96818
/sigma	4.175371	0.03332			4.110062	4.24068

Obs.	summary:	16438	left-censored observations at	logtoop2<=0
		10640	uncensored observations	
		0	right-censored observations	

Table (IV-7) shows the coefficients, standard errors and the significance related to the independent variables from Tobit run on the log value of the Total out of Pocket Health Expenditure (TOOP). And also the regression shows 16438 left-censored observations at  $\log_{\text{toop}} \leq 0$  and 10640 uncensored observations

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the Chi-square shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on TOOPHE with (83.1 %). For gender (male = 1) the regression shows that there is a positive and significant coefficient. In comparison with the non-educated people, having education and tertiary level will increase TOOPHE by 125.5 % and 135.3 % respectively with a significant p-value. Married people and those who lost their partners have a higher TOOPHE by 147.3 % and 159.6 % respectively compared to single ones. Land capacity will add less than 1% to TOOPHE and the number of hospitals will augment the TOOPHE by 140.9 %. But the number of beds in hospitals will decrease TOOPHE by 1.4 %. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) the regression shows increase on TOOPHE by 12.3 % and the dummy for people living in other states than Khartoum, the regression shows insignificant p-values.

Table IV-8 Out of pocket health expenditure for non-chronic care

Tobit regression	Number of obs	=	27078
	LR chi2(11)	=	337.61
	Prob > chi2	=	0
Log likelihood =	-24746.7	Pseudo R2	= 0.0068

logacoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	0.36219	0.123159	2.94	0.003	0.120793	0.603587
sex	-0.01853	0.089887	-0.21	0.837	-0.19472	0.157651
Basic_education	0.970205	0.099901	9.71	0	0.774394	1.166016
university	0.035114	0.260677	0.13	0.893	-0.47583	0.546055
urban_ru	-0.22317	0.09398	-2.37	0.018	-0.40738	-0.03897
married	-0.49368	0.117456	-4.2	0	-0.7239	-0.26346
widvorce	-0.53771	0.214969	-2.5	0.012	-0.95906	-0.11636
landcap	0.006469	0.001246	5.19	0	0.004026	0.008912
hrate	1.861984	0.210864	8.83	0	1.448679	2.275289
bedrate	-0.02741	0.004037	-6.79	0	-0.03532	-0.0195
popstate	-1.11299	0.417086	-2.67	0.008	-1.9305	-0.29548
_cons	-3.96571	0.489434	-8.1	0	-4.92503	-3.0064
/sigma	5.224389	0.061886			5.103088	5.345689

Obs. summary: 21680 left-censored observations at logacoop2<=0  
5398 uncensored observations  
0 right-censored observations

Table (IV-8) shows the coefficients, standard errors and the significance related to the independent variables get from Tobit model run for the log value of the Out of Pocket Health Expenditure for Acute disease (ACOO) on explanatory variable. And also the regression shows 21680 left-censored observations at  $\log_{\text{acoop}} \leq 0$  and 5398 uncensored observations

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the Chi - square shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on ACOOP with (36.2 %). For gender (male = 1) the regression shows that there is a negative and insignificant coefficient. In comparison with the non-educated people, having basic education will increase ACOOP by 97.0 % but tertiary level the regression shows insignificant p-value. Married people and those who lost their partners have a negative impact ACOOP by 49.4 % and 53.8 % respectively compared to single ones. Land capacity will add less than 1% to ACOOP and the number of hospitals will augment the ACOOP by 186.2 %. But the number of beds in hospitals will decrease ACOOP by 2.7 %. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) and the dummy for people living in other states than Khartoum, the regression shows decreasing on ACOOP by 22.3 % and 111.3 with significant p-values.

Table IV-9 Out of pocket health expenditure for chronic care

Tobit regression	Number of obs	=	27078
	LR chi2(11)	=	1703.53
	Prob > chi2	=	0
Log likelihood =	-10797	Pseudo R2	= 0.0731

logcroop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	-0.42496	0.217483	-1.95	0.051	-0.85124	0.001316
sex	-0.81754	0.181203	-4.51	0	-1.17271	-0.46238
Basic_education	1.170234	0.193065	6.06	0	0.791816	1.548651
university	1.046813	0.440748	2.38	0.018	0.182924	1.910703
urban_ru	0.959576	0.182337	5.26	0	0.602186	1.316967
married	5.783078	0.242541	23.84	0	5.307684	6.258471
widvorce	7.781891	0.351211	22.16	0	7.093499	8.470283
landcap	0.008456	0.002377	3.56	0	0.003798	0.013115
hrate	-2.68615	0.432354	-6.21	0	-3.53358	-1.83871
bedrate	0.074155	0.008287	8.95	0	0.057912	0.090399
popstate	3.800264	0.811295	4.68	0	2.210085	5.390443
_cons	-20.9758	1.053501	-19.91	0	-23.0407	-18.9109
/sigma	7.184173	0.144202			6.90153	7.466816

Obs. summary: 25096 left-censored observations at logcroop2<=0  
1982 uncensored observations  
0 right-censored observations



Table (IV-9) shows the coefficients, standard errors and the significance related to the independent variables from Tobit run on the log value of the Out of Pocket Health Expenditure for chronic disease (CROOP). And also the regression shows 25096 left-censored observations at  $\log_{\text{croop}} \leq 0$  and 1982 uncensored observations

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the Chi-square shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a negative effect on CROOP with (42.5 %). For gender (male = 1) the regression shows that there is a negative and significant coefficient. In comparison with the non-educated people, having education and tertiary level will increase CROOP by 117 % and 104.6 % respectively with a significant p-value. Married people and those who lost their partners have a higher CROOP by 578.3 % and 778.2 % respectively compared to single ones. Land capacity will add less than 1% to CROOP and the number of hospitals will decrease the CROOP by 268.6 %. But the number of beds in hospitals will increase CROOP by 7.4 %. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) and the dummy for people living in other states than Khartoum, the regression shows positive coefficient and significant p-values.

Table IV-10 Out of pocket health expenditure for hospital care

Tobit regression	Number of obs	=	27078
	LR chi2(11)	=	163.64
	Prob > chi2	=	0
Log likelihood = -9831.27	Pseudo R2	=	0.0083

loghsoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
newage	1.26589	0.353186	3.58	0	0.573628 1.958152
sex	0.096376	0.263978	0.37	0.715	-0.42103 0.613786
Basic_education	0.246595	0.291015	0.85	0.397	-0.32381 0.817
university	-0.18703	0.721744	-0.26	0.796	-1.60169 1.227622
urban_ru	-0.11144	0.273172	-0.41	0.683	-0.64688 0.423987
married	1.565253	0.332994	4.7	0	0.912567 2.217939
widvorce	0.938059	0.598128	1.57	0.117	-0.2343 2.11042
landcap	0.016183	0.00344	4.7	0	0.009441 0.022925
hrate	2.419111	0.621626	3.89	0	1.200693 3.63753
bedrate	-0.03482	0.011827	-2.94	0.003	-0.058 -0.01163
popstate	-0.11229	1.189415	-0.09	0.925	-2.4436 2.219025
_cons	-18.7243	1.455512	12.86	0	-21.5772 -15.8714
/sigma	10.42058	0.241217			9.947786 10.89338

Obs.	summary:	25522	left-censored observations at	loghsoop2<=0
		1556	Uncensored observations	
		0	right-censored observations	

Table (IV-10) shows the coefficients, standard errors and the significance related to the independent variables from Tobit run on the log value of the Out of Pocket Health Expenditure on hospital care (HSOOP). And also the regression shows 25522 left-censored observations at  $\log\text{croop}_2 \leq 0$  and 1556 uncensored observations

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the Chi-square shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on HSOOP with (126.6 %). For gender (male = 1) the regression shows that there is a positive and insignificant coefficient. In comparison with the non-educated people, having education and tertiary level the regression shows insignificant coefficient. Married people will increase HSOOP by 156.5%, but those who lost their partners the regression shows insignificant relationship with HSOOP compared to single ones. Land capacity will add 1.6 % to HSOOP and the number of hospitals will augment the HSOOP by 241.9.6 %. But the number of beds in hospitals will decrease HSOOP by 3.5 %. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) and the dummy for people living in other states than Khartoum, the regression shows insignificant p-values.

Table IV-11 Out of pocket health expenditure for preventive care

Tobit regression	Number of obs	=	27078
	LR chi2(11)	=	1411.37
	Prob > chi2	=	0
Log likelihood =	-6365.98	Pseudo R2	= 0.0998

logproop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
newage	1.479767	0.278673	5.31	0	0.933554 2.02598
sex	3.755664	0.234507	16.02	0	3.296017 4.21531
Basic_education	0.229249	0.203245	1.13	0.259	-0.16912 0.627619
university	1.266913	0.423355	2.99	0.003	0.437115 2.096711
urban_ru	0.134831	0.191786	0.7	0.482	-0.24108 0.510741
married	3.506494	0.270395	12.97	0	2.976507 4.036482
widvorce	-1.38396	0.55427	-2.5	0.013	-2.47036 -0.29756
landcap	0.019168	0.002224	8.62	0	0.014808 0.023528
hrate	1.826611	0.456859	4	0	0.931144 2.722079
bedrate	-0.02107	0.008534	-2.47	0.014	-0.0378 -0.00435
popstate	1.465893	0.815569	1.8	0.072	-0.13266 3.06445
_cons	-19.0107	1.075465	-17.68	0	-21.1187 -16.9028
/sigma	6.086261	0.162334			5.768079 6.404443

Obs. summary: 25945 left-censored observations at logproop2<=0  
1133 Uncensored observations  
0 right-censored observations

Table (IV-11) shows the coefficients, standard errors and the significance related to the independent variables from Tobit run on the log value of the Out of Pocket Health Expenditure on preventive care (PROOP). And also the regression shows 25945 left-censored observations at  $\log\text{croop2} \leq 0$  and 1133 uncensored observations

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the Chi-square shows that there is significance for the overall set of the explanatory variables. The new age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on PROOP with (148 %). For gender (male = 1) the regression shows that there is a positive and significant coefficient by 375.6%. In comparison with the non-educated people, having basic education the regression shows insignificant relationship with PROOP but tertiary level will increase PROOP by 126.7 % with a significant p-value. Married people will increase PROOP by 350.6 % but those who lost their partners will decrease PROOP by 138.4 % compared to single ones. Land capacity will add 1.9 % to PROOP and the number of hospitals will augment the PROOP by 182.6 %. But the number of beds in hospitals will decrease PROOP by 2.1%. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) the regression shows insignificant P-value but the dummy for people living in other states than Khartoum, the regression shows significant p-values with increasing in PROOP by 146.6 %.

Table IV-12 Out of pocket health expenditure for dental care

Tobit regression	Number of obs	=	27078
	LR chi2(11)	=	1930.88
	Prob > chi2	=	0
Log likelihood = -11081.8	Pseudo R2	=	0.0801

logdnoop2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
newage	3.10764	0.208153	14.93	0	2.699648	3.515631
sex	0.488963	0.156222	3.13	0.002	0.182759	0.795166
Basic_education	2.469832	0.17468	14.14	0	2.127452	2.812213
university	3.733291	0.336024	11.11	0	3.074667	4.391915
urban_ru	0.527955	0.157119	3.36	0.001	0.219993	0.835917
married	2.216175	0.188025	11.79	0	1.847638	2.584713
widvorce	2.915119	0.322812	9.03	0	2.28239	3.547848
landcap	0.009056	0.002018	4.49	0	0.0051	0.013012
hrate	2.046051	0.373413	5.48	0	1.314141	2.777961
bedrate	-0.02795	0.007002	-3.99	0	-0.04167	-0.01422
popstate	-1.62646	0.690441	-2.36	0.018	-2.97976	-0.27316
_cons	-13.2225	0.84969	-15.56	0	-14.8879	-11.5571
/sigma	6.281924	0.121839			6.043113	6.520735

Obs. summary: 24965 left-censored observations at logdnoop2<=0  
2113 Uncensored observations  
0 right-censored observations

Table (IV-12) shows the coefficients, standard errors and the significance related to the independent variables from Tobit run on the log value of the Out of Pocket Health Expenditure on dental care (DNOOP). And also the regression shows 24965 left-censored observations at  $\log(\text{DNOOP}) \leq 0$  and 2113 uncensored observations

The adjusted  $R^2$  shows that the relation between the dependent variable and the explanatory variables are very weak. But the Chi-square shows that there is significance for the overall set of the explanatory variables. The age group (newage) is a dummy variable that is equal to 1 if the age of individual remains in age group 16-59 and equal to zero otherwise. The p-value is significant. So the age group has a positive effect on DNOOP with (310.8 %). For gender (male = 1) the regression shows that there is a positive and significant coefficient. In comparison with the non-educated people, having education and tertiary level will increase DNOOP by 247 % and 373.3 % respectively with a significant p-value. Married people and those who lost their partners have a higher DNOOP by 221.6 % and 291.5 % respectively compared to single ones. Land capacity will add less than 1% to DNOOP and the number of hospitals will augment the TOOPHE by 204.6 %. But the number of beds in hospitals will decrease DNOOP by 2.8 %. For the urban resident variable (Urban\_ru = 1 if person live in urban areas) increase DNOOP by 52.8 %, but the dummy for people living in other states than Khartoum will decrease DNOOP by 162.6 % and the regression shows significant p-values.

Passed on results from OLS and Tobit on the log value of the dependent variables (OOP health expenditure on different type of care), the following conclusions can be made

The equations were run only on those reported to be sick. Therefore, there were 27078 observations (out of 75184 observations) i.e. 36% of the sample. This means one in three people sought care for one or more type of diseases during the identified period in the survey. This could imply that there was a very bad health situation overall in the country. If we connect this with situation in Sudan where OOP reached 64.3% from THE, and poverty was high at 44.8% with per capita health expenditure of US\$111, the results suggest that there could be catastrophic health expenditure among Sudanese households especially in rural areas which represent 69% of the population in Sudan, of who 57.6 % were poor.

The age groups in general have a significant effect on different types of care. OOP health expenditure increases when age increases. Only in preventive care is the relationship negative. This means the preventive care will decrease when age increases. This is consistent with the real situation that immunization is for children less than five years old. Gender seems to not have any effect with chronic and non-chronic care OOP but it has a high correlation with total health OOP expenditure and dental care OOP expenditure. Education level increases health expenditure in total. But it does not have a significant impact on chronic or non-chronic care. For preventive care there is a positive relationship. In urban areas there is a high OOP for every type of health care. There is a high OOP spending on preventive care, dental care and total OOP health expenditure for married and widowed persons. Divorced people seem to have a high OOP spending on preventive care only. Land capacity has an effect on all types of diseases except chronic care but the effect is very small. The number of hospitals in the area has a high positive and significant effect on all kinds of care except chronic care. This means hospitals play a very good role to provide care for the population around their areas, especially chronic care. Living in any state far away from Khartoum state seems to decrease total OOP expenditure and increase the burden of acute and chronic care.



## **CHAPTER V CONCLUSION AND RECOMMENDATION**

### **5.1. Conclusion**

In the regressions, there are some statistically significant explanatory variables. Variables that usually positively impact OOP spending include age groups, gender, and education level, parents that lost his or her partners, land capacity and hospital rate. Variables that usually negatively impact OOP spending include, state resident and bed rate. Recall that the OOP variables come from the summation of treatment cost, cost of food, and accommodation for the co patient and transportation cost. Transportation costs seem to be very high for all type of care. This suggests that the distribution of medical personnel and medical facilities is unequal.

### **5.2. Recommendations**

Health is a right for all people and, to prevent people from having high OOP health expenditure that lead to impoverish people, the Government should make plans to reform the health sector in general and the public sector of health particularly.

#### ***5.2.1. Recommendation based on the literature review***

From the literature review from Sudan Federal Ministry of Health statistical report 2010 and from the first National Health Account report 2008 for Sudan I suggest the following recommendations

1. To increase the number of medical doctors.
2. To open up the country for investment in health sector
3. To upgrade the young medical assistants to be general practitioners, dentists or pharmacists within their specialties.
4. To create new medical facilities.
5. To work with health care providers and consumers protection agency to find ways to control the rising health care prices.
6. Expand and increase health insurance coverage with different type of insurance
7. Use Zakat chamber to cover poor people under social insurance

### **5.2.2. Recommendation based on the regression results**

1. The government can subsidize the family with old age members and high number of children
2. The rural resident shows high OOP with no clear reason only if the transportation cost is high so the government and National Health Insurance Fund expand the health coverage overall rural areas facilities
3. For gender government can subsidize services for women

### **5.3. Limitation of the study**

The OLS, seemingly unrelated regression and Tobit models produce similar results. This study is not without limitation. First, I do not have information about health of individuals in the study. Second, Sudan is a very big country with different cultures which could affect care seeking behavior. However, statistics or data that represent each culture for each individual are not observed. Moreover, the intensity of diseases among Sudanese households for different types of diseases is unknown and there is no any information about income or wealth of the household in the survey.

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